

Hamid M. K. Al Naimiy · Maamar Bettayeb ·
Fakir Al Gharaibeh · Hussein M. Elmehdi ·
Ihsan A. Shehadi *Editors*

Sustainability, AI and Innovation: Proceedings of the Applied Research in Humanities & Social Sciences (ARHSS 2023)

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of the Applied Research in Humanities
& Social Sciences (ARHSS 2023)**

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Foreword

The papers presented in this edited book cover many aspects of the current and future insights related to human and social sciences where cognitive and predictive approaches are being adopted. This book also tackles the issues related to applied research in human and social sciences, particularly the potential use of AI and machine learning in assessing psychological and behavioral profiling. With the advancements in computational and data sciences, education shall not be the same as is evident through the research work that is endorsed in the proceedings of this important conference. The papers cover a wide spectrum of social-behavioral aspects from assessment methodologies, data analysis, policies and legislation, social sustainability, applications of AI in social simulations and predictions, and selected case studies in related fields. Hence, this edited book can be a valuable reference for much applied research in social and human sciences for years to come.

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Foreword by Silvio Waisbord

This book presents a state of the art of communication scholarship, with a focus on the Middle East and applied sciences and knowledge. The chapters are based on presentations delivered at an international conference hosted by the University of Sharjah in 2023. The conference gathered scholars from the region and the world and put emphasis on applied/implementation science. The volume offers a wide-ranging survey of contemporary lines of research including teaching, religion, the environment, health, social media, children, consumerism, political participation, and artificial intelligence. It should be of interest to scholars and students interested in getting fresh insights into these topics and understanding how communication scholarship makes a positive difference in people's lives.

Silvio Waisbord

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Washington, DC, USA

Foreword by Ken Rutherford

The Research Institute of Humanities and Social Sciences (RIHSS) at the University of Sharjah plays a leading international and regional role in applied research to help address broad societal questions, such as alleviating suffering of people living on the margins of society.

RIHSS's leadership on applied research was recognized in 2023 when it successfully organized the 1st International Conference: Applied Research in Humanities and Social Sciences and received widespread academic and media attention. The conference was incredibly well-organized by RIHSS. The attendees included international and regional academics, practitioners, and students and it was held under the patronage of H.H. Sheikh Sultan Bin Ahmed Al Qasimi, Deputy Ruler of the Emirate of Sharjah.

With this book, *Sustainability, AI and Innovation: Proceedings of The Applied Research in Humanities & Social Sciences (ARHSS 2023)*, the RIHSS continues his mission to highlight the importance and application of humanities and social sciences in our lives and building our societies. It shows that there is a serious-minded need to provide individuals and societies with ongoing social, psychological, and legal support.

At the broader level, the world is facing enormous social, socioeconomic, cultural, health, and environmental problems around the world. To address these challenges, Professor Fakir has selected a wide array of social scientists, highlighting how scientific research is an important and necessary tool to better address such challenges, investigate problems, develop new knowledge, and perhaps offer innovative solutions to these problems. Many of the research findings are published in this book for the first time, which, in turn, are important because the value of the findings of applied research can be used to solve practical and real problems in society.

The 2023 RIHSS conference remarked that all are welcome to participate in any of the “joint initiatives that effectively service humanity in general, and the Emirati society in particular and contribute to its development and prosperity.”

The researchers recognized that many of those who live in the Arab world have a hard life. Those who have lost limbs or faculties in those countries—be it from

war or other causes—have the hardest life of all. Their disabilities usually result in the loss of jobs, inability to go to school, and the impoverishment of their entire families. This is not just because of physical barriers. There are profound social barriers as well. Other chapter topics include Identifying Students Who Suffer from Attention Deficit Hyperactivity Disorder to Unveiling Link Between Prayer and Wellbeing to Mobilizing Youth for Climate Change Awareness Educational System in Iraq.

These topics resonate with me at the personal level as I lost both my legs to a landmine in Somalia. My life would never be the same. Little did I realize then that one day I would have the honor to become a professor, help mold young students lives to service the world, and collaborate with wonderful institutions such as the University of Sharjah and applied scholars.

I had the privilege to participate in the RIHSS conference, meet many of the participants, and see how it profoundly touched people affected by many of the region's social issues. This book's vision for publishing research projects that directly inform important social issues reflects the active role the University of Sharjah plays in community service and academic research.

I commend RIHSS for creating an academic model pioneering the importance and application of humanities and social sciences. This innovative academic book offers a unique, holistic approach to applied social science research. It serves as a unique collection of articles authored by experts in the field, which will enrich the research locally and globally.

Ken Rutherford
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Harrisonburg, VA, USA

Preface

The editors of this book are keen to publish selected high-impact articles after extensive peer reviews in an open access book to disseminate knowledge and share expertise with a wide spectrum of social scientists and professionals. This book offers a unique platform to map applied research in humanities and social sciences with contemporary global issues that involve behavioral and psychological analysis using computation methods, AI, and machine learning. In addition, the book tackles the digital, ethical, and methodological advances in applied research in social sciences through: Research best practices: case studies, opinion polls, ethnographic research findings, mixed approaches across disciplines, and cross-sectional studies/mixed methods across disciplines and areas. Such topics and approaches are expected to be of great benefits to crime prevention, policy making and implementations, predictive trend analysis and simulations, authentications of art and artifact work, economic sustainability, and applied research in law and Islamic studies. Hence, the book is an essential reading for scholars, students, policymakers, law enforcement, humanitarian agencies, social workers, and practitioners who are interested in a better understanding of the evolutions in social sciences and humanities and the related research trends.

The themes of this book span the following areas:

1. Mapping the Scope of Applied Research in Humanities & Social Sciences
2. Research Contributions in Crime Prevention and Enhancing Social Security
3. Digital, Ethical, and Methodological Advances in Applied Research
4. Partnerships and Community-Based Research Practices in Humanities and Social Sciences
5. Sustainability and Innovative Research on Economy, Society, and Governance (ESGs)
6. Applied Research in Law and Islamic Studies.
7. Post-Graduate Research Students' Research Aspirations and Progress

Over 250 papers were presented during the conference and scholars were given the opportunity to submit their papers for publication in this special volume entitled “*Sustainability, AI and Innovation: Proceedings of The Applied Research in*

Humanities & Social Sciences.” All papers have gone through rigorous international standards reviews, which have included at least two experts in the field, plus similarity and plagiarism check as well as language. The 25 chapters which are to be published in this edited book (volume 1) represent 27% of the total papers which have been submitted to the “The 1st Sharjah International Conference on Applied Research in Humanities & Social Sciences” that was held on October 31st, 2023 at the premises of the University of Sharjah.

The chapters in this book cover case studies, models, and reviews of original collaborative research conducted in over 42 countries around the world. Hence, making this volume unique in presenting a comprehensive overview of the modern landscape of the applied social sciences and provides an outlook on new evolving trends in such area, with the emphasis on technologically driven applications.

The edited book is in line with the strategic goals of the University of Sharjah, which highlights the importance of scientific research in the applied social sciences to serve the scientific community at the national, regional, or international levels. The editorial board has been working diligently to ensure that the chapters contribute to the noble goal of preparing institutions for area emerging era of AI and machine learning.

Sharjah, United Arab Emirates

Hamid M. K. Al Naimiy
Maamar Bettayeb
Fakir Al Gharaibeh
Hussein M. Elmehdi
Ihsan A. Shehadi

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About the Editors

Maamar Bettayeb received his Ph.D. in Electrical Engineering from the University of Southern California, Los Angeles, in 1981. He has been Professor at the University of Sharjah UAE since August 2000. He also held key leadership positions including Advisor to the Chancellor for Graduate Studies and Scientific Research (2004–2006), Director of Research and Studies Center (2005/2006), and Vice Chancellor for Research and Graduate Studies at the University of Sharjah (UOS), starting September 2014. He was the chair, co-chair, and chair of the organizing and scientific committees of several key international conferences, e.g. ISSPA 2007 and SHJEDU2022. He was Associate Editor of the International Journal of Modeling, Identification and Control. He was the leader of intelligent systems research group at UOS. He also led the development of the Strategic Planning for Research at the University of Sharjah. He has published over 350 journal and conference papers in the fields of control and signal processing.

Hussein M. Elmehdi is the Dean of Academic Support Services and an Associate Professor of Biomedical Physics at the Department of Applied Physics and Astronomy. He obtained his PhD in 2001 from the University of Manitoba, Canada in Biomedical Physics. He joined the University of Sharjah (UOS) in Feb 2005 as a Biomedical Physicist. Dr. Elmehdi is very active in several research areas covering biomedical applications of ultrasound, environmental acoustics, health & environmental physics, online education, and remote learning. Dr. Elmehdi is participating in several well-funded international and national research projects. Dr. Elmehdi has over 100 refereed publications in high impact factor journals, well-known international conferences, and book chapters as well as two registered patents. He is the chief scientific judge at the Emirates Foundation for Youth Development and Ministry of Educations. He has received numerous excellence awards and recognitions in research, teaching, and community services. Among these awards are the prestigious UoS Excellence Award in Research (2014), UoS Excellence Award in Teaching (2015, 2012), UoS Excellence Award in Community Services (2011),

Transformational Leadership Awards (Tahawil Tech) 2020, and UOS Excellence Award in Leadership (2021).

Fakir Al Gharaibeh is a Professor of Social Work and Social Policy, currently serving as the Director of the Research Institute of Humanities and Social Sciences (RIHSS) and the Center for Family and Child Studies (CFCS) at the University of Sharjah, UAE. He also holds the title of Honorary Professor at the University of Jordan. Professor Al Gharaibeh earned his PhD from Curtin University of Technology, Australia (2006), and completed advanced training in teaching and learning in social work at Brunel University and the University of Reading, UK. His multidisciplinary research spans social innovation, digital humanities, mental health, divorce, refugees, child abuse, criminal justice, and Arab youth. He has an extensive publication record in national and international journals, has served as a consultant on family policies, and has successfully secured numerous research grants. As a guest editor, he oversaw a special issue of *The Journal of International Women's Studies* published by Bridgewater State University. He also serves on the Editorial Boards of *International Social Work* (SAGE) and *RUDN Journal of Sociology* (Russia).

Professor Al Gharaibeh is a member of several prestigious international professional associations, including the American and Australian Social Work Associations. His significant contributions to academia and community service have earned him notable accolades, such as the Leadership Award in Research and Graduate Studies and the Sharjah Voluntary Work Award for Research.

Hamid M. K. Al Naimiy, Chancellor of the University of Sharjah, General Director and Founder of the Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST) and President of the Arab Union for Astronomy and Space Sciences (AUASS) in the United Arab Emirates, is a renowned scientist in the fields of astronomy and astrophysics and a leader in education. He has held numerous senior level administrative positions, including Academic Department Chair, Dean of the College of Arts and Sciences, and Vice Chancellor for Academic Affairs, in addition to his current positions. He has served as the chief/associate editor for over 10 journals and edited books and has been a keynote speaker at more than 250 national and international conferences, symposia, and workshops, including the IAU conference. He has published more than 30 books (in the fields of astronomy, space sciences and education), authored over 800 scientific articles, published in newspapers, magazines, and journals, and refereed over 130 publications in indexed journals. Professor Al Naimiy has been the recipient of numerous awards, including the prestigious Khalifa Award for Education 2009/2010 (in the field of higher education), UAE, and the IAU and UNESCO Award for Outstanding Contribution to the Success of the International Year of Astronomy 2009.

Ihsan A. Shehadi earned his Bachelor's degree from the American University of Beirut, Lebanon, and his Ph.D. degree in Physical Chemistry from Northeastern University, Boston, Massachusetts, U.S.A. Dr. Shehadi has published more than 55 peer evaluated research papers in reputable international journals and conference proceedings in the areas of physical chemistry, computational chemistry, chemical education, and heterogeneous catalysis. During the past few years, his research has focused on using computational chemistry and bioinformatics tools (e.g., docking, molecular dynamic simulations, sequence alignments, active sites searches, structural genomics) to search for potential inhibitors for selected enzymes. He had numerous contributions in developing curricula, experiments, assessment tools, and instructional methodologies in chemical science. During his academic career, he contributed heavily in the organization of many events as conferences, competitions, students' supervision at the graduate and undergraduate levels, workshops, etc.

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Unveiling Link Between Prayer and Wellbeing: A Systematic Literature Review



Afreen Faiza and Jerald Paul Immanuel

Abstract Prayers are an integral part of wellbeing. This systematic review investigates the link between prayer and wellbeing by examining 87 papers published between 2000 and 2020. The databases utilized include Scopus, Google Scholar, and Web of Science. We applied standardized quality assessment criteria, and independent reviewers selected eight studies for inclusion. The novelty of this study lies in its comprehensive time frame, rigorous selection criteria, and the use of multiple databases, which enhance the reliability and breadth of the review. The present investigation distinguishes itself from existing research by offering a robust synthesis of two decades of studies, ensuring high-quality inclusion through meticulous criteria, and providing a broad yet detailed examination of the connection between prayer and wellbeing. Our analysis reveals a consistent positive correlation between prayer and wellbeing. This research contributes to a holistic understanding of prayer's positive impact on overall wellbeing and offers practical applications for enhancing mental health interventions, promoting holistic health practices, and informing public health policies. It invites further exploration and application to improve wellbeing at individual and community levels.

Keywords Prayer · Wellbeing · Relationship · Systematic review

1 Introduction

Prayer serves as a useful mechanism among patients with various physical illnesses, including heart ailments, congestive cardiac surgery, and cancer (Johnson & Outlaw, 2002; Saudia et al., 1991; Soderstrom & Martinson, 1987; Taylor et al., 1999). It promotes catharsis, hope, forgiveness, love, contentment, empowerment, and other

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positive emotions (Levin, 1996), thus fostering wellbeing by boosting spirituality, reducing stress, and improving self-esteem.

Wellbeing is characterized by joy, satisfaction, minimal discomfort, and an optimal state of biological and psychological functioning (Ryan & Deci, 2001), including physical health, positive social relationships, existential meaning, self-acceptance, and productivity and progress (Ryff & Keyes, 1995). Numerous studies have revealed positive linkages between prayer and wellbeing. For instance, prayer assists individuals in coping with stressful situations and gaining a sense of control, purpose, and meaning that reduces distress. Among populations from different religious backgrounds, such as Muslims (Munir et al., 2012; Levin, 2013) and Christians, prayer schedules are positively linked with happiness and wellbeing. However, several studies have also investigated associations between prayer and mental health, representing inconsistent findings (Ladd & Spilka, 2006; McCullough, 1995; Pössel et al., 2013).

For example, Masters and Spielmans (2007) reported an absence of associations for two variables: lack of associations for prayer regularities, satisfaction with life, and positive mood; and a reverse association between the regularity of prayers and satisfaction with life (Poloma & Pendleton, 1991). An examination of the current body of literature on the relationship between prayer and mental health has yielded somewhat contradictory findings. Some earlier cross-sectional studies suggest positive correlations between prayer and mental wellbeing (Levin, 1996), whereas others indicate a lack of associations (Masters & Spielmans, 2007) or even adverse mental health outcomes. The primary objective of this systematic literature review was to examine quantitative studies within the Muslim population, aiming to elucidate the connection between prayer practices and overall wellbeing.

This review aimed to provide a contemporary update to existing literature reviews on the correlation between prayer and wellbeing, focusing specifically on high-quality studies conducted with Muslim samples. Anticipating the outcomes of these studies, it is hypothesized that all included research would demonstrate a statistically significant positive relationship between prayer engagement and wellbeing. The comprehensive review is designed to contribute insights into the significance of prayer in individuals' wellbeing within the Muslim context. Additionally, it aims to bring attention to the diverse array of measurement tools employed in assessing both prayer practices and overall wellbeing in these studies.

Understanding the impact of prayer on wellbeing is crucial not only for individual mental health but also for developing effective public health strategies that incorporate spiritual practices (Koenig, 2012; Pargament & Mahoney, 2005). The primary objective of this systematic literature review was to examine quantitative studies within the Muslim population, aiming to elucidate the connection between prayer practices and overall wellbeing. This review aimed to provide a contemporary update to existing literature reviews on the correlation between prayer and wellbeing, focusing specifically on high-quality studies conducted with Muslim samples. It was hypothesized that the included research would demonstrate a statistically significant positive relationship between prayer engagement and wellbeing. This comprehensive review is designed to contribute insights into the significance

of prayer in individuals' wellbeing within the Muslim context. Additionally, it aims to highlight the diverse array of measurement tools employed in assessing both prayer practices and overall wellbeing in these studies.

2 Methodology

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist, the current review was conducted (Page et al., 2021). The keywords "effect of prayer" AND "prayer" OR "worship" OR "influence of Pra*" OR "wellbeing" OR "happiness" OR "quality of life" OR "life satisfaction" were used to search the databases of Scopus, Google Scholar, and Science Direct during January and February 2023.

By using a combination of these keywords, the search aimed to retrieve a comprehensive range of studies that explore the effects of prayer on different aspects of wellbeing. This approach ensures a thorough exploration of relevant literature in databases, providing a solid foundation for the systematic review.

Figure 1 displays a PRISMA flow diagram (Page et al., 2021) that outlines the addition and omission parameters of papers, as well as the search, screening, and selection processes.

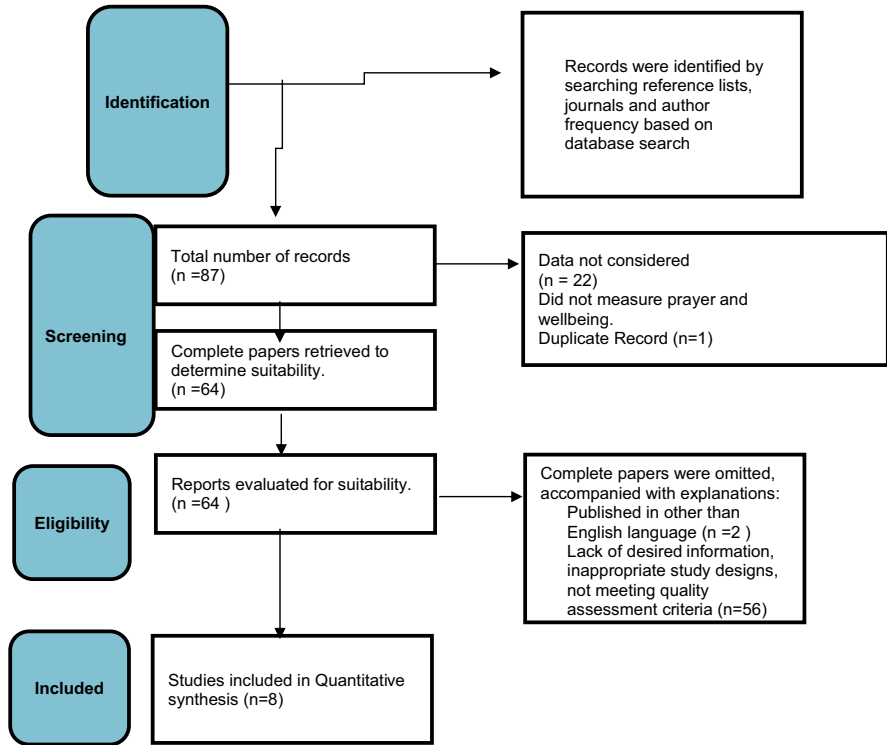
2.1 Inclusion and Exclusion Criteria

Original Papers published between the years 2000 and 2020 in English were included in the systematic review. Case reports, conference proceedings, review papers, and qualitative studies were excluded.

2.2 Study Selection and Quality Assessments

The titles, abstracts, and full texts of articles were evaluated based on inclusion/exclusion criteria. Duplicate records were carefully considered and eliminated from the final selections.

Data extraction focused on the main findings along with the name of the researcher, published year, population and geographic location of the study, measurement tools utilized, and key outcomes. Quality assessment of papers was carried out utilizing a 20-item appraisal tool, AXIS, to measure the quality of papers (Downes et al., 2016). The AXIS, comprising 20 critical appraisal items, employs a three-response rating system (yes, no, and do not know) to assess the methodological quality of research articles. Each positive response is assigned a score of one, with higher scores indicating a lower risk of bias. Researchers have utilized the



PRISMA flow diagram (Page et al., 2021) delineates the stages of searching, screening, selecting, and applying criteria for both retention and removal in the conducted studies.

Fig. 1 Study selection and quality assessments

AXIS criteria to evaluate article quality, enabling differentiation among studies based on their methodological rigor (De Cock et al., 2022; Sujatha et al., 2021).

Quality scrutinization and data retrieval were done using AXIS, and studies that merit favorable quality were included in the final analysis.

3 Results

Initially, 87 papers were obtained through database search. One duplicate study was removed, and 22 studies were excluded as they did not measure variables of prayer and subjective wellbeing. The remaining 64 articles were evaluated and analyzed, out of which two papers were excluded because of languages other than English. After the evaluation of full-text articles, 56 studies were excluded for not qualifying quality assessment criteria, lack of information about target variables, and inappropriate study designs and tools used. The final selection encompassed a total of eight

quantitative papers that remain in consideration. Table 1 provides a descriptive assessment of each study.

3.1 Sample and Participants

The total number of participants in the eight studies was 2871. Forty-four participants marked the smallest number in a study (Boelens et al., 2012), while the highest number was 1500 (Bradshaw & Kent, 2018). Studies included a diverse range of participants from different religious groups, such as Muslims (Achour et al., 2019; Albatnuni & Koszycki, 2020), Christians (Bradshaw & Kent, 2018; Schnitker & Richardson, 2019), and Jews (Lazar, 2015), of both genders (Lazar, 2015). Some studies focused only on women (Boelens et al., 2012; Shaw et al., 2007), Older adults (Bradshaw & Kent, 2018), student populations (Kiyania et al., 2011), patients (Shaw et al., 2007), and nurses (Achour et al., 2019).

3.2 Measures

Prayer and wellbeing are multidimensional concepts; hence, they have been operationalized differently in studies. Prayer is measured by the researcher's self-developed single or dual items in terms of frequency and duration of prayers (Albatnuni & Koszycki, 2020; Bradshaw & Kent, 2018) and attendance in prayer ceremonies (Kiyania et al., 2011). Some studies also indicated prayers measured in unique ways, such as linguistic inquiries or religion-related word counts, such as pray and worship (Shaw et al., 2007). The authors mentioned that participants or prayers are accessed via weekly gratitude journaling, such as listing and uttering grateful things to God aloud (Schnitker & Richardson, 2019). Other studies utilized a multidimensional prayer inventory, which assessed three prayer aspects of belief, type (adoration, confession, thanksgiving, supplication, reception), and behavior (Lazar, 2015), as well as an Islamic prayer scale (21 items) with three subscales for performing prayer, prayer concept, and prayer impact (Achour et al., 2019).

Whereas wellbeing is measured by satisfaction with life (Bradshaw & Kent, 2018; Lazar, 2015), self-esteem and optimism scales, Hamilton anxiety and depression, and optimism scales (Boelens et al., 2012; Bradshaw & Kent, 2018), emotional and functional wellbeing, social support, and positive reaffirming, the general health questionnaire (Kiyania et al., 2011), and family, life, and job satisfaction (Achour et al., 2019).

Studies also mentioned control variables such as ethnicity, age, insurance, and living status and mediators such as daily spiritual experience, life orientation, mindful attention awareness, and the system of belief inventory (social support obtained from religious communities) (Albatnunia & Koszycki, 2020).

Table 1 Summary of research papers

Author/Year	Region/Sample	Measures	Outcomes
Bradshaw and Kent (2018)	United States 1500 (752 old blacks, 748 old whites)	Mental connection to God	PWB, Rosenberg self-esteem scale, optimism, relationship between prayer and wellbeing is life satisfaction scale, prayer frequency, attachment complex and moderated by perceived relationship with God, prayers improve wellbeing of individuals with secure attachments to God but not those with insecure attachment to God
Boelens et al. (2012)	Vicksburg, Mississippi 44 women	Ritual experiences scale	Hamilton rating scales for depression and improvement of depression, anxiety, optimism anxiety, life orientation test, and daily spiritual experiences at 1 month and 1 year than the baseline for measures ($p < 0.01$ in all cases)
Shaw et al. (2007)	Michigan, USA: 231 patients (breast cancer)	Tive	Breast cancer-related concerns. Negative emotion frequency counts for the use of religious words, emotional wellbeing, functional wellbeing (prayer, worship, faith, holy, Christ) words associating, health self-efficacy, social support, positive and with lower levels of negative emotions, and greater health self-efficacy and functional
Kiyania et al. (2011)	Iran-Ahar 100 university students in Canada 155 Muslims (122 women and 33 men)	Ritual ceremony	Religious expression—religion-related word expression of wellbeing. Precision (pray, worship, faith, holy, Christ), general health questionnaire, and prayer participation—participation in prayer improves the wellbeing of students
Albatnuni and Koszycki (2020)		Tension awareness scale	Frequency of prayer, duration of prayer (self-relationship between prayer and wellbeing measure report), satisfaction with life scale, system of dilated by optimism and spiritual experiences. Belief inventory, the daily spiritual experience, further mediated variables with prayer scale, life orientation test-revised, mindfulness includes mindfulness, social support, and daily spiritual

(continued)

Table 1 (continued)

Author/Year	Region/Sample	Measures	Outcomes
Achour et al. (2019)	Malaysia 300 Muslim nursing staff California	Workplace stress scale, Islamic prayer	Wellbeing (family, job, and life satisfaction), prayers improve the wellbeing of individuals. Also prayers reduce job stress. Participants in prayer condition showed lowered
Schnitker and Richardson (2019)	196 undergraduate students	Satisfaction with life scale	Positive and negative affect schedule, health negative affect, high level of gratitude, positive questionnaire, gratitude questionnaire, hope affect, hope, and life satisfaction (hedonic and Eudemonic wellbeing)
Lazar (2015)	345 Jews, Israel	Scale, journaling (self, social, prayer) with life scale	Multidimensional prayer inventory, satisfaction prayer related to life satisfaction for men, while no direct relationship was found for women; however, interaction effects for prayer type, duration, and belief were evident. Study implies a complex relation between prayer and wellbeing aspects

4 Discussion

Considering religiosity in the context of overall psychological wellbeing, outcomes showed that the majority of studies reported positive linkages between prayer and wellbeing. Researchers identified the complex relationship between prayer and wellbeing mediated by several variables such as attachment to God (Bradshaw & Kent, 2018), spirituality, mindfulness, optimism, and social support (Albatnuni & Koszycki, 2020), as well as prayer belief and duration (Lazar, 2015). The literature utilized measures for prayer accessed via a researcher's self-developed tool solely based on one or two items to measure prayer as a key variable in terms of the frequency of prayer (Albatnuni & Koszycki, 2020; Bradshaw & Kent, 2018), not validated by any assessment ways. Whereas nearly half of the literature included the wellbeing scale restricted to the Life Satisfaction Scale (SWLS; Diener et al., 1985), which assesses overall levels of Life satisfaction and provides global descriptions of levels of satisfaction with life. The relationship between prayer and wellbeing is complex and needs valid and psychometric sound instruments that account for prayer in measuring wellbeing. Studies utilized multidimensional and psychometrically tested scales to assess prayer (Achour et al., 2019; Lazar, 2015) were limited, and the use of wellbeing measures to address prayer as a component of wellbeing was not addressed in any of the measures considered in the studies included.

The complexity of measurement tools, larger and nonrepresentative sample sizes, or smaller sample sizes raises concerns over the generalizability of outcomes. While the research participations were unidentified, feedback may be influenced to access prayers in terms of religious affairs being private and sensitive, social desirability bias, reliance on quantitative measures, and nonrepresentative populations, demanding cautious interpretations of findings. In future research, enhancing

measurement tools for assessing prayers' impact on psychological wellbeing is crucial. This involves adopting validated instruments that capture the multifaceted nature of prayer experiences and their associations with attachment to God and spirituality. Additionally, utilizing specific wellbeing scales tailored to measure prayers' contribution to overall wellbeing can offer deeper insights. Ensuring representative sample sizes and addressing potential biases through mixed-method approaches are essential steps for advancing understanding in this field.

However, specific merits can be identified in the review, such as the two-wave nationwide project (Bradshaw & Kent, 2018) that included 1500 older participants of 65 years and above from the United States who pointed out the perceived relationship with God as a mediating factor between prayers and wellbeing, and attachment to God became one of the protective factors during aging, which demarcates lots of challenges related to physical health, reduced social support, financial constraints, and the loss of loved ones (George, 1993; Scott et al., 2011). Prayer improves the wellbeing of people with Secure attachments with God as compared to those with insecure attachments with God; however, the findings demand careful generalizability owing to the nonrepresentative sample. Outcomes of the study suggest that regular spiritual encounters and optimistic attitudes hold significance for linkages between prayers and wellbeing. A study by Schnitker and Richardson (2019) conferred a unique aspect about frequent gratitude prayers and positive linkages for aspects of wellbeing (hedonic & eudaimonic) as compared to gratitude prayers without religious aspects. The study invites further exploration to fully grasp the variables of interest. Several implications have been indicated by studies, such as prayer interventions improving the wellbeing of patients suffering from depression and anxiety (Boelens et al., 2012) and females with breast cancer (Shaw et al., 2007), providing valuable insights about the usage of religious methods to enhance the wellbeing of individuals.

It is imperative to carry out future studies. Researchers should focus on recruiting larger and more diverse samples across different cultures, age groups, socioeconomic statuses, and countries to enhance the generalizability of findings. Additionally, conducting comparative analyses across various religions can provide insights into the differential impact of prayers on wellbeing. Utilizing multiple measurement scales that capture subjective experiences, physiological, and behavioral markers of wellbeing, validated in controlled settings, is essential. Moreover, exploring the mediating and moderating roles of psychosocial factors can deepen our understanding of the linkages between prayer and wellbeing. By employing sophisticated methodologies integrating these approaches, researchers can advance our understanding of the impact of prayer on individual wellbeing across diverse populations.

5 Conclusion

In summary, this systematic review delved into two decades of studies investigating the associations between religiosity and wellbeing, revealing a consistent and positive correlation between these variables. Findings underscore the potential of prayer as a beneficial practice for enhancing mental and emotional health. The review highlights the necessity for further research to address the identified gaps, such as the need for more diverse and longitudinal studies, which could significantly advance knowledge in this field. While the variability in study designs presents a limitation, this review addresses it by employing rigorous selection criteria and independent assessments to ensure the reliability and validity of the included studies.

Additionally, the significance of this research extends globally, suggesting that incorporating prayer and other religious practices into wellness programs could have broad applications. For instance, integrating prayer into mental health interventions in various cultural and religious contexts could enhance their effectiveness and cultural relevance. In clinical settings, incorporating prayer and spiritual support has been shown to improve patient outcomes and satisfaction in diverse cultural contexts (Koenig, 2012). In community health initiatives, integrating religious practices can enhance social support and community cohesion, particularly in regions where religiosity is a significant aspect of daily life (DeHaven et al., 2004). Furthermore, in educational settings, including religious and spiritual dimensions in wellbeing programs can foster a more inclusive environment that respects and supports diverse beliefs (Benson et al., 2003). In conclusion, this research contributes to a holistic understanding of the positive impact of prayer on wellbeing and highlights the importance of continued exploration in this area to further substantiate and expand upon these promising findings.

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Exploring the Impact of Artistic Practices on Undergraduate Student Stress Levels: An Applied Research



Ghadah Shukri Albakri

Abstract This research explores the impacts of involving undergraduate students in various artistic practices on their stress levels. An integrated approach was adopted for this purpose, using both qualitative and quantitative methods to compare stress levels before and after participation in artistic activities. One hundred and fifty-five undergraduate students were involved in the Stress Scale to examine their stress levels before and after the arts activities. Additionally, 15 undergraduate students wrote protocol writing and participated in focus group discussions while practicing art. These qualitative insights provided valuable information on their emotional states before and after the artistic interventions. The study revealed that artistic practices have an inevitably positive impact on students' moods, effectively reducing their stress levels. Furthermore, the results suggest that extending artistic practices to academia can be fruitful for students, thereby promoting their emotional health and helping them manage stress during their academic career. The results show that engaging in artistic endeavors significantly improves students' moods and lowers their stress levels. According to the findings, integrating art activities might help students feel better emotionally and manage their stress while they are learning. This research advances our knowledge of art as a comprehensive tool for improving the mental health of students and provides guidance for possible approaches to using art in student support programs.

Keywords Artistic practices · Stress levels

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1 Introduction

In the dynamic landscape of higher education, the well-being of undergraduate students is of paramount importance. As academic demands and societal pressures continue to shape the experience of students, understanding effective strategies for stress reduction becomes imperative. One such strategy is the integration of art, whose impact on our world is undeniable. Art illuminates culture and history, facilitates understanding between societies with different values, encourages participation in social movements, and influences cognitive behavior, mindfulness, physical health, and educational outcomes. It also plays a significant role in communicative power, social influence, and aesthetic appeal, making it a potent tool for enhancing student well-being.

In this study, the independent variable is engagement in artistic practices. Numerous studies have highlighted various dimensions of art's impact on stress, the dependent variable. For example, Hetland (2013) and Boyes and Reid (2005) explored how art enhances cognitive functions, which can indirectly reduce stress. Researchers such as Tomporowski and Pesce (2019) and Posner and Patoine (2009) suggest that engaging in artistic activities contributes to cognitive development, potentially alleviating stress. Mindfulness, when integrated with art, has been shown to reduce stress significantly, as emphasized by Mastandrea et al. (2019), who highlighted the therapeutic impact of art on emotional well-being and stress reduction. Art education also plays a crucial role in improving academic performance and student engagement, which can mitigate stress. Studies by Ellen and Stéphan (2013) indicate that integrating art into educational curricula maximizes learning outcomes. Graham and Lewis (2021, 2023) and Grynspan (2018) suggest that practicing art in educational settings enhances problem-solving, critical thinking, and creativity, all of which contribute to lower stress levels.

Community building is another critical aspect of artistic practices that can reduce stress. Taylor (2019) noted that art serves as a medium for community engagement and social cohesion, especially in diverse cultural contexts. Kilroy et al. (2007) confirmed that artistic expression influences cultural perspectives and fosters positive social change by promoting inclusivity and celebrating diversity. Furthermore, art has been shown to improve physical health, which is closely related to stress levels. Roswiyani et al. (2019) concluded that art activities positively affect physical health by reducing cortisol levels and improving immune function, thereby promoting physical well-being and reducing stress.

Collectively, these studies bridge the gap between education and psychology, neuroscience, and other relevant fields. Sandmire et al. (2012) discovered that art-making helps control anxiety, while Hui and Ma'rof (2019) noted improvements in undergraduate students' anxiety through mindful art practices. This interdisciplinary approach underscores the long-term impact and acceptability of integrating art into stress management strategies.

Recently, interest has developed in studying the therapeutic benefits of artistic practices in reducing stress and anxiety among students. Previous research, such as

the study by Hui and Ma'rof (2019), has indicated the positive impact of mental art interventions on reducing stress levels in university students. Even though these findings are promising, there remains a gap for further exploration into the specific effects of various artistic practices on stress reduction and the underlying mechanisms that contribute to these outcomes.

Thus, this present study investigates the impacts of engaging in multiple art practices on the stress levels of undergraduate students, including drawing, painting, digital art, photography, writing, and sculpting. This broader approach allows for a more comprehensive understanding of how different artistic activities can influence stress levels. Specifically, our study seeks to:

- Quantify the change in students' stress levels before and after participating in artistic practices using the Perceived Stress Scale (PSS)
- Explore the connection between undergraduate students' self-reported stress levels and qualitative data after artistic practice experiences

By expanding the scope of artistic activities and focusing only on stress rather than anxiety, this research provides new insights into the potential of artistic practices as a comprehensive instrument for managing stress in an educational environment. Furthermore, the inclusion of both quantitative and qualitative measures promises a well-rounded analysis of the impact of these interventions on students' well-being. The contribution of this research is not limited to only contributing to the existing literature by filling the gaps left by previous research but also to enlightening university policies and practices regarding students' mental health support. The results of this study are supposed to support the integration of diverse artistic practices into students' support programs, promoting a more holistic approach to education that prioritizes mental health and well-being.

1.1 Applied Research in Art Field

The diverse expressiveness of art harbors a profound testament to the human experience. In this rich tapestry of artistic endeavors, it is at that meeting point between creativity and research where a world of possibilities, beyond those simply satisfying aesthetics, can open. This applied research gives insight into this dynamic field of art to bridge the gap between theoretical understanding and practical usage. The role of art is not just to applaud aesthetics but to serve as a medium for inspiring social change, a channel for self-expression, and a lens through which we interpret the human condition. The basis for applied research in the domain of arts lies in the very understanding that even though the theoretical understanding of art is beneficial, its true spirit lies in its physical application. This research also attempts to unify the distance between academic discourse and practical implications, exploring how theoretical frameworks within the field of art can inform and enrich creative processes, educational practices, and societal engagement. In this research, we investigate how established theories in art, spanning various movements and

disciplines, can be practically applied in contemporary artistic practices. Additionally, possible integration of some theoretical insights into the education of art, enhancement of pedagogical approaches, and fostering of the development of the next generation of artists and scholars. According to Hedrick et al. (1993), Baimyrzaeva (2018), Krueger (2014), and Guest et al. (2013), the applied research holds significance in its prospects to transcend the artistic boundaries between theory and practice. Thus, this study assesses the broader societal and cultural implications of applying art theories, considering how artistic endeavors contribute to dialogue, understanding, and cultural enrichment. By exploring the practical applications of art theories, this research aspires to contribute to the evolution of artistic practices, inspire innovative educational approaches, and stimulate societal conversations that resonate with the transformative power of art. As we embark on this exploration, the aim is not only to deepen our theoretical understanding of art but also to unlock its practical capability in shaping a world where creativity becomes a powerful force for positive change. Through applied research in the art field, we embark on a journey of discovery, seeking to unravel the intricate connections between theory, creativity, and the lived experience of those immersed in the boundless realm of artistic expression. The primary goals of this kind of research (applied research) include supporting undergraduate students. As a university faculty member, I notice that there is a high percentage of undergraduate students who consistently feel stress.

To support my students, I wanted to contribute a possible solution, or at the least a strategy, to deal with stress. I continued my journey by developing research questions that a study could answer and later began to review the existing knowledge from scholarly literature and looked at prior research, relevant news, and social media. Having a background and informed knowledge about stress related to studies led me to design an applied research project that presents these questions. After deeply reading about the many methods used by researchers for data collection, I chose to utilize a scale, protocol writing, and a focus group interview to collect data for my study. I then began to structure and implement my research project.

1.2 Positive Emotions

Positive emotions play a key role in university students' lives because rich and colorful emotional experiences characterize their feelings, yet the dynamics can be unstable and fluctuate significantly. Thus, as educators, we need to offer students a guide and positive solutions to help them manage stress safely. Practicing arts is one approach that can assist their mental health and help with the emotional management of college undergraduates (Guo, 2021). Drawing, painting, and other forms of creativity can be used as stress relievers. Studies have shown that most people who practice art for stress relief have experienced significant reductions in their cortisol levels when doing so. According to Slayton et al. (2010), numerous researchers have reported a variety of different activities that are effective in creating a better

mood. Additionally, the “venting” or “catharsis” account has been the theory that has received the most support in the past, according to Chambala (2008), Curl (2008), and Kramer (2000). Drawing can also help with mood enhancement for many other reasons, including expressing positive emotions to balance out negative ones (Abbott et al., 2013; Dalebroux et al., 2008; Wilkinson & Chilton, 2013); additionally, drawing can help with emotional balance and the viewing of aesthetically pleasing images (Abbott et al., 2013; Bell & Robbins, 2007). Thirty-seven studies were taken into consideration for a systematic review titled “Creative Arts Interventions for Stress Management and Prevention Research,” of which 73% were randomized controlled trials. One of the four arts modalities was used in therapy to significantly reduce participant stress in 81.1% of the included studies. Positive emotional expression and attention may both be attention-distracting factors associated with physical manipulation and focus, according to Abbott et al. (2013). Drawing was proven to improve mood better than reproducing geometric patterns or doing crossword problems as per De Petrillo and Winner (2005). Unfortunately, neither Abbott et al. (2013) nor Boothby and Robbins (2011) could duplicate this distinction between creating and appreciating art. Numerous research studies have recently focused on the function of various mood expressions in sketching. On the other hand, according to Curl (2008), people who were instructed to express happy emotions had lower stress levels, while the negative expression recipients had elevated stress levels. The present study was designed to examine if practicing art activities reduces stress and could produce the same outcome as the prior study in our population of undergraduate students by utilizing alternate approaches of induction and assessment. Positive expression of emotion may improve mood through simple diversion, as mentioned by Drake et al. (2011) and Drake and Winner (2012), rather than through the substitution or cancellation of one mood state by another. Cooley et al. (2008) and Koff (1999) explored the use of art-based interventions as a means of decreasing stress in higher education settings. This could include specific art forms or activities integrated into the curriculum.

2 Researcher Positionality and Credibility

As a seasoned academic with a Ph.D. in teaching and learning arts and social science, my journey in academia has been marked by a rich blend of experiences and learnings. My academic journey has been centered on the intersection of art education and social science. This interdisciplinary foundation has not only shaped my research interests but has also provided a refined vision through which I perceive educational phenomena. The rigorous training in both the theoretical and practical aspects of these fields informs my research design and inquiry. My professional engagement extends beyond research. Daily interactions with students, colleagues, and the academic community contribute to my understanding of the educational landscape. This role offers a unique vantage point from which to observe, question, and dive into the intricacies of education and the arts. Having worked in both the

United States and Saudi Arabia, I bring a diverse cultural perspective to my research. The experiences gained in these distinct educational settings enrich my understanding of global educational practices and highlight the importance of cultural context in shaping learning experiences. My published work spans diverse areas such as curriculum and instruction, teaching and learning arts, higher education, performance art, physical education, auditory art, and integration arts. Each of these domains contributes to the mosaic of my expertise, shaping my research questions and methodologies. It is essential to acknowledge that, despite conscious efforts to maintain objectivity, biases may exist. My commitment is to recognize these biases, confront them, and ensure they do not unduly influence the research process. I wish to expand on these findings to provide a more significant expression and decrease stress levels. Thus, I participated in the present research to create a more practiced arts condition.

3 Research Questions

The aim of this research is to look at how artistic practices impact undergraduate students' stress levels. Particularly, it used the Perceived Stress Scale (PSS) to measure students' stress levels before and after art activities and investigated the relationship between students' self-reported stress levels and qualitative feedback on their experiences of artistic practices. The three primary research questions in this research are:

- Q1: To what extent do undergraduate students' stress levels vary before and after art participation, as assessed by the Perceived Stress Scale (PSS)?
- Q2: How does participation in artistic activities and practices impact the qualitative self-perceived stress levels of undergraduate students?
- Q3: How does quantitative data link with students' qualitative self-reported stress levels on their experiences and perceptions of artistic practices?

4 Significance of the Study

- Understanding the relationship between artistic practices and stress reduction can lead to the development of effective interventions that promote mental health and well-being among students. Higher retention rates enhance academic success, and a more encouraging campus climate can result from this.
- By quantifying changes in stress levels through the Perceived Stress Scale (PSS), this study provides empirical evidence on the effectiveness of artistic practices in stress management. Promoting the inclusion of arts-based plans in student support services may serve as an inspiration for policies and procedures at the academic institution.

- The results of this study can support a more all-encompassing approach to education, where academic success is not prioritized over emotional and mental health.
- Although undergraduate students are the primary focus of this study, its implications also apply to other educational settings and levels. The results found have implications that go beyond undergraduate students, advocating for art as a universal means of stress management and personal growth.
- This study shows the multidisciplinary character of research and its capacity to address difficult societal challenges. It crosses the gap between art education, psychology, and social sciences, demonstrating how they can be instruments for stress control and personal growth. It highlights how crucial collaboration is in providing a comprehensive solution for students' well-being.

5 Definitions of Concepts and Items

The definitions of concepts items in this research include:

- *Artistic Practices*: Defined as “Showing a natural skill or pleasure in art” (Oxford Learners Dictionaries). It is the creation of beautiful or significant things. Synonyms: art, artistic creation, or a painting, sculpture, photograph, etc., that is created to be beautiful or to express an important idea or feeling (Britannica Dictionary, 2023). In this research, the definition of Artistic Practices includes undergraduate students practicing sculpting with clay, printing, painting, crafting, and writing by undergraduate students from specific academic institutions.
- *Stress*: It refers to the “state of mental tension and worry caused by problems in your life, work, etc. She uses meditation as a way of reducing/relieving stress” (Britannica Dictionary). In this research, stress levels will be measured by using the Perceived Stress Scale (PSS), which assesses the degree of stress in undergraduate students before and after practicing arts.

6 Methodology

According to Scott (2018), performance can become a part of research and pedagogy by drawing on personal experiences to demonstrate the use of performance studies in the classroom. In this research, I highlight the effect of embodied interactions in the classroom setting and how this can be developed further to aid our students through educational art activities in the classroom. This applied research was used in the educational art field to reduce stress, to see how well it works, and how it affects students. This study uses mixed methods to collect data from first-hand sources, which are then translated to generate results and conclusions. I utilized the knowledge of different researchers in the field to establish the effective methods

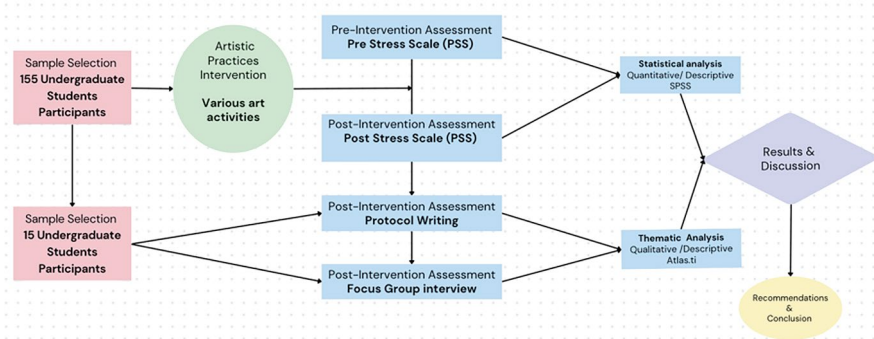


Fig. 1 Illustrate the study design

they used in different situations when practicing arts to explore the outcomes of stress. A mixed-method design was used, which is an integrated quantitative and qualitative criterion (Teddle & Tashakorri, 2009). This research answered questions from several viewpoints to ensure that there were no gaps in the information and data collected. Stange et al. (2006) confirmed that mixed-method research involves “integrating quantitative and qualitative approaches to generate new knowledge and can involve either concurrent or sequential use of these two classes of methods to follow a line of inquiry” (p. 292). The quantitative part of the study contained a Pre–Post Stress Scale. The qualitative part of the study included protocol writing and a focus group interview (with open-ended questions) for 15 undergraduate students to answer the second and third research questions. Figure 1 below illustrates the study design.

7 Control Variables

In this study, several strategies were employed to control variables and ensure the reliability and validity of the results. The study focused exclusively on undergraduate students from specific academic institutions to maintain a consistent demographic profile. This control helped to minimize variability related to age, academic level, and institutional differences. All students were exposed to the same set of artistic activities under similar conditions. The activities were standardized to ensure that each student received the same type and amount of artistic intervention, reducing variability in the treatment. Stress levels were measured at two consistent points in time: before and after the intervention. The artistic activities and focus group discussions were carried out in a controlled environment, ensuring that external factors such as interruptions, noise, and environmental conditions did not affect the students’ experiences and responses. Also, the Pre–Post Stress Scale used in the study was a standardized and validated instrument. This ensured consistency in how stress levels were measured across all participants. If applicable, the students could

be randomized into different groups or conditions to avoid bias in selection and to ensure the comparability of groups at the start of the study. Whenever possible, the assessing researchers were blinded to the previous responses by the students and to the specific intervention details for data collection and analysis to be less biased. By implementing all these controls, the study aimed to isolate the effect of artistic practices on stress levels, ensuring that the observed changes could be attributed to the intervention rather than extraneous variables.

8 Research Participants and Sites

The sampling frame for this study consists of undergraduate students at an academic institution. This specific population was chosen because the study aims to investigate the influence of artistic practices on the stress levels of university students, making this demographic directly relevant to the research questions. A total of 155 undergraduate students, aged between 20 and 22, participated in practicing sculpting with clay, printing, painting, crafting, and writing in the “Let It Go” workshop. This sample size was determined based on several considerations:

1. A sample size of 155 ensures sufficient statistical power to detect significant differences in stress levels before and after the intervention.
2. Power analysis often guides the determination of sample size, ensuring that the study can confidently identify meaningful effects.
3. The available resources, including time, budget, and manpower, were considered.
4. A sample size of 155 was deemed feasible to manage within the constraints of the study while still providing robust data.
5. Reviewing previous research in similar fields indicated that a sample size in this range is typically adequate to achieve reliable and generalizable results.

Type of Sample The study employed a stratified random sampling method. Stratification helps to control for potential confounding variables by ensuring a more balanced and representative sample. Within each stratum, students were randomly selected to minimize selection bias and ensure that every student within the strata had an equal chance of being included in the study. This enhances the generalizability of the findings to the broader undergraduate student population at the university. This approach ensures that the results are both statistically valid and practically relevant. The workshop took place at the “Art Lab.” The Artistic Practices workshop was set for 1 month, with three sessions a week, which lasted for approximately 4 h every session. An email with a barcode to invite students to complete the experiment’s Pre–Post Stress Scale was sent to undergraduate students. In addition, an advertisement was placed at the entrance of the “Talent House” for passersby to easily scan the banner barcode and take part in the experiment. The invitation was also sent through Telegram and WhatsApp.

Table 1 Artistic practices workshop agenda

Week	Title	Sessions
Week 1	Introduction to artistic practices	<i>Session 1:</i> Introduction to sculpting with clay, printing, painting, crafting, and writing <i>Session 2:</i> Exploring photography and digital art <i>Session 3:</i> Group discussion on the impact of artistic practices on stress and mood
Week 2	Exploring different art forms	<i>Session 1:</i> Start practicing sculpting with clay, printing, painting, crafting, photography, digital art, and writing <i>Session 2:</i> Continuation of artistic practices <i>Session 3:</i> Continuation of artistic practices
Week 3	Personal art projects	<i>Session 1:</i> Planning and brainstorming individual art projects <i>Session 2:</i> Working on individual projects with instructor guidance <i>Session 3:</i> Mid-point review and feedback session
Week 4	Reflection and exhibition	<i>Session 1:</i> Completing individual art projects <i>Session 2:</i> Preparing for a final exhibition <i>Session 3:</i> Final exhibition and group reflection session on the overall experience

9 Artistic Practices Workshop

The purpose of the workshop for Artistic Practices is to explore how undergraduate students' stress levels are affected by their participation in different artistic mediums. This study investigates how engaging in artistic endeavors might improve students' well-being and reduce stress. The workshop's unique methodology offers a forum for reflection and self-discovery in addition to giving students a chance for creative expression. Table 1 below is the artistic practices workshop agenda.

10 Review and Arbitration of the Workshop

To ensure the validity and effectiveness of the intervention workshop, experts in relevant fields reviewed the workshop context. This multidisciplinary review process was extremely important for the Validation of Content, Improvement of workshop Design, and Credibility and Reliability. Specifically, the intervention was evaluated by:

- A Psychology expert (Dr. N. A.) was essential to confirm that the intervention appropriately addresses the psychological aspects of stress reduction. This expert provided insights into how artistic practices might influence physical stress responses and overall health, ensuring that the workshop was grounded in sound psychological principles.
- An art education expert (Dr. E. A.) was involved in the validation of the artistic components of the workshop and to ensure they are pedagogically sound. These

experts can assess whether the art activities are designed and implemented in a way that maximizes their therapeutic potential and educational value.

By incorporating feedback from both experts, the intervention workshop was optimized to meet the needs of students better and achieve the desired outcomes of stress reduction and improved emotional well-being. Next, the intervention workshop was an arbitration from five specialists and experts; then the notes were applied to develop the workshop.

10.1 Validity

- To guarantee the accuracy of the measurements, precise definitions of crucial terms like “stress levels” and “artistic practices” were devised.
- The Perceived Stress Scale (PSS), created by Cohen et al. (1983), a popular and well-researched psychological tool for gauging stress perception, was employed in this investigation. Research has demonstrated that the PSS possesses good construct validity, effectively representing the subjective stress levels of people.
- The content of the treatments and assessments was verified to appropriately reflect the constructs under study by expert evaluations from the faculties of physiology and art education.
- By controlling for confounding variables such as the environment and timing of assessments, the study aimed to isolate the effect of the artistic intervention on stress levels.
- Students were randomly allocated, where appropriate, to various groups or conditions in order to reduce selection bias and guarantee group comparability.
- The PSS was used to gauge stress levels before and after the intervention in order to identify any changes that may be linked to creative activities.
- Although the study’s scope was restricted to undergraduate students at certain universities, its conclusions may offer useful information for related groups. However, when extrapolating to other groups or environments, care should be used.
- Enough information is provided about the study design and technique to enable replication in different contexts, which can help verify the results even further.

10.2 Reliability

Consistency of Measures The same procedures were followed for all students during the administration of the PSS, protocol writing, and focus group sessions, ensuring consistency in data collection. Training of Researchers: Researchers involved in data collection were trained to administer the PSS and conduct the sessions uniformly, reducing variability due to human error.

Test-Retest Reliability The PSS’s pre–post assessment evaluations made it possible to evaluate improvements over time, demonstrating the intervention’s consistency in having a positive impact.

Reliability of PSS It has been demonstrated that the PSS has strong test-retest reliability, which means that it consistently detects stress levels across time.

Inter-Rater Reliability Several researchers categorized qualitative data from focus group interviews and protocol drafting to guarantee uniformity in the data’s interpretation and analysis. To guarantee uniformity in the data analysis process, clear coding rules were created, and disagreements amongst coders were reviewed and resolved.

Expert Review The intervention artistic practices workshop was reviewed by experts in physiology and art education, ensuring that the content was valid and grounded in established principles from both fields. Through the careful selection and application of the Perceived Stress Scale (PSS), among other validity and reliability considerations, the study sought to generate reliable and substantial results that add significantly to our understanding of how undergraduate students’ artistic practices affect their stress levels. Lee (2012) examined the PSS-10’s psychometric qualities. In each of the 12 research that employed the PSS-10, Cronbach’s alpha was assessed to be more than 0.70. Four studies evaluated the PSS-10’s test-retest reliability, and all of them found that it fulfilled the >0.70 threshold.

10.3 Materials

Through a combination of quantitative and qualitative measures, this study seeks to understand how participation in artistic practices influences students’ stress levels. By quantifying changes in stress levels using the Perceived Stress Scale (PSS) and analyzing qualitative data on students’ experiences and perceptions, this research aims to provide valuable insights into the therapeutic effects of art in an educational setting. The list of tools below was used to collect data (Table 2).

(A) Pre–Post Stress Scale

In the first part of this research, the Pre–Post Stress Scale was used to examine the stress level before and after the arts activities. This first instrument was used in the quantitative part of the research. Cohen et al. (1983) are the authors of the perceived stress scale (PSS). A five-point Likert scale was used to score the ten

Table 2 List of tools to collect data

	Tools	Type of study
1	Pre–post stress scale	Quantitative/Descriptive
2	Protocol writing	Qualitative/Descriptive
3	Focus group interview questions	

questions (0 = Never, 1 = Almost Never, 2 = Sometimes, 3 = Fairly Often, 4 = Very Often). The scale includes a number of direct queries about current levels of experienced stress. This scale was used to answer the first research question. The questions in the Perceived Stress Scale asked undergraduate students about their feelings and thoughts during the last month. In each case, they chose a point by circling how often they felt or thought a certain way.

(B) Protocol Writing and Focus Group Interview Questions

These tools were used in the qualitative part of the research to answer the second and third research questions. Krueger's (2014) focus group guide was followed for applied research to give impersonal facts about the human dimension. They were allowed to explain and express their experiences and perspectives through the questions posed to them. We sought the participants' consent to record the sessions, as it made it easier to transcribe the data.

10.4 Data Collection and Analysis Procedures

Applied research methods supported this study's research questions by uncovering in-depth data from the participants, analyzing how they felt after the art experiment, and explaining the reasons behind their beliefs. In the beginning, ethical clearance was obtained from the academic institution's Human Research Ethics Committee for the study and enrollment of students. Then, the data was collected from pupils who enrolled in the study. The Talent House at the academic institution was set up for the experiment, arranged with tables and chairs. The instructions were written on the board and offered optionally and randomly. The experimenters were confronted with activity materials and tools and were allowed to choose the materials and colors that they wanted to practice with. Some pupils made artworks that expressed positive or negative feelings to express their current level of stress.

SPSS was used to analyze the quantitative data, as well as the pre-post stress scale data. To analyze the qualitative data, I adhered to the coding procedures, techniques, and theme analysis described by Saldana (2016). After gathering the data, I used the "ATLAS.ti.8" software to conduct a thematic analysis to find new themes in the qualitative data and corroborate those found in the quantitative data. I organized and looked for content using themes and issues that arose naturally in the qualitative data. No previous categories were discovered. Coding is a crucial process that was vital for our investigation. Based on their shared characteristics or areas of resemblance, I grouped the codes. I compared categories, which led to the creation of themes. Saldana (2016) asserts that coding involves "not just labeling" but also a "heuristic" or "exploratory problem-solving technique" (p. 9). The transcript was read more than twice for the analysis, and I was inspired by brand-new topics, subjects, vocabulary, thought processes, concepts, and data chunks, which I recorded to form my study question. Researchers' comments focused more specifically on developing units, codes, categories, and subjects (Saldana, 2016). Finally, the codes

Table 3 Analysis procedures of qualitative data

Stage	Schedule of procedures
<i>Stage 1:</i> Prepare and study data, Discover Main ideas and categories	Translation Importation of data to <i>ATLAS.ti 8</i> software Grouping in two categories: Category 1: Status feelings Category 2: Pupils experience
<i>Stage 2:</i> Reread, assess data, generate coded data, organizing coded data in categories, summarize data, revise coding scheme	Developed categories into subcategories Reread and recoded the data Placed sections of material into categories and increased the number of categories Read data carefully; reread and emphasize specific words, ideas, etc. Reviewed coding scheme and rereviewed each information Created subcategories, merged coding, and polished Revised using a second reviewer
<i>Stage 3:</i> Focus coding schemes to themes and describe outcomes	Each category has several subcategories Each subcategory has several coding schemes Provided participant quotations Summarized key outcomes by generating words' clouds

were classified and divided into subjects and subcategories. I gathered all the topics and arranged them into categories.

It was necessary to use multiple linear analyses to meet the study’s aims across all methodological parts. Also, merging numerous methods presents several benefits, such as stronger outcomes, a wider approach to the research questions, and a more holistic phenomenological understanding of a topic (Davis et al., 2011). The qualitative analytic process was cyclical. The first step of coding occurred during the initial coding of the data (Bloomberg & Volpe, 2018; Saldana, 2016). *ATLAS.ti.8* software was used to code the data in several cycles and generate Tag Clouds. Table 3 represents the qualitative data analysis process. Two main categories appeared from the research’s two qualitative questions. These categories were “status feelings of undergraduate students” mood and the feelings they experienced requested after completing the workshop. The identification of these two categories allowed for the development of more precise subcategories. Table 3 shows the stage of the analytic process used in this research.

11 Results

This study looked at the effects of practicing different art activities assigned over 3 weeks to compare stress levels before and after artistic practices in undergraduate students. The results of this study can be easily summarized.

Quantitative Analysis Before the art activity, students were requested to complete the pretest, and after practicing the art task, they completed the Post-Stress Scale; this was the process for evaluating the stress level induction. In the Pre-Post Stress Scale, the means and standard deviations of stress levels among undergraduate students before and after practicing different art activities were computed to answer the first question. Then, as noted in Table 4 below, a paired sample *t*-test was performed to see if there were any significant differences in the means.

Table 4 indicates that the means of stress levels before and after practicing different art activities, significantly differ statistically at ($\alpha = 0.05$), which correlates to a reduction of stress levels after practicing the arts. Stated more specifically, the paired sample *t*-test implied that there was a significant decrease in the Stress Levels from $\bar{x} = 3.10$, $SD = 1.555$ to $\bar{x} = 2.74$, $SD = 1.227$, with $t(155) = 3.246$, $p > 0.05$, after contributors practiced art (see Table 4 above). Concerning Stress Levels, the size of the effect for the analysis was discovered to exceed Cohen’s (1988) findings for a small effect (i.e., $d = 0.20$), with Cohen’s $d = (3.10 - 2.74) / 1.227 = 0.293$. Cohen (1988, 1992) suggested that $d = 0.2$ be considered a “small” size effect and that $d = 0.5$ be considered a “medium” size effect. Therefore, the total is rounded to 0.3, which is a standard deviation.

Figure 2 (upper) graphically presents the results of pre-post stress levels tested on undergraduate students before and after artistic practices, as shown above in the

Table 4 Means, standard deviations, and *T*-test results of stress levels before and after artistic practice

Stress levels	N	Mean	Std. deviation	t	df	Sig. (2-tailed)
Pre	155	3.10	1.555	3.246	154	0.001
Post	155	2.74	1.227			

Fig. 2 Mean plots of stress levels in undergraduate students before and after artistic practice

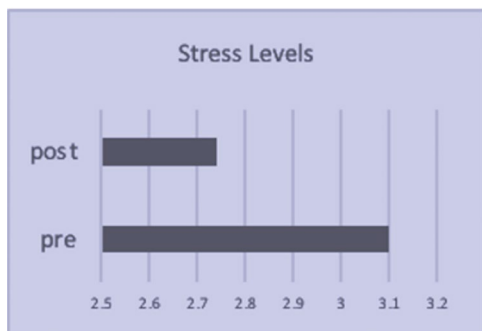


Table 5 The coding schemes of the second stage

Coding scheme				
Enjoy-discussion-with-group	Enjoy-moment	Smiling	Convenience	Fun-loving
Relaxation	Laughing	Joyful	Feel-positivity	Decompressed
Positive-emotions	Touched-feelings	Artistic-production	Feeling-happy	Chilled
Passion-to-practice-art	Increased-awareness	Thankful	Better-mood	Reduction-painful
Look-for-a-solution	Deal-with-issues	Comfortable	Breathing	Pleased
Less-depression	Look-at-things-differently	Less-negativity	Blissful	Satisfied
Comfy-feeling	The-lack-of-anxiety	Reduce-stress	Glad-to-attend	Breathing-well



Fig. 3 The last cycle of coding for stress levels after artistic practice

bar graph form. It shows information on changes from the pretest to the posttest concerning disagreement percentages. The posttest for stress levels was the lowest ranked. On the other hand, the pretest was the highest ranked. This means that the stress levels reduced and became lower in the posttest.

Qualitative Analysis This research used two tools to collect qualitative data, which were Protocol Writing and Focus Group Interview questions (with open-ended questions) for 15 undergraduate students to answer the second and third research questions. The stages of the analytic process used in this research were:

- Stage 1: Organization of data and discovery of main ideas and categories.
- Stage 2: Reviewing data and focusing on coded data to reduce the number of coding schemes, from 345 to 35 (see Table 5 below).
- Stage 3: Reducing Focused Coding Data from 35 down to 15 themes. The themes shown below in Fig. 3 graphically illustrate the last stage of coding for reducing stress levels and expressing happiness (positive) through practicing arts in the Word Cloud figure.

Table 6 Key themes and illustrative quotes

	Key themes	Themes	Quotes examples
1	Relaxing and decreased stress	Pupils frequently stated feelings of relaxation and stress reduction after collaborating in artistic activities.	“I felt so relaxed and at ease after the painting session. It was like all my worries melted away.” “The art practice really helped me decompress. I felt the tension leaving my body.”
2	Positive emotions and mood improvement	Many pupils described an overall improvement in their mood, expressing positive emotions such as happiness and joy.	“The art activities brought a lot of joy into my day.” “It was a fun-loving experience that made me smile and laugh. I left the session feeling much more positive.”
3	Increased awareness and touched feeling	Pupils stated an increased sense of awareness and mindfulness during and after practicing art	“While drawing, I became more aware of my thoughts.” “The artistic process helped me focus and be present in the moment, which was very calming.”
4	Social interaction and enjoyment	The social aspect of the art sessions contributed to pupils’ enjoyment and sense of community	“Discussing artworks with the group was enjoyable and added to the fun of the experience.” “Sharing the artistic journey with others made me feel connected and less isolated.”

Finally, the themes were reduced from 15 down to four main key themes, which are Relaxing and Decreased Stress, Positive Emotions and Mood Improvement, Increased Awareness and Touched Feeling, and Social Interaction and Enjoyment. Table 6 below provides key themes and illustrative quotes.

12 Discussion

The primary objective of this research was to find out how engaging in artistic activities affects the stress levels of undergraduate students. Drawing on existing literature, we integrated quantitative and qualitative data to offer a comprehensive understanding of the impact of artistic practices on stress reduction. I followed the examples of researchers in the field to test and reduce stress through practicing arts.

One hundred fifty-five undergraduate participants responded to a Pre–Post Stress Scale for the quantitative part. Figure 2 shows the mean results of stress levels in undergraduate students before and after artistic practice. The quantitative results indicated a significant decrease in stress levels among pupils after participating in the artistic practices. This reduction is quantitatively supported by the pre–post stress scale scores, which showed an average stress decrease of approximately 11.61%.

Also, for qualitative data, 15 undergraduate students responded to the protocol writing and focus group interview questions for the qualitative data. Figure 3 shows

15 themes that illustrate the last stage of coding to testing stress levels after practicing arts activities from protocol writing and focus group interview questions. This data provides rich, contextual insights that help explain why and how the artistic practices led to this decrease in stress levels. A better comprehension of the mechanisms behind the reported quantitative adjustments in apparatuses was provided by the four main key themes below.

Relaxing and Decreased Stress The qualitative data reveal that many undergraduate students experienced profound relaxation during the art sessions, which aligns with the significant reduction in stress levels measured quantitatively. This suggests that the physical and mental act of creating art can effectively alleviate stress.

Positive Emotions and Mood Improvement Students reported feeling happier and more positive after the art activities. This emotion likely contributed to the overall reduction in stress levels, as a positive mood can counter feelings of stress.

Increased Awareness and Touched Feeling The practice of art seemed to promote mindfulness and increased self-awareness among students. This heightened state of mindfulness may have helped students manage their stress more effectively, thereby reducing their overall stress levels.

Social Interaction and Enjoyment The enjoyment derived from social interactions during the art sessions added another layer of stress relief. The feelings and enjoyable experiences shared with others helped bond the undergraduate students and enhanced their emotional well-being, further contributing to reduced stress levels.

Stress levels were significantly lowered by three aspects of artistic practices, including:

Creative Process Engaging in the creative activities provided assisted in alleviating stress, creating a mental escape and a sense of achievement for the undergraduate students.

Social Engagement The art sessions fostered a sense of community and support, enhancing the stress-relief benefits through interaction with peers during these sessions.

Self-Expression Allowing expression of oneself allowed students to process and release their emotions, leading to a decrease in stress through art.

Below are a number of studies that agree with this study that influenced feelings positively, improved mood, reduced stress, social competence, stress levels, increased relaxation, emotional management, creative expression, happiness, focused attention, and encouraged a sense of accomplishment. According to Curl (2008), Dalebroux et al. (2008), and Smolarski et al. (2015), practicing art to express happiness, positive feelings, and improving mood are indicators that stress is reduced. Furthermore, Smolarski et al. (2015) found that individuals drawing to express happiness offered mood improvement almost three times more than the results produced by a concentrated, attention-requiring drawing task. Additionally,

this research agreed with Visnola et al. (2010) that reduced stress and anxiety levels were evident effects of artistic practice. The research found that the state of anxiety and the level of the stress hormone (cortisol) over 24 h decreased significantly. However, when employees were the participants in the same study using a different route by obtaining an art intervention's efficiency in stress level reduction and management, Martin et al. (2018) conducted a systematic review; the included research noted a significant decrease of 81.1% in stress in the participants due to practicing four arts. Additionally, Scott (2017) added that art is a stress reduction tool that can be accessed. He found that participating in an artistic activity reduced clinical and nonclinical stress levels. Moreover, Bell and Robbins (2007) confirmed significant reductions in negative mood and anxiety in practicing arts groups compared to the art-viewing control group. Also, Lee et al.'s (2012) research assessed the impact of practicing arts on children by using art therapy practices to evaluate daily stress levels and social competence. This research agreed that the mean final stress levels and situational anxiety for the experimental group were significantly lower than the control group. Likewise, Creedon (2011) agreed that integrating arts into education can assist pupils in dealing with stress levels to aid their ability to learn by improving the production of cortisol in the brain. He added that practicing arts has been shown to produce endorphins, which neutralize cortisol products. Finally, integrating arts into education has been particularly useful for disadvantaged students. Knell's (2021) research hypothesized that students' stress levels would decrease on days when they actively performed auditory arts in a hybrid band or orchestra class than on days when they did not perform. Data analysis reports that the null hypothesis should be rejected, and the student's stress levels were lower on auditory arts performance days. Moreover, Aggarwal (2021) conducted research using the mailed questionnaire approach to explore teenage stress levels and whether art and auditory arts helped them manage, as well as research their usefulness. They were mentioned by the participants as helpful stress-managing strategies, which support the hypothesis that stress and anxiety levels in teenagers can be significantly reduced using effective management approaches such as art and auditory arts listening. Besides, this research agreed with Guo (2021), who said that art education in universities can help college students adjust their emotions and make them maintain a positive attitude, while also stimulating their enthusiasm for creation and promoting their emotional management. Likewise, in previous studies related to artistic practices for reducing stress levels (Smolarski et al., 2015; Babouchkina & Robbins, 2015; Bell & Robbins, 2007; Boothby & Robbins, 2011), the contributors in this research were undergraduate students. The current research result supports all previous studies, mainly Smolarski et al.'s (2015), with the statement, "The creation of artwork contains many components such as creativity, expression of personal memories or feelings, expression of general mood states such as depression or happiness, specific motor behaviors, focused attention, a sense of accomplishment or completion, and the ultimate viewing of a potentially aesthetically pleasing end product" (p. 200). Research findings resonate with previous studies, such as those by Visnola et al. (2010), Martin et al. (2018), Scott (2017), and others, indicating a consistent trend of art's effectiveness in reducing stress levels. Notably, the current research focused

on undergraduate students, aligning with the assertions of Guo (2021) that art education positively influences emotional management in university students.

13 Implications of the Study

The study emphasizes how adding creative activities into classrooms may be beneficial, especially for undergraduate students. Organizations can think about including art-based treatments to assist students in better controlling their stress levels and improving their general well-being. The results offer proof that art therapy is a useful stress-reduction tactic for college students. This has practical implications for educators, counselors, and mental health professionals who can leverage art activities to promote stress reduction among students. Academic institutions might explore integrating art-related components into existing curricula, acknowledging the positive impact of artistic practices on stress levels. This integration could contribute to a more holistic educational experience for undergraduate students. Universities could consider expanding support services to include art-based interventions for stress management. Offering workshops, resources, or designated spaces for artistic expression may provide students with additional tools to cope with stress. The study suggests that art could be a valuable component in the health and well-being of artistic practices on university campuses. Institutions may create programs that encourage incorporating art into more comprehensive student health and wellness plans.

The ramifications also apply to teachers, who are encouraged to make use of professional development programs that acquaint them with the possible advantages of integrating art into their instructional strategies. This has the potential to promote a more thorough and student-focused approach to education. The study contributes to the ongoing research in art education, emphasizing the need for continued exploration of the specific mechanisms through which art influences stress reduction. Future research can delve deeper into the types of artistic activities or interventions that yield the most significant benefits. Policymakers in education might consider the inclusion of art-based approaches in broader educational policies aimed at promoting student well-being. Acknowledging the role of art in stress reduction could lead to the development of supportive policies at institutional and governmental levels. Given the potential cultural variations in the perception and utilization of art for stress reduction, institutions should consider cultural and diversity factors when implementing art-based interventions. Tailoring programs to meet the diverse needs of student populations is crucial. Recognizing the enduring impact of art on stress reduction, educational institutions play a key role in equipping students with lifelong coping skills. Artistic practices learned during undergraduate years may serve as valuable tools for managing stress in various life contexts. In conclusion, the implications of this study extend beyond the academic realm,

influencing educational practices, support services, and potential policy considerations. The findings advocate for a holistic approach to student well-being, recognizing the role of art in fostering a positive and stress-resilient academic environment.

14 Acknowledgment of the Limitations

- The study predominantly focused on undergraduate students, potentially limiting the generalizability of the results to a wider population. More varied samples, including those from different age groups, genders, and cultural origins, may be the goal of future studies.
- The dependence on self-reported and nonscientific measures for stress levels introduces the possibility of biased responses. Future studies could incorporate objective measures, such as physiological indicators, to enhance the robustness of stress assessments.
- The study primarily examined short-term effects immediately before and after engaging in artistic activities. A longitudinal approach tracking stress levels over an extended period would provide a more comprehensive realization of the sustained effects of art on stress reduction.
- The research encompassed a broad spectrum of artistic activities. Future investigations could explore the differential effects of specific art forms (e.g., visual arts, performing arts) to identify nuances in their impact on stress levels.
- The study did not extensively explore cultural variations in the perception and effectiveness of artistic practices for stress reduction. Recognizing cultural nuances and conducting cross-cultural studies would contribute to a more inclusive understanding of the subject.

15 Conclusion and Recommendations

As discussed earlier, using art activities to reduce stress in undergraduate students is important. Art education in higher education plays an essential role in supporting the mental health of undergraduate pupils. Furthermore, it assists in improving pupils' emotions, which need more attention and research from college educators. Enriching college education with arts practices cultivates students' noble artistic emotions, psychological abilities, and confidence by making them believe in their skills and helping them accept themselves. Likewise, it helps improve their optimistic mood. Overall, a happy mood increases with practicing artwork. This study contributes to the growing body of evidence supporting the efficacy of artistic practices in reducing stress levels among undergraduate students. The integration of both quantitative and qualitative data strengthens the robustness of our findings. Further

research could explore specific art forms or interventions tailored to a diverse student population. Finally, everyone may express themselves through practicing arts. You may just draw what you are feeling in a sketchbook, no matter what your level of competence is—just assist yourself in decreasing stress.

Through this research, we hope to contribute to the growing body of literature on the benefits of art in promoting mental health and well-being. Diverse samples from different demographics, socioeconomic origins, and educational levels should be given priority in future studies. This might improve the findings' generalizability to a larger group. Researchers should think about including objective measures of stress, including physiological indicators or biomarkers, to reduce the possible bias associated with self-reported measures and give a more thorough and trustworthy evaluation. Longitudinal research would shed light on the long-term effects of creative endeavors on stress alleviation. This approach would contribute to a more nuanced understanding of the long-term benefits and potential variations over time. Future investigations could explore the specific effects of different art forms on stress reduction. This could inform tailored interventions based on the unique characteristics of various artistic activities. Researchers should prioritize cultural competence in the design and implementation of studies related to art and stress reduction. This includes considering cultural variations in the perception of art and adjusting interventions accordingly. Working together with educational institutions' counseling and mental health services might make it easier to include art-based treatments in the current support systems. This collaborative method looks at the possible advantages of merging artistic practices with other stress management strategies in order to ensure a more comprehensive and coordinated effort to promote student well-being. Future research can enhance the efficacy of treatments in educational settings by addressing these constraints and putting the suggested solutions into practice. This will lead to a more comprehensive knowledge of the link between creative activities and stress reduction.

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An Evolving Research Culture: Insights into a Current Multidisciplinary Study on Covid-19



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Abstract Multidisciplinary research needs to be examined not only for outcomes and significance of results but also for the interaction among researchers and the features of research culture that evolve through the different study phases. Examining those interactions using qualitative and quantitative data analysis helps to describe features of research culture that emerge through a research project. This chapter examines the emerging characteristics of research culture among a group of 21 researchers who were selected by the Faculty of Women for Arts, Sciences, and Education in Ain Shams University to form a team to study the Coronavirus. Data was collected from a WhatsApp group that was created to host all communication among the participants and with the supervising committee, which consisted of four professors representing the Arts, Sciences, and Education fields. This study used a guiding list of themes of research culture and traced them in participants' group chat content. The predetermined list included the general themes of research culture that relate to the participants and the team. The chat room and meetings encouraged project team members to express their thoughts, concerns, and inquiries freely at flexible times and get answers from the team. The study compared the growth in themes of research culture in four quarters of a year; the growth in most of the themes was relatively equal. The findings underscore the need for institutions to prioritize the need for well-planned research agendas that consider research culture vital for research project success and to accommodate researchers' needs, develop their skills, and maintain a positive environment for scientific collaboration and production. The growth/lack of certain characteristics of research culture may guide institutions' decisions when planning for professional development training programs for researchers to overcome difficulties such as international publishing or financial procedures. Future research is needed to further explore research culture themes in other settings such as interinstitutional research projects. It is also recommended that future research may use the current list of research culture themes to

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develop customized training programs for researchers and faculty members and explore their effects on research objectives and outcomes.

Keywords Case studies · Multidisciplinary research project · Research culture · Qualitative case studies

1 Introduction

The interaction among participants in a multidisciplinary research study could be either a key to success or a factor of failure. The issue of having different researchers from multiple academic disciplines work together under a major goal is influenced by their ability to interact together as a team. One of the factors that may affect this interaction is the characteristics of research culture that influence the researchers' attitudes and behaviors within a group. Research culture, as defined by Hanover Research (2014), is "a system that places great value on conducting and communicating scholarly research, it is the behaviors values, expectations, attitudes and norms including the impact they have on research processes and career" (Moran et al., 2020). A strong research culture fosters an environment that encourages curiosity, collaboration, innovation, and integrity among researchers (National Academies of sciences, engineering, and medicine, 2017). In multidisciplinary studies, research culture is identified as the attitudes and behaviors that affect the research process and outcomes of a study with researchers from different specializations. Many characteristics and features exist to describe research culture. The most related to the context of multidisciplinary research are openness, transparency, collaboration, peer review, mentoring and training, inclusivity and diversity, public engagement, and adaptability and learning (Cheatle et al., 2019).

The objective of this study is to identify the evolving themes and characteristics of research culture among a group of researchers participating in a multidisciplinary research project on Covid-19. When studying global crises such as Covid-19, multidisciplinary research could allow for a comprehensive analysis using expertise from fields like public health, sociology, and environmental sciences. Fostering research culture among researchers in multidisciplinary research will help to understand the crisis from multiple points of view and support the application of suggested solutions (Wuchy et al. 2007; Klein 2020).

Twenty-one researchers were selected by the Faculty of Women for Arts, Sciences, and Education at Ain Shams University to form a team to study the Coronavirus. The faculty has 19 different departments in the fields of Arts, Sciences, and Education. During the epidemic, the Vice Dean for graduate studies and research initiated a call for a multidisciplinary research study to explore the effects of Covid-19 on human health, education, and social context. The project was funded by the University of Ain Shams. Researchers were asked to submit proposals guided by an announced set of criteria to study the epidemic from their fields of specialization. Twenty-one faculty members were selected and formed a team to study Corona

from different perspectives, predict its future impact, and suggest possible recoveries. The project started on November 1st, 2022, with four 6-month phases. Each researcher sets goals for her individual point of research.

Two main questions lead the current study: (1) What are the themes and characteristics of research culture among the 21 researchers participating in the research project?, and (2) How did those characteristics evolve through the 12-month period of the study?. Data needed to answer these questions was collected from a WhatsApp group that was created to host all communication among the participants and with the supervising committee, which consisted of four professors representing the Arts, Sciences, and Education fields. Analysis of the chat content in a time period of 12 months provided indicators of characteristics of research culture, which were further traced through the four quarters of the year to describe the evolvement of research culture among the participants. A total of 211 segments were found that corresponded with the guiding list of themes. Each segment was coded in accordance with the theme it represented to imply a characteristic under that particular theme. Then, each characteristic was assigned a code using an *alphabet/number* style, where the *alphabet* represented the theme and the *number* represented the characteristic.

2 Literature Review

Fostering research culture among faculty members is becoming vital for academic research success. In multidisciplinary studies, it is difficult to manage differences among researchers, which requires special design of group management techniques that make multidisciplinary research a “complex system” (Dalton et al., 2021) and may require the use of the “Agile method” to manage (Senabre Hidalgo, 2018). Multidisciplinary research is defined as a group of researchers from multiple disciplinary domains investigating subproblems within the same metaphor (Dalton et al., 2021). It involves integrating methods and insights from different fields to understand a subject of interest (Levitt & Thelwall, 2008). It is crucial to consider the research culture’s impact on research process and outputs, as communication and collaboration are fundamental to study a global problem from different perspectives (Rossouw, 2020). Redfearn et al. (2016) and Borders et al. (2018) stressed the lack of developing and examining faculty members’ research habits and behaviors and the need for extensive in-depth studies on atmosphere among researchers in multidisciplinary studies. For investigating the importance of researchers’ perceptions and experiences of research culture, Moran et al. (2020) used both qualitative (interviews) and quantitative (surveys) methods to investigate researchers’ understanding of research culture and concluded that conditions in which research takes place are not inclusive and lack sufficient support mechanisms.

Feldon et al. (2011) expressed the challenges that face multidisciplinary studies, such as conflicts in academic norms, resource allocation, and varying research paradigms. He mentioned strategies to foster research culture habits, including training

and dialogue for making decisions. Wuchy et al. (2007) highlighted the impact of diversity on the production of knowledge and the importance of research culture in modern research to promote collaboration in multidisciplinary projects. Klein (2020) introduced research culture as a model for sustainability and development in any organization to promote integration of diverse perspectives in multidisciplinary research. Frost (2020) concluded that a culture of research should emphasize critical thinking, which is vital for synthesizing multiple perspectives and enhancing the quality of multidisciplinary research. Borders et al. (2018) developed a faculty research culture scale based on previous work by Gelso (1997) and other scientists using descriptive measures. The results showed the importance of exploring faculty scholarly productivity as affected by the departments' strategies to hinder or support them. The work conducted by Hanover Research (2014) and Mirasol and Inovejas (2017) formulized the characteristics that foster research culture among faculty members, categorizing them into three groups: institutional, leadership, and individual. Iqbal et al. (2018) surveyed 155 faculty members and concluded that personal factors of research culture were mostly prevalent than institutional factors. The current study observes the individual characteristics of research culture that evolved within the multidisciplinary research team in a time period of 12 months.

Based on the findings of previous studies, a list of themes of research culture was developed to guide the inquiry of the current study when detecting segments that describe a characteristic of research culture in the participants' chat content. In each theme, a number of characteristics were represented as examples to help locate similar segments within the chat content.

3 Methodology

To answer the question "what are the themes of research culture that evolved among participants?," this study used a guiding list of themes of research culture and traced them in participants' group chat content. It was developed based on related literature and observations of the researchers. The predetermined list included the general themes of research culture that relate to the participants and the team as a whole but not to the context or the institution. The list included seven themes that are mostly found in literature, which were: sharing research data, collaborating across disciplines, encouragement and new ideas, peer evaluation, research skills development, a friendly research community, and financial expertise. Table 1 describes the guiding list and the corresponding codes.

An inductive research method was used to elaborate on the list based on the segments detected in the chat content (Charmaz, 2006; Creswell, 2002). Using qualitative and quantitative data analysis techniques resulted in producing a list of research culture themes and underlying characteristics.

Table 1 List of research culture themes

Theme of research culture	Codes
Research skills development	V
Encouragement and new ideas	G
Sharing research data	S
Friendly research community	F
Collaborating across disciplines	C
Financial expertise	X
Peer evaluation	P

Table 2 Multidisciplinary fields of participants

Field of study	No. of participants
English literature	4
Geography	1
Sociology	2
Educational technology	2
Child education	1
Educational psychology	1
Nutrition and biochemistry	3
Physics	2
Chemistry	2
Zoology	1
Home economics	1
Mathematics	1

Table 3 Academic ranks of participants

Academic ranks	No. of participants
Associate professor	10
Assistant professor	11

3.1 Participants

This research was designed in accordance with the ethical guidelines outlined in the Ain Shams University Manual for Research Ethics Bylaws (2023). At the time the Covid-19 multidisciplinary research project was initiated, the 21 researchers selected to join the project were asked to sign a consent form to participate in the project and the research papers that build on it. Chat room content and meetings administered for the current study were considered as part of the main Covid-19 project.

Participants were informed of the current study objectives and procedures, which included the analysis of chat room content. The participants were female faculty members with multi academic majors and ranks. Table 2 describes the majors of the participants, and Table 3 presents their academic ranks (Fig. 1).

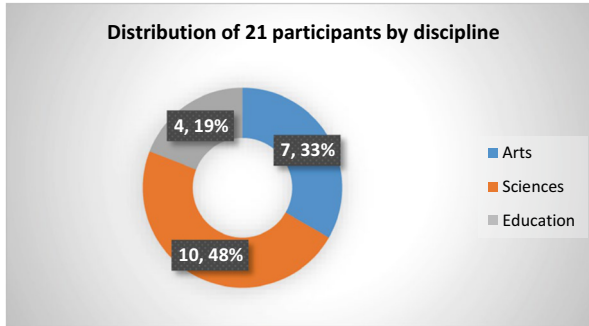


Fig. 1 Distribution of majors among participants

3.2 Chat Room Group Discussion

A WhatsApp group was created to host all discussions among the project team, including the 21 researchers and the 4 supervising committee members. An administrator was also added, who was responsible for monitoring participants' interactions within the group and tracking new posts and team responses. Several steps were taken to manage the chat group, including adjusting group settings, posting, managing posts, and chat backup. Settings were adjusted to control who could post, and permission was given to all participants to post at any time using text, images, audio, or video. The ability for participants to add other members was disabled. The researcher posted a weekly announcement to the group to initiate responses, and the participants responded back. All participants were motivated to respond to most of the posts, and the researcher and the administrator encouraged all participants to respond and ensured that discussions stayed relevant. Participants were encouraged to reflect on their research by reporting any progress made, obstacles or difficulties, the status of publishing the research paper, and related updates. The supervising committee posted regularly to check on the status of participants' individual progress, provided feedback and guidance when an issue arose, and showed appreciation for participants' posts. A face-to-face meeting with the participants took place at the end of each phase, when participants discussed their inquiries, progress, and concerns. Summaries of meetings were posted in the group to stimulate further comments from the participants. Chat content was exported at the end of each month and stored for backup.

The chat room encouraged project team members to express their thoughts, concerns, and inquiries freely at flexible times and get answers from the team. This helped to expand the content in which the segments of research culture would be traced. It also helped to have the participants use media such as links, videos, photos, and animations to post their responses and thoughts. All announcements, requirements, and project information were posted by the supervising committee, and the researchers would post back. The content of the chat room was exported using the "group>> More>> Export" function in the group tool menu and saved in

a word document file for content analysis, totaling 28 pages of posts from October 1, 2022, to October 1, 2023. The chat content was divided into four sections, with each section containing the chat content of 3 months. The chat content was revised to omit unrelated posts, such as deleted messages or repeated posts and repeated dates and times for empty posts. After revising the content, it was divided into four sections, 3 months each, to be able to trace the characteristics in a timely manner and to further describe the evolution of the characteristics of research culture during the year. The content for each section was then copied into a table with columns for chat content, theme code, and characteristic code. The analysis was conducted using the guiding list of research culture themes and characteristics. The principal investigator examined all segments and compared them to the list of research culture themes. The chat content was revised twice by the researcher and an assistant to make sure that all chat content was examined and all segments were detected.

3.3 Chat Content Analysis

To answer the question, “what are characteristics of research culture that evolved among the participating researchers?,” chat content was analyzed using a qualitative technique. Chat content was collected from the researcher and the administrator to ensure the representativeness of the chats. Precautions were given to ensure that no posts were deleted during the study period. Data from both sources were converted to a word file, then compared to ensure no posts were deleted or not exported. It was found that the chat content exported from the two sources was all paired.

A total of 211 segments were found that corresponded with the guiding list of themes. Each segment was coded in accordance with the theme it represented to imply a characteristic under that particular theme. Then, each characteristic was assigned a code using an *alphabet/number* style, in which the *alphabet* represented the theme and the *number* represented the characteristic. The principal investigator read the complete chat file and highlighted all parts that seemed as a characteristic, then marked each segment with a matching code in accordance with the guiding list. When a segment was detected that didn't match a theme code, it was given a new number with *N* letter, which stands for New. The table shows a summary of the number of segments and the representing characteristics in each theme. The theme with the highest number of detected segments was “research skills development,” with 64 detected segments representing 30% of the total of 211 detected segments that indicated a particular characteristic (Table 4). No segments were detected that implied the need to add a new theme; thus, the letter *N* was not assigned to any segments. Tables 5, 6, 7, 8, 9, 10, and 11 show the frequency and percentage of segments that implied a characteristic within each theme.

To answer the research question “how the characteristics of research culture evolved through 12 months period of the study?,” the number of segments that matched the characteristics of research culture were calculated for each research

Table 4 Number of emerged research culture characteristics classified by theme from highest to lowest

Theme of research culture	Number of derived characteristics	Number of detected segments that implied the characteristic	Percentage of overall 211 detected segments
Research skills development	4	64	30%
Encouragement of new ideas	4	53	25.1%
Sharing research data	7	45	21.3%
Friendly research community	3	18	8.5%
Collaborating across disciplines	2	13	6.2%
Financial expertise	2	12	5.7%
Peer evaluation	2	6	2.4%
Total	24	211	100%

Table 5 Number and percentage of segments that implied research culture characteristics for the theme “Research skills development”

Research skills development	No.	Percentage of theme characteristics	Percentage of overall characteristics
Committed to attend all meetings with the supervising committee of the project	21	28.3%	7%
Committed to attend all workshops announced for the project	20	31.2%	9.5%
Committed to answer all questionnaires sent by the project manager to track research progress	17	22.6%	5.7%
Develop skills to fulfill requirements of completing your research	7	17%	4.3%

Table 6 Number and percentage of segments that implied research culture characteristics for the theme “Encouragement of new ideas”

Encouragement of new ideas	No.	Percentage of theme characteristics	Percentage of overall characteristics
Share information and resources to help other participants in the team	17	32%	8%
Share helpful announcements with others in the team	15	28.3%	7%
Share experiences with others in the group to give support	12	22.6%	5.7%
Advise others in the group if facing problems with their research	9	17%	4.3%

Table 7 Number and percentage of segments that implied research culture characteristics for the theme “sharing research data”

Sharing research data	No.	Percentage of theme characteristics	Percentage of overall characteristics
Share obstacles with procedures	15	33.3%	7.1%
Share status of publishing the paper	12	26.7%	5.7%
Share information about the journal	6	13.3%	2.8%
Share problems with language or writing	6	13.3%	2.8%
Share title and procedures	3	6.7%	1.4%
Share details of the research	2	4.4%	0.95%
Share progress of data collection and results	1	2.2%	0.5%

Table 8 Number and percentage of segments that implied research culture characteristics for the theme “friendly research community”

Friendly research community	No.	Percentage of theme characteristics	Percentage of overall characteristics
Feel it would be more comfortable to be in a group of researchers from one field of study	9	50%	4.3%
Willing to participate in similar projects in the future	5	27.8%	2.4%
Find diversity of participants’ specializations a positive thing for the project	4	22.2%	1.9%

Table 9 Number and percentage of segments that implied research culture characteristics for the theme “Collaborating across disciplines”

Collaborating across disciplines	No.	Percentage of theme characteristics	Percentage of overall characteristics
Provide solution to another participant’s problem	9	70%	4.3%
Consult another researcher when facing a problem with individual research	4	30.8%	1.9%

culture theme in four quarters of the year and then compared to show the degree to which each theme has evolved.

Table 12 presents the number of segments detected in the chat content for each theme in four quarters, representing the time period used for the current study.

Figure 2 describes how each theme of research culture has evolved through the four quarters of the study based on the number of segments detected in each quarter for each theme.

Table 10 Number and percentage of segments that implied research culture characteristics for the theme “Peer evaluation”

Peer evaluation	No.	Percentage of theme characteristics	Percentage of overall characteristics
Have the committee member review individual work to refine	3	60%	1.4%
Have a specialist refine the paper for publication	2	40%	0.94%

Table 11 Number and percentage of segments that implied research culture characteristics for the theme “Financial expertise”

Financial expertise	No.	Percentage of theme characteristics	Percentage of overall characteristics
Acquired experience in financial and paperwork by participating in this project	7	58.3%	3.3%
Seek training or consultancy to be able to process the paperwork	5	41.6%	2.4%

Table 12 Number of segments detected in each quarter of the year

Themes of research culture	Quarter 1 Oct. 1st–Dec. 31st	Quarter 2 Jan. 1st–Mar. 31st	Quarter 3 Apr. 1st–Jun. 30	Quarter 4 Jul. 1st– Sep. 30
Research skills development	15	15	14	20
Encouragement and new ideas	9	8	21	15
Sharing research data	8	13	10	14
Friendly research community	3	4	4	7
Collaborating across disciplines	0	3	5	5
Financial expertise	5	5	1	1
Peer evaluation	0	0	2	5

The seven themes of research culture have evolved with a slightly different degree. While an obvious change took place in peer evaluation, with 0 segments in quarter 1 raised to 5 segments in quarter 4, and in research skills development, with 15 segments in quarter 1 versus 20 in quarter 4. Financial expertise dropped down from 5 segments in quarter 1 to 1 segment in quarter 4. A disoriented track of the theme “Encouragement and new ideas” started with 9 segments in quarter 1, to 21 segments in quarter 3, and 15 segments in quarter 4.

To further explain which theme has developed more through the 12-month period, we calculated “Growth” for each theme. The difference between the last and first number of segments detected for each theme was calculated and compared, as shown in Table 13.



Fig. 2 Evolution of research culture themes

Table 13 Growth of theme characteristics in a year

Themes of research culture	Quarter 1 Oct. 1st–Dec. 31st	Quarter 4 Jul. 1st–Sep. 30	Growth
Research skills development	15	20	5
Encouragement and new ideas	9	15	6
Sharing research data	8	14	6
Friendly research community	3	7	4
Collaborating across disciplines	0	5	5
Financial expertise	5	1	-4
Peer evaluation	0	5	5

While “encouragement of new ideas” and “sharing research data” improved over the time of the study, “financial expertise” decreased to below the baseline.

Figure 3 compares the growth among the characteristics of research culture themes at the end of the 12-month period of the study.

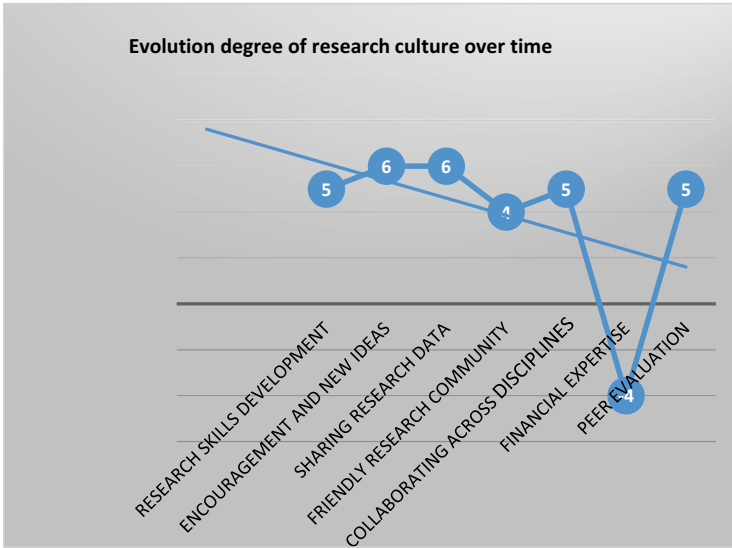


Fig. 3 Growth among research culture themes in a year

4 Discussion

In this study, we observed the evolution of research culture among a group of researchers with multidiscipline. Although some of the revealed themes and characteristics were mentioned in previous research, such as “openness and transparency” (Nosek et al. 2018) and “peer review” (Kovanis et al. 2016), detecting new themes like “friendly research community,” “sharing research data,” and “involvement and ideas” underlines the value of interaction in multidisciplinary research and the importance of the integration of diverse perspectives and sharing of knowledge (Horta & Jung, 2014; Nielsen et al., 2017; Stephan, 2012). Our results revealed the importance of “developing research skills” as a theme of research culture that promotes participants’ motivation for training and professional development. This is supported by previous research (Fong et al., 2019; Rhoten et al., 2015) that highlighted the importance of institutional support for researchers, offering them opportunities to develop their competencies and providing them with a motivating environment. Lyall et al. (2013) have stated the relationship between recognizing and rewarding multidisciplinary researchers to motivate them and increase their involvement.

The current findings align with previous research, emphasizing the difficulty of international publication of scientific papers (Bromham et al., 2016). We revealed how research culture characteristics related to writing research papers and seeking help with scientific writing are highly demonstrated by participants, particularly those from the humanities and social academic fields. The characteristics of research

culture guided researchers' writing, and the support they received during the project helped the majority of the researchers to publish their work. Sixteen researchers out of the twenty-one participants published their papers in Scopus and WOS-ranked journals, and four other researchers published their papers in international peer-reviewed journals.

The results emphasize the value of collaboration and interaction for research productivity, which supports earlier work that found "collegial ties" vital to support the development of a supportive and enabling research culture in all settings (Wilkes & Jackson, 2013). The emerging set of characteristics presented in this study as "friendly research community" is explained in related work by Marcos Rodriguez (2018), who considered diversity, seen in researchers' cultural and intellectual traits, to be "crucial" because it fosters innovation and enables individuals to examine problems from a wide range of perspectives.

Unlike earlier studies that emphasize the collaboration and interdisciplinary partnership among researchers, the current study findings show a limited appearance of research culture characteristics that represent the theme "peer review" or "collaborating across discipline" (6.2% and 2.4% of all detected segments). This was explained by Peffer and Renken (2016) as difficulties facing multidisciplinary teams, as researchers need to make a deliberate effort to comprehend the disciplinary practice of their partners while maintaining their own point of view. Normally, the participants from basic sciences fields have accumulated skills in research projects and international scientific publishing that outperform participants from the humanities and social studies fields due to the nature of their study that focuses on lab work and research teams. The findings also showed the influence of the institution on fostering the characteristics of research culture among diverse participants, as shown in the emergence of the research culture themes "friendly research community" and "seeking guidance and support" during different stages of the project, particularly concerning financial procedures and scientific publishing. This result is supported by previous research that emphasized the role of the institution in supporting multidisciplinary collaboration by providing financial and technical support to encourage researchers to work across disciplinary boundaries (Foten & Parker, 2004; Rafols et al., 2012).

The study compared the growth in themes of research culture in four quarters of a year; the growth in most of the themes was relatively equal. This result reflects the nature of research culture that widely affects the research environment in many aspects and aligns with previous research highlighting the role of research culture in shaping researchers' attitudes and behaviors in many ways (Jacobs et al., 2012). A notable finding is the decreased number of segments detected for the theme "financial expertise," which is explained by participants' lack of financial experience and skills, which were required at the beginning of the project to fulfill funding requirements. Berge (2019) explained earlier that researchers may not have the experience with financial skills and may not seek out opportunities to develop them, as they viewed them as less critical to their primary work.

5 Conclusion

In conclusion, this study inducted a list of research culture themes and characteristics based on a detailed, in-depth analysis of a group of researchers in a multidisciplinary research project. The findings underscore the need for institutions to prioritize the need for well-planned research agendas that consider research culture vital for research project success. Universities, in particular, should recognize the importance of supporting the professional growth of researchers and the academic community. The study calls for action by policy makers, decision makers, and academic leaders to include research culture in their strategic agendas and institution profiles to remain at the forefront among other institutions.

One limitation of the current study is the limited number of participants, which affects the generalizability of the findings and the use of statistical software to manage data. It is important to acknowledge that the analysis targeted characteristics of research culture that relate to individuals, not the institutions. Although efforts were made to mitigate the principal investigator's bias during the analysis of chat content, it is possible that some degree of bias may have influenced the results.

Future research is needed to further explore research culture themes in other settings, such as interinstitutional research projects. It is also recommended that future research may use the current list of research culture themes to develop customized training programs for researchers and faculty members and explore their effects on research objectives and outcomes.

6 Results Impact on Policies and Application

The current study provides a list of research culture themes and underlying characteristics that evolved among a team of researchers with multidiscipline. This list has significant implications for institutions seeking to enhance their research culture, emphasizing the need to engage researchers from different disciplines to collaborate and share expertise and knowledge. Also, the list should guide academic and research institutions when developing their strategic research plans. The insights learned from the findings provide a road map for universities to create a research community that fosters collaboration among researchers from different disciplines.

Understanding the aspects of research culture helps universities to accommodate researchers' needs, develop their skills, and maintain a positive environment for scientific collaboration and production. The growth/lack of certain characteristics of research culture may guide institutions decisions when planning for professional development training programs for researchers to overcome difficulties such as international publishing or financial procedures. Institutions should consider establishing mentorship and training for supervisors who lead multidisciplinary research teams with multidisciplines, as it requires unique skills to manage team conflicts and variations.

The implications of this research extend beyond academia to organizations and institutions that plan for interdisciplinary collaboration. They underscore the urgency of revisiting existing policies and research agendas in order to address the potentials and characteristics of the research community and implement suitable interventions.

In addition to offering customized training programs to researchers to develop specific sets of skills related to multidisciplinary research, leadership should promote a culture of openness and sharing of research data and findings among researchers to create an environment that supports multidisciplinary research capable of investigating complex, multifaceted issues. Universities should establish research centers or observatories that study global crises with an impact on human beings and the environment, providing sufficient financial and technical support to research teams to study the crises from different perspectives. The national and international response to Covid-19 has shown the urgent need to combine efforts to face the pandemic (Loannidis et al., 2020). As the researchers viewed its impact on their lives, their families, the society, and the environment, they recognized the importance of integrating various methodologies and data sources to be able to study the crises and suggest solutions or future actions.

In light of these results, it is recommended that institutions consider creating a manual for research culture principles and procedures that serves as a guide for researchers and organizations in planning and conducting research. We recommend that all universities and research institutions announce a *research culture profile* with data and indicators on the healthiness of their research procedures and code of conduct, in light of the characteristics of research cultures.

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Insta-Shopping: A Qualitative Study on Consumer Experiences and Purchasing Behavior on Instagram



Shahed Nassif and Abderrahmane Azzi

Abstract This study aims to investigate the purchasing behavior of Instagram users in the UAE and understand the factors influencing their purchase decisions. Data was collected from 10 respondents through personal interviews, focusing on their demographics, frequency of Instagram usage, purchasing behavior, and the role of social media influencers. The findings revealed that the majority of respondents were female Emiratis in their early twenties who use Instagram daily for both personal and business purposes. They reported making purchases through Instagram, with social media influencers significantly impacting their decisions. However, concerns about the authenticity of products were noted. This study provides valuable insights into the behavior of Instagram users in the UAE and underscores the importance of social media influencers in shaping purchase decisions. The findings suggest that businesses in the UAE should leverage Instagram as a marketing tool and ensure the authenticity and reliability of their products to avoid negative customer experiences. Future studies can explore the purchasing behavior of Instagram users in other countries and investigate the impact of various marketing strategies on their purchasing decisions.

Keywords Social media marketing · Impulsive buying · Purchasing behavior · Instagram · Consumer behavior · Personalization algorithms

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1 Introduction

These days, social media is a critical component of daily life. Due to mobile smartphones, people can access SNS (social network services) no matter where they are. Websites and software that enable people to participate in a variety of activities, including communication, collaboration, and exchange of information, are known as social media (Kim & Johnson, 2016). The marketplace for smartphones is expanding quickly, leading to a constant development of new applications. However, many applications enjoy only temporary popularity, with few maintaining and expanding their user base. Instagram is one of these (Amornpashara et al., 2015, p. 355). Increasing numbers of individuals are exposing themselves to digital and social media, acting as consumers who look for information about products, make purchases, and share their experiences (Stephen, 2016, p. 17). Since Instagram differs from other social media platforms, it is essential to study consumer behavior on Instagram (Sihombing et al., 2020, p. 237).

The UAE has witnessed significant growth in social media usage, particularly Instagram, which has become a vital platform for e-commerce. Despite its popularity, there are concerns regarding the authenticity of products and the influence of social media on impulsive buying behavior. This study aims to address these issues by investigating the purchasing behavior of Instagram users in the UAE, focusing on how social media influencers and personalized content contribute to impulsive buying (Fernandes, 2013).

Impulse buying, which can significantly increase sales, has long attracted researchers and marketers. It refers to purchases made spontaneously without logical or careful consideration, often driven by emotions (Darmawan & Gatheru, 2021, p. 12). Consumers' exposure to a broader choice of products that suit their emotional state while browsing online can contribute to impulsive buying (Madhavaram & Laverie, 2004). While many research efforts have focused on how the online environment encourages impulsive buying (Park et al., 2010), the role of SNS in this context has typically been understudied. As platforms like Instagram attract more users, it becomes increasingly important for marketers and researchers to understand their influence on consumer behavior, particularly impulsive buying (Pookulangara et al., 2018).

In this study, Instagram was used to examine the impact of advertising on young consumers' impulsive purchasing behavior. Instagram was selected because it is one of the most widely used social media platforms among youths and has integrated features designed to make shopping more convenient. As a mobile phone application, it simplifies users' ability to shop online. The study of impulsive buying in the context of Instagram is relevant since increasing numbers of companies are using this platform to advertise to a wider audience. This research will contribute to the literature by providing insights into the purchasing behavior of Instagram users in the UAE, addressing gaps in understanding the impact of social media on impulsive buying, and offering practical implications for businesses leveraging Instagram for marketing. Recent studies, such as those by Martínez-López et al. (2021) and

Hussain et al. (2023), will be integrated into the literature review to provide updated context and support for our findings.

2 Literature Review

2.1 *What Is Advertisement?*

Advertising is a form of communication used to persuade viewers, readers, or listeners to buy or take action regarding products, information, services, etc. Advertising is a subgroup of the promotion mix, one of the 4Ps in the marketing strategy. Advertising plays a key role in raising consumer awareness of a product to influence future purchasing behavior (Kumar & Raju, 2013, p. 37). It is a tested promotional method employed by companies to sell goods and services, by medical institutions, academic institutions, and religious organizations to advertise their services, and by industry groups, unions, governments, and other organizations to promote the value of their projects (Markham, 2001, p. 4). The term “advertising” means drawing attention to, exposing, or informing someone. Advertising is an irrational system that puts a lot of pressure on our emotions and antisocial tendencies that have nothing to do with the products being offered (Dyer, 2008, p. 2). It is an effective form of communication that enables a seller to convey an idea repeatedly while also enabling the consumer to understand and evaluate other sellers’ messages (Budacia, 2012, p. 65).

2.2 *Old Advertisement Versus Modern Advertisement Advertising*

Advertising has been around for hundreds, if not thousands, of years. Certainly, it has changed with time, with technological advancements such as the first printing press in the mid-fifteenth century and the Industrial Revolution in the late eighteenth and early nineteenth centuries having a significant impact. Corporations have become more aware of the influence of client attitudes and views toward their products and services due to the growth of corporations over the nineteenth and twentieth centuries. Traditionally, the only mass media outlets were newspapers and magazines. Eventually, radio and television received enormous influence, and most recently, the world became aware of the power of individual communications media via the Internet (Markham et al., 2001, p. 4). Organizations nowadays have grasped the chance to influence audiences, both internal and external, with more technologically advanced media (Goodman, 1998).

The advertisement sector has been altered by the Internet. In fact, the dominant position of television, radio, and newspapers in advertising has been challenged by

digital platforms, including browsers, web pages, and social media advertising. According to recent surveys, the amount of advertising money allocated to online media accounted for 44% of total worldwide advertising spending in 2018 and 50% in 2020 (Handley, 2017). Hussain and Lasage (2014) found that Internet characteristics, such as ubiquity and immediacy, and the evolution of technological devices (e.g., smartphones) have transformed consumer habits and fostered new forms of interaction with other users, firms, and content creators. The rise in social media usage for news and entertainment illustrates how the use of technology for communication and information is changing users' daily lives. Social media platforms are used to connect with friends and brands (Rambe & Jafeta, 2017). Today's world has more than 3196 million social media users, and that number is increasing by 13% annually (Cooper, 2018). Sheldon and Bryant (2016) found that social media has changed how marketing communications are done by altering how customers choose, share, and evaluate information. In other aspects, social media has evolved into a vital form of advertising in contemporary life (Jung, 2017). Consumer views regarding social media advertising are critical in determining its effectiveness (Chen et al., 2014).

Allcott and Gentzkow (2017) tested consumer assumptions about social media, indicating that marketers should be cautious when deciding which social media platforms and campaign types to use. The success of advertising today is heavily influenced by social media platforms, which are now seen as the key information source during the decision-making process for purchases (Hamilton et al., 2016). Social media use can encourage unplanned purchases and the buying of things promoted by celebrities (Thoumrunroje, 2014). High-quality photographs on social media sites are more likely to provide visitors with pleasant affective experiences (Colliander & Marder, 2018). While an image's quality is essential, it also has to conform to the patterns of the media to be likable and trustworthy.

2.3 Who Are Social Media Users?

Social media use is mainly common among young individuals (ages 18–29), with 90% of young adults today using social media. At some point, women were more likely than men to use social media platforms; however, since 2014, these differences have become much less pronounced. Nowadays, 68% of all women and 62% of all men use social media (Perrin, 2015, p. 3). These categories prefer to buy through social media platforms rather than going to retail shops, which is why firms and brands are advertising through social media platforms.

2.4 The Effect of Advertisement on Social Media Users

Danaher (2017) found that in recent decades, both advertisers and advertising scholars have shown an interest in the topic of raising advertising effectiveness. The three primary variables related to advertising power in the social media environment, according to previous studies, are consumer attitudes toward an advertisement, loss of privacy, and loyalty (Ashley & Tuten, 2015). The primary motivator of consumer voluntary control behavior is attitude (Agly & Chaiken, 1993). As a result, one of the best indications of an advertisement's performance in a communicative context is how people feel about it (Goldsmith et al., 2000). Lutz (1985) defined attitude toward advertisements as a tendency to react favorably or unfavorably to a specific advertising stimulation during a higher exposure situation. According to established literature on persuasion, creating favorable attitudes toward an advertisement is crucial to get people to at least think about the products or services being advertised. Influencing a viewer's perception of an advertisement may be essential for attracting and keeping their attention (Bright & Daugherty, 2012). In order to build a client base for their brands and products, marketers are focusing their efforts on enhancing campaign effectiveness in digital advertising (Van Noort & Willemsen, 2012). Indicators of the persuasive effect that social media has on loyalty include intention to purchase (Dehghani & Tumer, 2015). Djafarova and Rushworth (2017) discovered that the appearance of images and videos on various digital channels can cause attitudes. Kroeber-Riel (1984) argued that visuals have the potential to distract consumers' attention from printed text. Furthermore, clients' attitudes regarding the promoted products might be altered by the features of images used in marketing communication. Aaker et al. (1995) found that online advertising content might cause affective reactions, such as attitude change, but could also affect behavioral concepts, including purchase intentions (Becker-Olsen, 2003) and intention to visit the website. Along with impacting affective advertising, curiosity can influence how consumers behave. In particular, curiosity can result in exploratory behavior.

2.5 Instagram Advertisement

Instagram is one of the most rapidly expanding online photo social websites where users share images from their daily lives with other users, yet there is limited academic research on this platform (Teng et al., 2014). The platform recently decided to broaden its advertising platforms, making it a relevant channel to concentrate on. Revenue from advertisements on Instagram was anticipated to reach \$2.81 billion in 2017—more than both Twitter and Google combined (Vizard, 2015). Members and followers believe that Instagram is very important. The content in people's posts is influenced by their expectations for performing this task (Thoumrunroje, 2014). Marketers are becoming more interested in using Instagram for advertising due to the widespread use of this mobile platform, which had 14 million users in the UK

alone (Statista, 2016). This predicts a larger audience for brands and retailers, as well as an expanded range of brand-specific themes that might be worth advertising (Vizard, 2015). Teng et al. (2014) demonstrate that Instagram offers significant persuasive potential for marketers due to its ability to attractively promote products and services. The application enables users to submit more colorful content, such as video posts, in addition to photo publishing. Advertising that uses rich media, also known as “vivid,” is frequently more interactive than advertising that uses visual elements and primarily uses impressive audio and video (Rewick, 2001). Instagram video advertising is recognized as an effective marketing tool since the platform’s visitors are quickly attracted by the combination of dynamic images and sound (Li & Bukovac, 1999), making the message more “emotionally interesting” (Nisbett & Ross, 1980). Instagram video advertising is especially beneficial for travel businesses, considering that trip goods and services cannot be physically evaluated before purchase (Tuckman, 2012). Baker (2015) explored that 48% of Instagram users use the app to explore new potential travel destinations. Videos can be used to successfully influence users’ decisions to travel. Companies can post video material in various advertising contexts on Instagram to attractively sell their goods and brands. Instagram’s original advertising context focuses on native advertising (Harms et al., 2017). The recent launch of Instagram Stories provides a fresh, extremely effective marketing channel. The rise of temporary communication is reflected in this advertising context (Anderson, 2015). Ephemeral advertising in Instagram Stories may be more suited to catching users’ attention because it achieves this in a way that is significantly different from the rest of the feed. Mansfield (2016) found that businesses must carefully strike a balance between attracting attention and irritating consumers to achieve positive advertising outcomes. Video marketing was predicted to make up 80% of all consumer Internet traffic in 2019. Jin and Phua (2014) found that visual images are more likely to be tweeted than text messages. As a result, a social media platform focusing on visual content, like Instagram, may be even more powerful as an advertising medium for determining consumer perception of quality and desire to shop. High levels of engagement with posts, such as “like” votes and shares, in particular, can significantly affect purchase behavior (Beukeboom et al., 2015). Clients’ attitudes regarding the promoted products might be altered by the features of images used in marketing communications. When the photographs seem to be of high quality, purchasers are more likely to make positive assumptions about the quality of the product. Consumers are more likely to see the image and have more positive opinions of the products, even if the image’s size is changed (Kim & Lennon, 2008).

2.6 Online Advertisement Content and Impulse Buying

The content of an online advertisement includes all aspects and elements that form an advertisement, such as the model, color, lighting, and text (Chen et al., 2016). Interactive two-way communication between advertisers and potential customers is

achieved through online advertising (Laudon & Traver, 2012). Social networking is one method of online advertising. Social networking advertising (or social media) is a type of social advertising, which is a part of online commerce and involves the use of social media to advertise products and services and convey brand image. Logan et al. (2012) found that social media users are more likely to understand advertising content posted on social media, which provides consumers with more information about new items, additional benefits of those products, and product comparison information. This effectively increases value (Saxena & Khanna, 2013). Instagram is a social media platform that focuses heavily on the visual aspect, giving attractive images and videos priority over text. Kahn (2017) explored that items that stand out more visually due to brightness, color, size, or the number of filters used make the item stand out from the screen, direct automatic attention directly to the item, increase the duration of fixation, and can influence a consumer's preferences by attracting their attention and causing impulse purchases. The comments section on Instagram is a place where customers may find actual product reviews from other customers who have already purchased and used it. These reviews can provide information about the products' quality or the authenticity of the seller. Ning and Khalifa (2012) found a powerful connection between advertisement content and impulsive buying. Dawson and Kim (2010) discovered a positive connection between advertisement appearance on websites and impulse buying.

2.7 The Role of Instagram in Impulse Buying

Instagram can be particularly relevant for fashion companies because of the crucial role of visuals in promoting fashion products (Casaló et al., 2017). The delight of using the app, which is connected to impulsive buying, impacts the decision-making process (Aprilia & Setiadi, 2017). The use of Instagram encourages impulsive buying (Xiang et al., 2016). Numerous factors have been reported in studies examining the impact of Instagram on impulsive buying behavior: materials for promotion (Handayani et al., 2018), Instagram posts of images or videos from brands, as well as recommendations from friends and opinion leaders (Xiang et al., 2016). Instagram's purchasing characteristic, which was upgraded in 2018 to allow retailers to tag product photographs and sell directly to followers, has also significantly increased the number of impulse buys (Khanom, 2018).

2.8 Underpinning Theory

The theoretical framework for this study is grounded in the Stimulus-Organism-Response (SOR) model (Jacoby, 2002), which posits that external stimuli (such as Instagram advertisements) influence the internal states of individuals (cognitive and emotional responses), which in turn affect their behaviors (purchasing decisions).

This model has been widely used to understand consumer behavior in various contexts, including online shopping and social media marketing. The SOR model is particularly relevant for examining impulsive buying behavior on Instagram, as it highlights how stimuli (e.g., personalized ads, influencer posts) can trigger emotional responses (e.g., excitement, fear of missing out) that lead to impulsive purchases.

2.9 Hypothesis Development

Based on the literature review and the underpinning theory, the following hypotheses are proposed for this study:

- H1: Personalized Instagram advertisements positively influence users' impulsive buying behavior.
- H2: The frequency of posts from influencers and brands on Instagram positively influences users' purchasing decisions.
- H3: The visual quality of Instagram advertisements positively influences users' perceptions of product quality and purchasing behavior.
- H4: Psychological factors, such as fear of missing out and social validation, mediate the relationship between Instagram advertisements and impulsive buying behavior.
- H5: Demographic factors (e.g., age, gender, income level) moderate the relationship between Instagram advertisements and purchasing behavior.

3 Method

3.1 Research Design and Instruments

Ethnography was employed to study the impact of Instagram on users' purchasing behavior. Ethnography is a qualitative research method that involves immersion and observation to understand the culture and practices of a particular group. In this case, it aims to provide a detailed and holistic understanding of how consumers experience Instagram in their purchasing behavior. The researcher immerses themselves in the Instagram environment, observing the behaviors and practices of users who shop on the platform. This involves studying their social media habits, analyzing their interactions with influencers and brands, and understanding the role Instagram plays in their purchasing decisions through detailed interviews. Similar methodologies have been successfully used in previous studies, such as Kozinets' (2002) netnography of online communities and Hamilton and Hewer's (2010) ethnographic examination of branding and marketing on social media platforms.

Utilizing ethnography and based on insights from prior research discussed in the literature review section, a set of eight research questions was formulated to cover the identified research gaps in this study. The questions, along with their corresponding objectives, are shown in Table 1 for clarity and ease of reference. The questions aim to gather information on the respondents’ experiences in using Instagram’s shopping feature, the factors influencing their purchasing decisions, potential barriers to using the feature, the impact of Instagram advertising, and how it fits into the decision-making process. It also explores the effect of content and the frequency of posts from brands and influencers, the role of Instagram’s algorithm in purchasing behavior, and the psychological and emotional factors that might contribute to impulsive buying behavior. Lastly, it seeks to understand how demographics might influence exposure to products and brands on Instagram and how this affects purchasing behavior.

Table 1 Questions formulated in this study with their corresponding objectives

No.	Questions:	Objectives:
1	Have you ever made a purchase through Instagram’s “shop now” button or a similar feature? Can you describe the experience and what influenced your decision to make the purchase?	Understand user experiences and factors influencing purchases through Instagram’s shopping features
2	What are some factors that might make you hesitant to make a purchase through Instagram, even with features like “shop now” buttons available?	Identify barriers to purchasing on Instagram
3	Can you describe a time when an Instagram advertising campaign was particularly effective in influencing your purchasing behavior? What made it effective?	Assess the effectiveness of Instagram advertising campaigns
4	How does the content and frequency of posts from brands and influencers on Instagram impact your purchasing decisions?	Evaluate the impact of content and post frequency on purchasing decisions
5	Can you describe a time when Instagram’s algorithm showed you a personalized content (ad or product) suggestion that was particularly relevant to your interests or needs? How did you respond to the ad?	Examine the impact of personalized content suggestions on purchasing behavior
6	Can you describe any psychological or emotional factors that might contribute to impulsive buying behavior on Instagram, such as the fear of missing out or social validation?	Understand psychological and emotional factors influencing impulsive buying
7	How do you balance the influence of Instagram advertising with other sources of information, such as reviews or recommendations from friends and family?	Investigate how users balance Instagram ads with other information sources
8	Do you feel that your gender, age, and income level influence the types of products or brands that you are exposed to on Instagram? How does this impact your purchasing behavior?	Explore demographic influences on exposure and purchasing behavior

3.2 Participants

To achieve the discussed objectives, this study collected responses from individuals of different ages, genders, nationalities, and academic backgrounds through a survey. The personal interview surveys were conducted over a total of 2 weeks between March 2023 and April 2023. Due to a shortage of time, a sample of ten individuals was interviewed for the questions in Table 1, with each interview taking an average of 15 minutes. Participation in the study was completely voluntary and confidential. There were no right or wrong answers, and no monetary incentive was provided for participation. Moreover, demographic information was collected, including gender, age, program of study, and nationality (Arab, Non-Arab, and Local). A statistical description of the collected responses is summarized in Fig. 1a and b for gender with nationality and gender with field of study, respectively. Out of the total respondents, 60% were female and 40% were male. Among the female respondents, 20% belonged to each of the three types of institutions: engineering, medicine, and social sciences. Among the male respondents, 20% belonged to engineering and 10% belonged to each of medicine and social sciences. Moreover, 40% of the total respondents were Arab and 40% were local, while 20% were non-Arab. Among the female respondents, 20% belonged to each of the three nationality groups. Among the male respondents, 20% belonged to each of Arab and local, while none belonged to non-Arab. The ages of respondents varied between 19 and 27.

4 Results and Discussion

The interview responses are attached in the supplementary files with this manuscript. The following sections will discuss each objective (i.e., question) shown in Table 1 individually. Thereafter, conclusions and remarks will be drawn from the overall significant observations noticed.

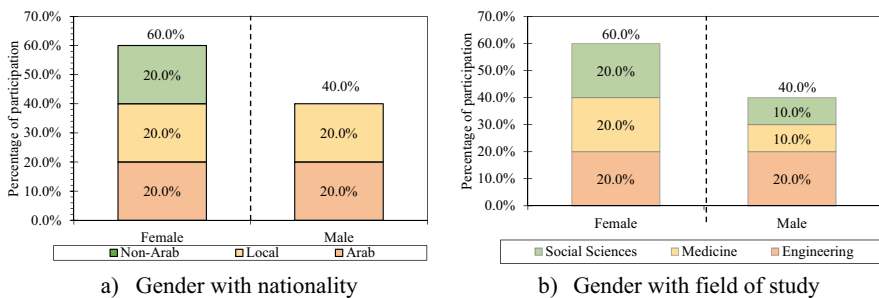


Fig. 1 Descriptive statistics of the collected respondents' demographics. (a) Gender with nationality. (b) Gender with field of study

4.1 Shopping Experience and Factors

Only a few respondents have made purchases through Instagram's "shop now" button or a similar feature. Among those who have made a purchase through these features, factors such as the ease and convenience of the process, as well as the influence of product recommendations and positive reviews, played a role in their decision to make the purchase. For instance, a 26-year-old male with excellent experience in purchasing behavior using Instagram noted that he had made several purchases through the platform and found the process to be easy and convenient. He also mentioned that positive reviews and product recommendations from influencers had influenced his decision to make purchases. On the other hand, a 21-year-old Arab male studying social sciences with a bad experience in purchasing behavior using Instagram expressed hesitancy to make purchases through the platform due to concerns about the authenticity and quality of the products being sold.

These findings have broader policy implications, suggesting that regulatory bodies need to ensure transparency and authenticity in online product promotions to build consumer trust. Recent studies corroborate these findings, indicating that clear, reliable product information and positive user reviews significantly influence online purchasing behavior (Hussain et al., 2023).

4.2 Barriers to Using Shopping

From the collected responses, it appears that several factors can make users hesitant to make a purchase through Instagram, even with features like "shop now" buttons available. These factors include concerns about the authenticity and quality of the products being sold, as well as issues related to payment and delivery. Two respondents with extensive experience in online shopping expressed concerns about the authenticity and quality of products being sold on Instagram. Another respondent noted issues related to payment and delivery.

These responses suggest that trust and transparency may be key issues for users when it comes to making purchases through Instagram. Brands and influencers may need to work to address these concerns by providing clear and accurate product information, as well as ensuring secure and reliable payment and delivery options. This aligns with the findings of Martínez-López et al. (2021), who highlighted the importance of trust and security in online shopping environments.

4.3 Ads and Purchasing Behavior

Effective Instagram advertising campaigns are those that are personalized, visually appealing, and offer value to the user. One respondent noted that an effective campaign showed her personalized and relevant product recommendations based on her interests and needs, suggesting that personalization is an important factor. Another participant emphasized the importance of visually appealing content and promotions, while another highlighted the value of discounts or promotions.

These findings highlight the necessity for businesses to create personalized, visually appealing, and value-offering advertising campaigns. This is consistent with the Stimulus-Organism-Response (SOR) model, which posits that external stimuli (e.g., Instagram ads) influence internal states (e.g., emotional responses) that affect behaviors (Jacoby, 2002). Hussain et al. (2023) support this theory, noting that personalized advertisements can significantly impact consumer behavior.

4.4 Brand and Influencer Posts

The frequency and content of posts from brands and influencers significantly impact purchasing decisions. A higher frequency of posts can lead to greater exposure and an increased likelihood of purchase, but too many posts can be overwhelming or annoying. Respondents also indicated a preference for honest and unbiased reviews from influencers.

This underscores the importance of strategic content management and authentic endorsements in social media marketing. Recent studies have shown that influencer marketing can effectively drive consumer engagement and purchasing behavior, provided the content is perceived as genuine (Djafarova & Rushworth, 2017).

4.5 Algorithm and Purchasing Behavior

Personalized content and product suggestions on Instagram can be effective in influencing purchasing decisions, especially for younger demographics. However, the frequency and content of posts from brands and influencers appear to have a mixed impact. Some respondents find frequent posts overwhelming, while others appreciate relevant and high-quality posts.

This indicates that Instagram's algorithm, which prioritizes personalized content, can effectively drive purchases if it balances frequency and relevance. The SOR model supports this, suggesting that personalized stimuli can evoke emotional responses that lead to purchasing behavior (Jacoby, 2002). Hussain et al. (2023) also highlight the importance of relevance in social media advertisements.

4.6 Psychological Factors of Impulsive Buying

Several psychological and emotional factors contribute to impulsive buying behavior on Instagram, such as the fear of missing out, social validation, and the excitement of discovering new products. These factors were particularly noted by younger respondents.

This suggests that Instagram's emphasis on visual content and curated feeds can create a sense of urgency and excitement, leading to impulsive buying behavior. This finding aligns with studies by Xiang et al. (2016) and Handayani et al. (2018), who found that social media platforms can significantly drive impulsive buying through psychological triggers.

4.7 Instagram Advertising in Decision Making

Instagram advertising influences purchasing decisions but is balanced with other information sources, such as reviews and recommendations from friends and family. Female and younger respondents were more likely to consider these additional sources.

This highlights the importance of multichannel marketing strategies that combine Instagram advertising with other trusted information sources. Martínez-López et al. (2021) emphasize the role of comprehensive information in consumer decision-making processes.

4.8 Demographics and Exposure to Brands

Demographic factors, such as age, gender, nationality, and academic background, impact users' purchasing behavior on Instagram. Younger respondents were more likely to make impulsive purchases, while different nationalities and academic backgrounds showed varying levels of trust in Instagram advertising.

These findings suggest that marketers should consider demographic differences when targeting audiences on Instagram. The SOR model supports this by indicating that different stimuli can affect various demographic groups differently (Jacoby, 2002). Hussain et al. (2023) also highlight the importance of demographic considerations in social media marketing.

5 Conclusions and Remarks

The conclusions of this study provide a comprehensive understanding of Instagram's influence on consumer purchasing behavior in the UAE, highlighting practical implications, potential limitations, and avenues for future research.

The study reveals several key insights into how Instagram influences purchasing decisions among users:

- Instagram significantly impacts the purchasing behavior of its users, particularly among younger age groups (Terttunen, 2017).
- Personalized content suggestions are highly effective in driving purchasing decisions, with users more likely to make purchases when recommendations match their interests or needs (Schafer et al., 2001).
- Concerns about product trustworthiness, shipping and delivery times, and authenticity can make users hesitant to purchase on Instagram (Martínez-López et al., 2021).
- Instagram advertising campaigns are effective, especially when they feature products that match user interests or needs. Users often balance these ads with other information sources, such as reviews and recommendations from friends and family.
- Demographic factors (age, gender, nationality, academic background) influence purchasing behavior, with younger users more prone to impulsive purchases driven by psychological and emotional factors (e.g., fear of missing out, social validation).

This study has certain limitations that should be acknowledged:

- The small sample size (10 respondents) may not represent the broader population of Instagram users in the UAE.
- Reliance on self-reported data may introduce biases, such as social desirability or recall bias.

Future research could build on this study by addressing the following areas:

- Including larger and more diverse samples to improve the generalizability of findings.
- Employing mixed-method approaches (qualitative interviews, quantitative surveys, experiments) to validate and expand on findings through numerical analysis, such as structural equation modeling (e.g., Aderibigbe et al., 2023; Bukhatir et al., 2023; Bukhatir Alshamsi et al., 2023).
- Investigating the long-term effects of Instagram advertising on consumer behavior.
- Exploring comparative studies involving users from different cultural and geographical contexts for a global understanding of Instagram's influence on purchasing behavior.

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Success Through Islamic Entrepreneurship for Sustainable Development



Fatima Zohra Aouati  and Zina Arabeche 

Abstract This chapter addresses the relationship between entrepreneurship and Sustainable Development (SD). Recognizing its growing importance, the research examines how the principles of entrepreneurship within the Islamic framework can positively impact overall performance. A qualitative method was conducted to address our research problem among Algerian entrepreneurs. The results of the study show that core values of entrepreneurship, such as honesty, hard work, integrity, and contribution to society, play a role in business sustainability. This underscores the importance of these values in supporting development efforts. This study will hopefully have significant implications for countries like Algeria, where entrepreneurial honesty can greatly influence sustainable economic growth.

Keywords Islamic entrepreneurship · Sustainable development · Islamic finance

1 Introduction

It is often known that Islamic entrepreneurship is vital for the long-term survival and prosperity of small and medium-sized enterprises (SMEs). SMEs have a major role in economic development and expansion on a national and global scale. Entrepreneurship is the basis of economic growth and progress, especially when it is guided by Islamic principles. Strong entrepreneurial cultures lead to notable advancements in a variety of fields, such as general prosperity, equitable wealth distribution, employment, income generation, and social and economic stability. Due to the impact that entrepreneurial activities have on societies and economies, Islam, as a religion, actively promotes the idea of entrepreneurship. Compared to traditional entrepreneurship, Islamic entrepreneurship adopts a dynamic approach.

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It also prioritizes social and economic factors in addition to monetary gains. For Muslim entrepreneurs to be successful in their endeavors and uphold the teachings of the Prophet Muhammad (peace be upon him) and the Quran, they must grasp the principles of business. To demonstrate their devotion to Allah *Subhanahu Wa Taala* (SWT), Muslims are encouraged to strive for material achievement, ensuring that business operations produce top-notch outcomes that are of seminal importance and that impact all involved parties, particularly the consumers.

Consequently, Islam promotes ventures that are in line with Shariah principles, while serving, at the same time, as a strong foundation for the Muslim world's economy. It is crucial to be mindful of the accountability of all deeds in the hereafter. Hence, it is vital for all business activities to adhere to principles (Ghoul, 2011; Gümüşay, 2015; Ullah et al., 2013). Several researchers have addressed the topic of entrepreneurship in the Islamic framework, such as Ahmad et al. (2017) and Machmud and Hidayat (2020), who focused on the characteristics of Muslim entrepreneurs in the success of their SMEs. The results showed that the variables of the characteristics of Islamic entrepreneurship together significantly influenced the success of SMEs. Salaheldeen et al. (2021) discussed halal entrepreneurship and its role in achieving SD. Rekarti et al. (2019) focused on the sustainability of Muslim entrepreneurs. These results indicate that the dry food sector is more sustainable than the wet food sector, as dry food sales are always in demand and do not require significant initial capital. The research question posed in this discussion is: *To What Extent Do the Islamic Values of Entrepreneurship Realize SD?*

Accordingly, this chapter aims to understand the relationship between Islamic principles and SD in the context of entrepreneurial activity. It also seeks to explore how Islamic principles affect and promote the objectives of SD. To answer the research question under scrutiny, we adopted a qualitative approach using interview guides with several Algerian entrepreneurs.

2 Entrepreneurship and Islam: Literature Review

2.1 Entrepreneurship

The phenomenon of entrepreneurship is in vogue. All the countries of the world have become aware of its importance in reducing unemployment, accelerating production rates, and creating economic and social value (Arabeche et al., 2022). According to Razak (2018), entrepreneurship is the process of launching a new project and managing it with the intention of exploiting a unique, creative chance to grow quickly and profitably. The act of founding and managing a new company, or entrepreneurship, is a major driver of economic growth. The process of starting a company with the goal of making the most profit possible by producing items and selling them on the market is known as entrepreneurship. One who starts one's own company is referred to as an entrepreneur. Additionally, an entrepreneur is someone

who possesses the ability and mindset to launch a business, manufacture products or render services, and make money from them.

2.2 Islamic Entrepreneurship

Several studies in recent years' entrepreneurial literature describe how entrepreneurs help people achieve both economic and noneconomic benefits (Chen et al., 2018a, b; Hojnik et al., 2018). Islam's view of entrepreneurship is controversial (Tok & Kaminski, 2018). According to the Islamic perspective, entrepreneurship is built upon three interconnected pillars: the entrepreneurial, the spiritual and religious, as well as the moral and the social (Ramadani et al., 2015).

"A pre-designed method for engaging in business operations and generating profits by ensuring the adherence to Islamic beliefs, is presented in the Qur'an and the Sharia laws to please Allah" (Yaseen et al., 2022). According to Ibrahim and Kahf (2020) and Ashraf (2021), Islam can be seen as an entrepreneurial religion, as most of its early imams were traders, providing for their families and the community. When describing opportunity identification, opportunity exploitation, employee involvement, customer orientation, risk-taking, financing, decision-making, resource management, innovativeness, and social responsibility, it is essential to incorporate Islamic religious values.

Islam encompasses aspects of life, including the realm of entrepreneurship, which retains great significance. The concept of "Islamic entrepreneurship" describes the process of running a business in conformity with values and principles. Islam encompasses all aspects of life in today's world. It fundamentally distinguishes itself from ethical entrepreneurship as it incorporates distinct practices, draws upon religious principles, and pursues a distinct metaphysical objective (Gümüşay, 2015). Entrepreneurship in the Islamic context influences not only individuals but also organizations and various institutions, such as states and markets, yielding a range of impacts at both micro and macro levels of analysis (Gümüşay, 2015; Tok & Kaminski, 2018). Consequently, it becomes imperative to integrate the intricacies of halal entrepreneurship into comprehensive models to enhance explanatory depth while upholding the importance of simplicity.

Islam, in line with Islamic goals and intellectual precepts, justifies engaging in commercial endeavors, claims Bhuiyan et al. (2011). Islamic entrepreneurship develops when businesspeople do their part in society while inspired by Islamic ideology to build a peaceful and successful society. To ensure justice and welfare, an Islamic entrepreneur initiates, plans, guides, and controls his firm in accordance with Islamic law. His primary concern is serving society as instructed by divine directions, rather than making money. His business conduct is guided by the philosophical underpinnings, which also include his faith, fear of, and dependence on his God, as well as his sense of responsibility, justice, altruism, and reliability. In essence, understanding the Islamic financial and management models provides instructions for adhering to Islamic entrepreneurship (Jaziri & Boussaïfa, 2012).

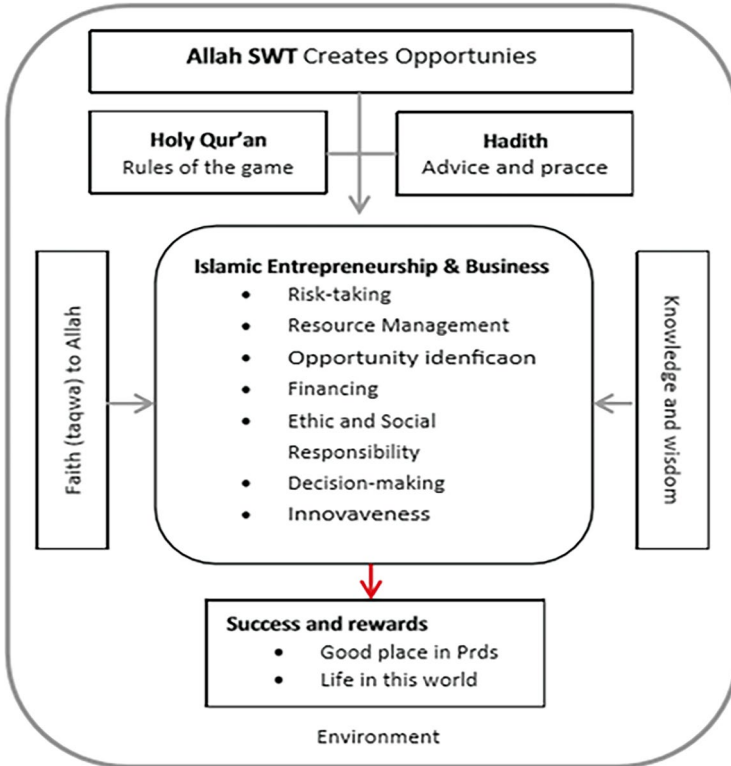


Fig. 1 A model of business and Islamic entrepreneurship. *Source:* Ramadani et al. (2015). b1.2 Taqwaa (Belief), Halal (Righteous), Haram (Immoral)

According to the Prophet Muhammad (SAW), nine times out of ten, sources of income originate from commerce. Nonetheless, Islam highly prioritizes the value of conducting business with honesty, integrity, justice, and diligence. Thus, in the Islamic community, businesspeople and entrepreneurs are well esteemed and admired because they are believed to be the ones who help others the most (Figs. 1 and 2).

According to Hamid (2018), Islam demands that believers carry out their commercial endeavors in a way that pleases and earns the *ridha* (approval) of Allah (SWT). According to Islam, businesspeople and entrepreneurs must have *taqwa* (piety) towards Allah (SWT). This implies that to succeed, they must have faith in Allah (SWT) and His Messenger, Muhammad *Salla Allahu Alayhi Wa Sallam* (SAW). This is supported by the Holy Qur’an, (61:10): “O you who have believed, shall I guide you to a transaction that will save you from a painful punishment? [It



Fig. 2 Outlines the UN’s SDGs in more detail. Source: United Nations SDGs

is that] you believe in Allah and His Messenger and strive in the cause of Allah with your wealth and your lives That is best for you if you should know.”

Mohieldin (2017) asserts that the Muslim businesspeople should exhibit the following qualities:

- Referring to the Holy Qur’an regularly
- Paying Zakat (donation) and performing prayers five times a day
- Donating to those in poverty and need
- Performing night and morning prayers
- Performing prayers of thankfulness

The ideas of halal (permissible), haram (prohibited), and mushtabeh (doubted) are closely related to *taqwa*. They are well explained by Al Serhan (2011) as follows:

1. The Core Halal is defined as a duty, i.e., obligations or compulsory deeds. If Muslim business owners do not put them into practice, they commit a sin and are not considered to be Shari’ah-compliant.
2. If business owners choose to neglect *mandoob*, it is not viewed as a sin. *mandoob* are preferred but not required acts. They are regarded as an additional Halal deed. If it is practicable, it is recommended to carry them out. Being helpful and going above and beyond are two instances of *mandoob*.
3. *Makrooh* are undesirable behaviors that Islam prohibits. They are frequently considered a final resort. Entrepreneurs should stay away from them if at all possible.

Islam as a religion forbids and condemns some behaviors as *haram*, either explicitly or implicitly. These behaviors are viewed as sinful. Escorting prostitutes, consuming prohibited substances such as alcohol, gambling, speculating, usury, and other practices are a few examples.

Entrepreneurs should avoid *mushtabeh* (doubtful acts) as much as possible because they might be *haram* or result in *haram* acts. These acts might be seen by stakeholders as dishonest.

2.3 Knowledge, Wisdom, and Entrepreneurs

Successful entrepreneurs must possess knowledge and abilities. Entrepreneurs must become aware of the numerous changes taking place in their various industries while also imparting their (new or old) knowledge and abilities to others. According to Hoque et al. (2014, p. 134), “an indolent and idle brain has no place in Islam.”

2.4 Opportunity Identification

Islam holds that Allah (SWT) creates possibilities for everything, counting business prospects. In the verse “you have been blessed with light and a good book from Allah” (5:15) in the Holy Qur’an, Allah (SWT) confirms and provides further evidence for these good possibilities that are available everywhere, but an entrepreneur needs to be able to recognize, assess, and utilize them. The ability to recognize, assess, and take advantage of good chances is a skill that every entrepreneur should possess. Concerning this matter, the Holy Qur’an (8:22) announces that “Indeed, the most despicable of creatures to Allah are those who are deaf and dumb and do not reason,” or that “There is no attainment for humanity except what they strive for.”

2.5 Innovativeness and Risk-Taking

As mentioned earlier, creativity and willingness to take risks are the hallmarks of entrepreneurship and business. As Allah states in the Holy Qur’an (13:11), “People’s situations cannot be changed until they make internal changes.” Everyone should work toward improvements that will make their lives easier and better. Islam encourages innovation in businesses that are run in conformity with Sharia’s Law.

2.6 Usage of Resources

Islam encourages businesspeople to make ethical use of their resources. Allah (SWT) declares in the Holy Qur’an: “Oh children of Adam! Eat and drink, but do not waste excessively, for Allah detests wasters” (Surah 7:31). And Muhammad (SAW) corrected one of his friends whom he saw wasting water during ablution, saying, “O Sa’d, how wasteful you are! Don’t waste water even if you are on the banks of a flowing river.”

2.7 *Financing*

Islam supports business and entrepreneurship but forbids interest-bearing debt (usury).

The Holy Qur'an states in 2:275–279 that “Those who consume interest will stand ‘on Judgment Day’ like those driven to madness by Satan’s touch. That is because they say, ‘Trade is no different than interest.’ But Allah has permitted trading and forbidden interest. Whoever refrains—after having received warning from their Lord—may keep their previous gains, and their case is left to Allah. As for those who persist, it is they who will be the residents of the Fire. They will be there forever. Allah has made interest fruitless and charity fruitful. And Allah does not like any ungrateful evildoer. Indeed, those who believe, do good, establish prayer, and pay alms-tax will receive their reward from their Lord, and there will be no fear for them, nor will they grieve. O believers! Fear Allah, and give up outstanding interest if you are ‘true’ believers. If you do not, then beware of a war with Allah and His Messenger! But if you repent, you may retain your principal—neither inflicting nor suffering harm.”

2.8 *Ethics and Social Responsibility*

Islamic entrepreneurship extends beyond profit motives, encapsulating a sense of corporate social responsibility deeply rooted in Islamic values. Given the close connection between integrity, moral conduct, and business operations, it is imperative that entrepreneurs and business owners understand the concept of social responsibility in the context of Islamic entrepreneurship. Islamic entrepreneurship is distinct due to *zakat* and endowment systems, which play a crucial role in elevating the social responsibility aspect of ensuring fair wealth distribution and improving societal well-being.

Eight guiding concepts make up Islamic ethics. Morality is determined by Allah through divine texts.

1. Innate Goodness (*Fitrah*): Humans are inherently good, not inherently wicked.
2. Acquired Wickedness: Negative traits result from external influences and choices.
3. Equality and Fairness: All individuals are equal, and ethics demand justice for all.
4. Divine Texts as Guidance: Islamic ethics rely on the Quran and Hadith for moral guidance.
5. Balancing Liberty and Accountability: Freedom should coexist with accountability and justice.

6. Rejecting Egoism: Islam rejects selfishness and emphasizes the interconnectedness of humanity.
7. Rejecting Utilitarianism: Morality is not based solely on maximizing pleasure but on divine guidance.
8. These concepts guide Muslims in their moral and social responsibilities, aiming to promote human welfare and prevent harm.

2.9 Decision-Making

Islamic decision-making is governed by the teachings of the Quran, emphasizing both the value of making well-informed judgments as well as reliance on Allah (*Tawakkul*). To make wise decisions and take appropriate action, the Quran recommends consulting experts and relying on solid evidence.

2.10 Success and Rewards

Entrepreneurs have faith in the success of their ventures because they have trust in their skills. This view is consistent with the promise made by Allah (SWT) in the Holy Qur'an (2:257), where Allah promises to lead the pious from darkness to light.

Success and spiritual objectives: For businesspeople, success is not simply making money but also reaching religious objectives that could result in benefits in the hereafter. According to the Holy Qur'an (2:200–202), Islamic business highly valorizes the pursuit of happiness in this life and the afterlife.

2.11 Environment

Entrepreneurship has historically been criticized as a bad career choice. Muslims, Christians, and Jews dominated trade in areas like Kerala, South India, while Hindus worked in other fields. Minority groups were able to flourish since the majority lacked entrepreneurial spirit. Due to religious restrictions, Lao men refrained from starting their own businesses in Laos, opening doors for foreign businesspeople, and socially excluding Lao women. These incidents show how cultural variables might limit individuals' ability to take advantage of business chances.

3 Islamic Entrepreneurship for Sustainable Development

3.1 *Sustainable Development*

In the present-day debate, the concept of SD is gaining popularity. Literally, sustainability is the ability to maintain something continuously, whether it is an entity, a process, or a result (Basiago, 1999). According to Stoddart et al. (2011), SD is the equitable and efficient use of resources between and among future generations while allowing socioeconomic activity to keep operating within the ecosystem's boundaries. For Mohieldin (2017), SD is a concept of development that uses resources in a sustainable way for other generations. SD seeks to achieve social progress, environmental balance, and economic growth (Gossling-Goidsmitths, 2018; Zhai & Chang, 2019). Insofar as it can apply to many industries and be seen from various angles, sustainability has several facets. As a result, there is no conclusive definition of sustainability. However, durability and resource efficiency are what give it its identity. As a result, many industries have incorporated the sustainability concept into their business activities, including manufacturing, agricultural, marketing, and construction (Ogunmakinde et al., 2021).

3.2 *Pillars of Sustainable Development*

It looks like the conversation on development science will continue to be influenced by the idea of sustainability. According to Porter and Van Der Linde (1995), this suggests that the best decisions are probably going to continue to be those that satisfy societal demands, while also being socially and ecologically acceptable, economically and socially fair, and environmentally as well as socially feasible. As seen in Fig. 3, this results in three interrelated spheres or domains of sustainability that characterize the connections between the environmental, economic, and social components of SD.

A. *Economic Sustainability*

Markets are places where trades take place inside economies. Dernbach (1993) asserts that there are guiding frameworks for assessing transactions and making judgments on economic activity. Production, distribution, and consumption are the three primary economic activities. However, the accounting framework used to direct and assess the economy with respect to these activities seriously distorts values, which has negative effects on both society and the environment (Cao, 2017). The limited natural resources on earth are used to support and sustain human life, as Allen and Clouth (2012) stated.

B. *Social Sustainability*

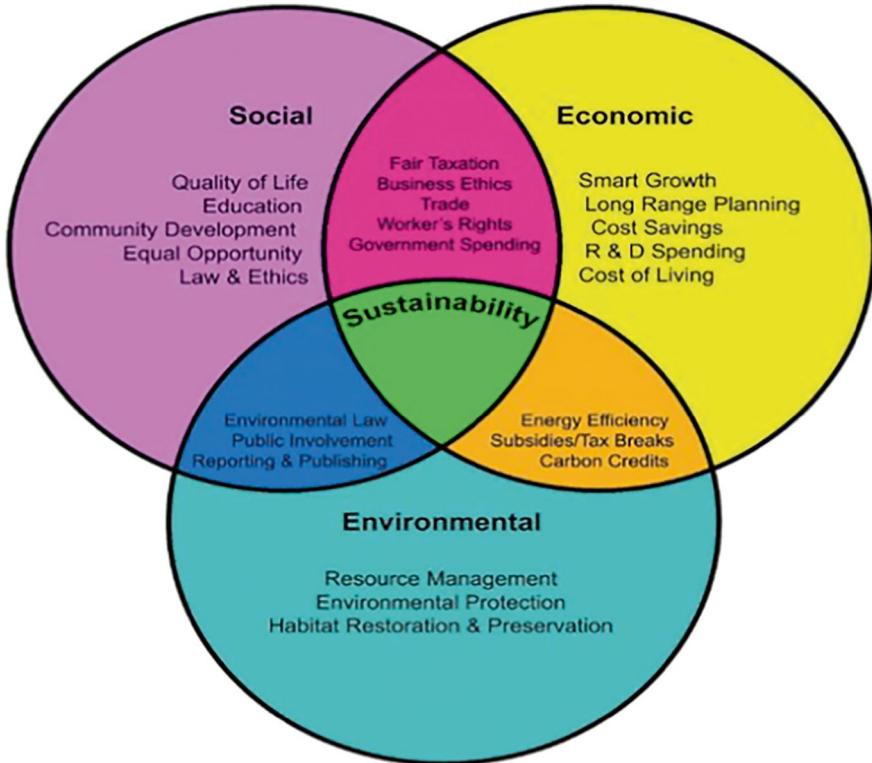


Fig. 3 Pillars of sustainable development

Social sustainability encompasses the notions of equity, empowerment, accessibility, participation, cultural identity, and institutional stability (Daly, 1992). This concept implies that people matter since development is about people (Benaim & Raftis, 2008). Basically, social sustainability connotes a system of social organization that alleviates poverty. However, in a more fundamental sense, “social sustainability” relates to the connections between social conditions such as poverty and environmental destruction (Farazmand, 2016).

C. *Environmental Sustainability*

The natural environment’s ability to continue to be resilient and productive enough to support human life is central to the idea of environmental sustainability. Ecosystem integrity and the natural environment’s carrying capacity are related to environmental sustainability (Brodhag & Taliere, 2006). It necessitates the sustainable utilization of natural capital as a waste sink and a source of economic inputs (Goodland & Daly, 1996). It follows that garbage cannot be released into the atmosphere more quickly than it can be absorbed by the environment, and natural resources cannot be extracted more quickly than they can be renewed (Diesendorf,

2000). This is so that equilibrium can be preserved within the limits or boundaries of the earth system.

3.3 Islamic Entrepreneurship and Sustainable Development

In today's world, where business is predominantly driven by individual and collective efforts, the issue of ethics in commerce has risen as a global concern. The rise of fraud is a growing challenge. Within Islam, there is an emphasis on engaging in ventures. However, Islam highlights the importance of conducting business ethically. It stresses the importance of consumer rights by encouraging business owners to supply customers with quantities of goods at the weight. The Qur'an contains verses that advocate for these principles:

“Give the appropriate weight and quantity, do not withhold from the people the things that are due, and do not injure the ground once it has been arranged.” (Qur'an, 7:85)

“Always consider all aspects thoroughly and maintain an balanced perspective; this approach is the most suitable and least harmful, in the run.” (Qur'an, 17:35)

“Give everything you have and cause no failure (to others through deceit).” (Qur'an, 26:181)

Sustainable development involves all life on Earth, including humans and non-human species. The goal is to do as little harm as possible and guarantee that everyone may live in a world with healthy soil, clean water, air, and abundant renewable resources. It is difficult to assess the full worth of sustainable development using conventional financial calculations. Costs for the future are unpredictable, and we cannot always foresee what expenses we will incur. Furthermore, the advantages of sustainable development are more qualitative than quantitative, such as protecting species. For instance, the value of a living species cannot be measured. But even in the absence of money, it is obvious that maintaining and extending life on Earth is more advantageous than it is expensive. Islamic ethics do support this contention (Hassan, 2020). The concept of entrepreneurship is controversial when viewed from an Islamic lens (Tok & Kaminski, 2018). According to the Islamic perspective, entrepreneurship is based on three interconnected pillars: the entrepreneurial, the religious and/or socioeconomic, and the ethical (Ramadani et al., 2015). It is inescapably different from ethical entrepreneurship since it involves specific procedures, scriptural references, and a metaphysical goal (Gümüşay, 2015). Similarly, from an Islamic standpoint, entrepreneurship shapes individuals, organizations, and a range of institutions, including states and markets, impacting both the micro and macro levels of analysis in complex ways (Gümüşay, 2015; Tok & Kaminski, 2018). Consequently, to produce explanatory richness without undervaluing parsimony, the complexity of Halal entrepreneurship must be integrated into holistic models.

4 Research Framework and Hypothesis

Due to the pressing need for solutions to the world's social and ecological issues, sustainable development is now firmly placed on the political agenda (George et al., 2016; Salaheldeen, 2015). The Agenda for the SD of 2030, which was endorsed by all UN members in 2015, provides a comprehensive plan for the present and future peace and prosperity of people and the Earth. There are 17 Sustainable Development Goals (SDGs) in total, which developed and poor countries must work together to attain. According to Hossain et al. (2017), entrepreneurship may be a transformative force that advances sustainable economic growth while assisting in the achievement of the SDGs. According to Peng and Walid (2022), businesses are more likely to come across opportunities for long-term growth. The importance of social companies in achieving the SDGs has been noted by Wei and Duan (2023). Due to their dedication to achieving social objectives, social entrepreneurs may abuse scarce resources (Peng & Walid, 2022). Sustainable development necessitates an innovation strategy built on the pooling of societal resources, necessitating the participation of numerous stakeholders, including the government, employees, and commercial partners.

1. According to Muñoz-Pascual et al. (2021), the importance of entrepreneurship for sustainable development was emphasized in 2019. This is consistent with the policy priorities of the European Union and the generally acknowledged contribution of innovation to the advancement of sustainability. Entrepreneurs who revolutionize sectors, like Jeff Bezos, co-founder of Amazon, serve as examples of this impact. As for ethical issues in the Islamic economy, it is important to comprehend the moral principles guiding the Halal economy. Due to their alignment with various Shariah intents (*maqasid*) and international criteria, SDGs offer a useful framework for determining objectives in the Islamic economy sectors.
2. Figure 4 shows how SDGs relate to the Halal and Islamic economic sectors. It also shows the mapping of SDGs to the Islamic Economy. In the context of Islamic teachings, entrepreneurship has social implications that go beyond its strictly economic aspects.

The Global Islamic Economic Indicator now places Malaysia in first place, positioning the country as a major center for Halal food worldwide. It keeps expanding its Islamic business ecosystem and economy. A national certification program called Social Enterprise Accreditation (SEA) has also been introduced in Malaysia with the goal of recognizing social companies and giving them a way to express their commitment to social and environmental issues. The Malaysian SDG report's evaluation notes that the government continues to encourage businesses in their efforts to meet the SDGs by 2030. As a result, the Halal Entrepreneurship Success Scale can serve as a crucial benchmark for Halal business owners and policymakers as well as a sign of how successfully the Islamic values that support the SDGs are being implemented. Based on the findings of the examination of Qur'anic verses

MAPPING OF SDG AND OTHER GOALS FOR ISLAMIC ECONOMY CATEGORIES	
Halal Products (halal food, pharmaceuticals and cosmetics ingredients)	8 priority SDG Goals: #2 No Hunger, #3 Good Health, #5 Gender Equality, #8 Good Jobs & Economic Growth, #12 Responsible Consumption, #13 Climate Action, #14 Life Below Water, #15 Life on Land,
Islamic Finance	11 priority SDG Goals: #1 No Poverty (Microfinance), #2 No Hunger, #3 Good Health, #4 Quality Education, #5 Gender Equality, #7 Clean Energy, #8 Good Jobs & Economic Growth, #9 Innovation & Infrastructure, #10 Reduced Inequality, #12 Responsible Consumption, #13 Climate Action
Halal Lifestyle (travel, modest fashion, media/recreation)	7 SDG Goals: #5 Gender Equality, #8 Good Jobs & Economic Growth, #9 Innovation & Infrastructure, #10 Reduce Inequalities, #11 Sustainable Cities, #12 Responsible Consumption, #13 Climate Action

Fig. 4 Islamic economic categories are matched with SDGs and other goals. The 2018/19 State of the World’s Islamic Economy Report

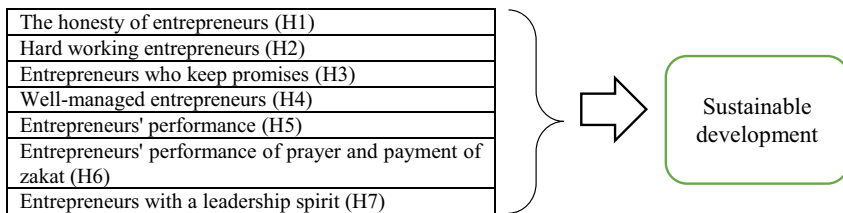


Fig. 5 Impact effect of Islamic entrepreneurship’s traits on the long-term growth of Algerian SMEs

and Hadith of the Prophet Muhammad, the following tools to assess this Islamic entrepreneurship were created. Regarding abstracted Islamic entrepreneurship (Beekun, 1997), Fig. 5 shows the conceptual foundation for the present study.

4.1 Hypothesis

3. The honesty of entrepreneurs greatly affects sustainable development.
4. Enterprises that work hard have a significant influence on sustainable development.
5. Entrepreneurs who keep promises have a significant influence on SD.
6. Well-managed entrepreneurs have a significant influence on SD.

7. Entrepreneurs' performance of prayer and payment of zakat greatly influences sustainable development.
8. Entrepreneurs with a leadership spirit greatly influence sustainable development.

4.2 Method

In this section of the chapter, a case study methodology was used with a qualitative method, and the Algerian entrepreneurs were chosen because they are totally Muslim. They work in the clothing, food, and service industries. The individuals have maintained their companies for longer than 10 years of existence. The qualitative method was chosen for this research because of the need to explain the nature of theoretical development (Agbim & Eluka, 2018; Bugu & Yucheng, 2018; Maldonado-Guzman et al., 2018; Udanoh & Zouria, 2018). Interviews with Muslim Algerian business entrepreneurs who were already engaged in sustainable operations were used to gather data (have normed 14,000). Only 11 of the 20 entrepreneurs who received the interview guide answered the questions. The interview approach was selected based on the individual's ability to offer important data on the research topic. Every interview was audio recorded and then transformed into text using transcription tools. In the end, secondary data from additional written sources were examined, in addition to all the acquired data. Interviews with Muslim business owners in Algeria who were already operating sustainably were used to acquire data. Lastly, secondary data from other written resources were analyzed along with all of the data that was obtained.

4.3 Findings and Discussion

H1. The Honesty of Entrepreneurs Greatly Affects Sustainable Development

Honesty and integrity are highly regarded in commercial interactions, as stated in a passage from the Quran. Lying, cheating, and deception are categorically forbidden in all spheres of life, including business, according to the Quran. Islam instills in businesses the value of being true and truthful with their employees and clients, which benefits society as a whole and the less fortunate (Ashraf, 2021). Based on the interviews, entrepreneurs agree that honesty is very important in their daily dealings with customers and employees, even if honesty sometimes gets in the way. This is due to Islamic teachings, as they are the first reference when it comes to commerce, business, and sustainability. This hypothesis is confirmed.

H2. Enterprises That Work Hard Have a Significant Influence on Sustainable Development

As a religion, Islam focuses on and advises performing labor as worship because it is a religious activity (Gafrej & Boujelbéne, 2022). Entrepreneurs who put in the necessary effort will succeed in business, make money, and please Allah. Running a business should be done with full dedication, without becoming angry, discouraged, or hopeless (Mohd-Nizho & Mohd-Shukri, 2005). Additionally, business owners should always speak to customers in terms that are enticing, pleasant, respectful, and polite and consider the needs of all parties. Entrepreneurs must maintain a flexible mindset and work to satisfy “user desire.” Customers’ needs come first for them. According to the entrepreneurs we interviewed, constant hard work is the basis of our work. We must always work hard to satisfy customers and stakeholders; otherwise, we will not be able to survive in the market because competition is intense. We are always eager to survive and achieve financial and societal well-being. This hypothesis is confirmed.

H3. Entrepreneurs Who Keep Promises Have a Significant Influence on SD

Promise, as defined by Muslim scholars, is a declaration made to another person regarding an act of kindness they intend to perform in the future. According to most entrepreneurs, the promise is not always present in their activities in order to achieve sustainable performance. They believe that today’s environment is characterized by turbulence and uncertainty, and the promise can be a two-sided currency. This hypothesis is not confirmed.

H4. Well-Managed Entrepreneurs Have a Significant Influence on SD

According to the business owners we interviewed, “Islamic financial management is governed by ethical and sustainable development principles.” Transparency and honesty are key components of proper accounting of revenue and expenses. Ensuring fair trade and preventing unfair enrichment requires detailed transaction recording. Accounts payable management places a strong emphasis on meeting deadlines since missed payments can damage client relationships. Islam places a strong emphasis on accountability and fairness in financial reporting, which reflects the idea of *Amanah* (trust). As excessive resource exploitation is avoided in favor of responsible and balanced economic growth that respects the environment and benefits society as a whole, sustainable development is promoted. This hypothesis is confirmed.

H5. Entrepreneurs’ Performance of Prayer and Payment of Zakat Greatly Influence Sustainable Development

In Islam, including prayer in daily routines is a practice to keep a close relationship with Allah and ask for His blessings. Prayers at the start and end of events show a spirit of humility and reliance on God. Timely prayer is a sign of self-control and devotion to one’s religion.

In addition, consistent *Dhikr* (remembrance of Allah) supports a meditative and spiritually grounded outlook on life and work. Combining this with SD in Islam means that people and communities should work toward moral and upright

economic practices that conform to the precepts of Islam, taking into account social equity, the preservation of the environment, and future generations. This strategy promotes a holistic and sustainable way of life in line with Islamic beliefs, ensuring that economic success is not attained at the expense of the environment or the rights of others. The term covers a wide range of prayers in Islam but is also used specifically for the five daily prayers that are obligatory for the faithful. The surveyed entrepreneurs attach a great deal of importance to prayer, as it is the guiding principle that shapes their lives and achievements, but according to them and to tell the truth, they don't always pray on time. This hypothesis is confirmed. The ability of the government to handle financial resources, development possibilities, and income tax rates is frequently linked to the Ummah's true economic development, for the purpose of managing financial resources, developmental opportunities, and operational costs of their local Muslim communities (Abdullah, 2021). For instance, when a nation can produce its own financial resources through the collection of taxes, it can achieve economic progress. Through zakat and tax collections, financial resources are made available. Zakat is a word that has Arabic origins. Al-Zakat is an Arabic term that translates to "holy," "blessing," "flowering," "fertilization," "growth," and "charity." According to the entrepreneurs we interviewed, most of them pay Zakat according to Islamic Sharia to assist the poor and vulnerable individuals in society on the one hand and to increase their wealth on the other hand.

H6. Entrepreneurs with a Leadership Spirit Greatly Influence Sustainable Development

According to the interviewed entrepreneurs, most of them unanimously agree that they do not involve employees in making important decisions within the organization and do not place complete trust in them. As a result, most of them say they cannot delegate their tasks to other employees, and they are the ones who make the final decision. This hypothesis is not supported.

5 Discussion and Conclusion

In the absence of an empirical study on a large sample, the results cannot be generalized. This study gives us a general descriptive idea of the contribution of the characteristics of Muslim entrepreneurs to the achievement of sustainable development. The study's findings demonstrate that Islamic entrepreneurship's core values—honesty, readiness to work hard, honoring promises, good management, perpetual prayer, and zakat—have a major impact on the sustainability of enterprises. As in any other nation, honesty among businesspeople can have a big impact on sustainable growth in Algeria. Entrepreneurs are crucial in improving the economic, social, and environmental facets of sustainability, which include all three. Here are some ways in which integrity can affect Algeria's sustainable development:

9. **Building Trust:** Honesty is fundamental in establishing trust between entrepreneurs, investors, customers, and other stakeholders. When entrepreneurs work

with transparency and integrity, they are more likely to attract investment and build strong, long-term relationships with customers and partners. This trust is essential for economic sustainability.

10. **Ethical Business Practices:** Honest business owners follow ethical business principles to avoid corruption and fraud, which can threaten long-term growth and economic stability.
11. **Environmental Responsibility:** They use eco-friendly procedures, like waste minimization and clean technologies, that help maintain the environment.
12. **Social Responsibility:** Honest businesspeople serve the community by engaging in fair labor practices, employee development, and community involvement.
13. **Honesty promotes higher-quality goods and services,** which in turn encourages client loyalty and long-term success through innovation and ongoing development.
14. **Legal Compliance:** Maintaining integrity assures compliance with national and international regulations, lowering the possibility of legal problems that could damage reputation and resources.
15. **Attracting Foreign Investment:** Honest business owners are more likely to attract foreign investors who respect openness and moral behavior, thus advancing Algerian economic growth.

Entrepreneurs' desire to put in a lot of effort is crucial for promoting sustainable development in any nation, including Algeria. Entrepreneurs who put in the necessary work and are committed to doing so contribute to many aspects of sustainability. First, their efforts may result in the development of new enterprises and sectors, which in turn may create jobs and promote economic expansion. As these companies expand and prosper, they frequently invest back into their communities, helping to lower poverty rates, raising living standards, and promoting social sustainability.

Second, innovative and productive improvements frequently result from hard-working entrepreneurs. Their commitment to enhancing procedures, goods, and services may result in better resource management and a lessened environmental effect, which will support environmental sustainability. Additionally, their unwavering pursuit of perfection can boost their companies' competitiveness, customer satisfaction, and product quality, assuring their long-term sustainability. In this sense, entrepreneurs' desire to put in a lot of effort is crucial for their own success as well as for Algeria's overall sustainable growth, which takes into account economic, social, and environmental factors.

The business ecosystem is strengthened when entrepreneurs reliably uphold their obligations to stakeholders, partners, and customers. As it stimulates additional investments, long-term commercial connections, and economic stability, this trust is a key component of economic sustainability. Additionally, businesspeople who keep their word are more likely to prioritize ethical business conduct, which reduces corruption and unethical behavior and furthers Algeria's economic and social sustainability. By honoring their obligations, Algerian businesspeople not only

promote economic prosperity but also lay the groundwork for a long-term scenario in which the advancement of the nation depends on honesty and integrity.

Entrepreneurs who exhibit a commitment to social responsibility, uphold a high standard of ethics, and practice effective management have a substantial impact on sustainable development in their communities and nations. Entrepreneurs can guarantee effective resource usage, reduce waste, and support economic stability through efficient administration and ethical company practices. This promotes a setting that is favorable for sustained economic growth and prosperity, a key component of SD. Additionally, by upholding moral standards and actively participating in CSR projects like charitable donations and community support, these businesspeople strengthen the social fabric of their communities and encourage social sustainability. Their example-setting in these areas encourages others to act responsibly and fosters a corporate culture that supports the overarching objectives. In fact, a strong entrepreneurial focus is essential if SMEs are to achieve good performance thanks to a positive organizational culture (Zina et al., 2023). Furthermore, business owners who exhibit a leadership mindset make a substantial contribution to sustainable growth. Their capacity to inspire and motivate their teams, along with their visionary thinking, can foster innovation and greatness inside their companies. This innovation may pave the way for the creation of fresh goods and services that deal with environmental problems, improving environmental sustainability. Additionally, these businesspeople frequently take on the roles of role models in their fields and communities, setting the bar high for moral conduct, civic duty, and dedication to environmentally friendly techniques. As a result, their entrepreneurial spirit not only fosters corporate success but also has a positive knock-on effect on the broader SD objectives of their countries and regions. Here are five suggestions for utilizing Islamic entrepreneurship to advance national SD:

Encourage Islamic business owners in Algeria to embrace and promote moral business practices that are based on Islamic teachings. This involves all commercial relationships being transparent, honest, and fair. Establishing and upholding an ethical framework can promote confidence among stakeholders and improve the standing of Algerian companies, luring new collaborators, investors, and clients. Encourage Islamic businesspeople to give priority to their communities by emphasizing social responsibility, emphasizing, as part of their corporate ethos, ideas like *zakat* and *sadaqah* (voluntary almsgiving). This could be giving to neighborhood charities, sponsoring educational programs, and funding projects to fight poverty—all of which help social sustainability.

Environmental Stewardship: Encourage environmentally friendly and ethical economic activities that are consistent with Islamic principles. To reduce their environmental impact, entrepreneurs might concentrate on resource conservation, waste minimization, and implementing clean technologies. This strategy is consistent with the environmental stewardship and respect values contained in Islamic teachings. Encourage Islamic business owners to spend money on R&D to promote innovation and raise the standard of their goods and services. Offerings of the highest caliber that satisfy client needs can result in long-term success, devoted patronage, and a competitive edge, fostering economic sustainability. Support programs that enable access to education and training in entrepreneurship and company management for

Islamic entrepreneurs. Increasing their knowledge and abilities will enable them to manage profitable and long-lasting businesses. Algerian businesspeople can make a significant contribution to the nation's SD, promoting economic growth, social well-being, and environmental preservation, by adopting Islamic entrepreneurship that is based on moral principles and a commitment to social and environmental responsibility.

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Digital Democracy: The Impact of Digital Election Technology on the Formation of Representative Institutions in the GCC Countries



Masab Mhalla

Abstract Digitization is a pivotal advancement in contemporary society, permeating various facets of life, particularly in tandem with the progress of artificial intelligence applications. Notably, its influence extends into the domain of electoral processes. This research explores the relationship between digital election technology adoption and the effectiveness, transparency, and legitimacy of representative institutions in the GCC states. It analyzes the technology's impact on institutional formation, performance, and perception, as well as political participation, identifying the technology's challenges and opportunities.

Employing a comparative analysis methodology, the study capitalizes on successful experiences and applications. The findings underscore that the digitization of electoral infrastructure is a multifaceted process necessitating sustained, multi-level evaluation and scrutiny. Substantive challenges arise, notably in the domains of transparency and voter trust, encompassing issues such as data confidentiality, cybersecurity, and adherence to democratic principles. Remarkably, the objectives of digital transformation diverge between well-established democracies and those concurrently undergoing digital and democratic transitions. The study advocates for intensified collaboration and knowledge exchange to cultivate sophisticated digital electoral systems within the Gulf Cooperation Council (GCC). Furthermore, the imperative analysis of digital election data emerges as integral for comprehending voter behavior and levels of participation, thereby furnishing a lucid comprehension of prospective electoral trajectories.

Keywords Digital elections · Representative institutions · Political participation · Digital democracy · e-voting

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1 Introduction

The state is a legal entity that arises from an individual's need for collective representation. It allows institutions to execute collective will, focusing on the public interest. This principle manifests imperfectly but inspires collective actions to achieve it through institutions. In democracies, institutions are legitimized through constitutionally governed election laws, taking multiple forms. Traditional electoral mechanisms have become outdated in the digital era. Advanced technology integrates electoral processes, provides accurate legitimacy, and enhances representative democracies. Digital election technology use varies in Gulf Cooperation Council GCC countries, but its role in elections is growing. The work of Helbing et al. (2023), titled *Democracy by design: Perspectives for digitally assisted, participatory upgrades of society* suggests that the use of digital technologies improves our societies by enabling participatory governance (Helbing et al., 2023). These technologies can empower individuals and communities to have a direct say in the decisions that affect them, leading to more adaptable, responsive, and effective societies.

This study explores the relationship between digital election technology adoption and the effectiveness, transparency, and legitimacy of representative institutions in the GCC states. It analyzes the technology's impact on institutional formation, performance, and perception, as well as political participation, identifying the technology's challenges and opportunities.

The objectives of this study are: (1) to highlight the best practices of digital election technology and its utilization in the GCC states; (2) analyze the impact of digital election technology usage on the efficiency, transparency, and integrity of the electoral process in Gulf countries; (3) clarify how electoral and political participation is affected by the implementation of digital election technology in Gulf countries; and (4) identify the challenges of implementing digital election technology and its impact on the representativeness of political institutions in GCC states.

The significance of the current research lies in its addressing of the GCC countries' unique political and technological contexts, offering tailored insights that general studies may overlook. The findings can also contribute to the global discourse on digital democracy, offering lessons that can be applied in other regions undergoing similar transitions.

1.1 Methodology

To achieve the outlined objectives, the research methodology involved a comprehensive literature review focusing on digital election technology and its impact on representative institutions. Specifically, the review systematically examined existing body of research on the adoption of digital election technology in GCC countries, examining its influence on electoral processes and political participation. This

investigation concentrated on a specific subset of GCC nations that have either implemented or are in the process of adopting digital election technology. The current study employed comparative case studies to analyze the effects of digital election technology on the operation of representative institutions within these nations. Additionally, the research extended beyond the GCC region to investigate successful applications of digital election technology in other countries, aiming to identify and suggest best practices for effective implementation within the GCC countries.

The accumulation of quantitative research in comparative constitutional fields aimed at enhancing democracies has legal, political, and practical relevance for the application of modern advanced mechanisms. This research, employing a comparative case study approach, will examine the adoption and implementation of digital election technologies across GCC countries. This approach facilitates an in-depth analysis of each country's distinct political and technological landscape, providing nuanced insights often overlooked by general studies. Quantitative data collection from national electoral bodies will enable the analysis of election results and voter turnout rates.

2 Practices of Digital Election Tech in GCC Countries

GCC countries are witnessing significant advancements in the use of digital technology in the election process. Some have turned to electronic voting systems, whereas others have chosen to stick to traditional methods. The political and social dynamics of each country largely determine the direction taken. This legal framework sheds light on the foundations and laws governing the use of digital technologies in elections. Through a detailed analysis, this study reveals the differences facing each country in the region regarding election technology.

2.1 Legal Framework for Elections

Legal structures governing elections consist of an intricate and evolving array of laws that supervise electoral activity. Recognizing the interconnections between international and national legal norms is crucial to guaranteeing elections that uphold fairness, transparency, and freedom. Prominent global treaties, such as the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights, specify the core principles to which all elections should adhere. These include the right to vote and seek elections, equitable voting privileges, freedom of expression and assembly, and the preservation of ballot secrecy. While domestic laws often provide a more detailed breakdown of electoral processes, they touch upon areas such as the enrollment of voters, qualifications for candidacy, election finance, methods of polling, and vote tallying. The recent trend of leveraging digital tools in electoral mechanisms has been unmistakable. However, the

integration of these advancements has introduced legal dilemmas. These revolve around the imperative to guarantee the resilience and trustworthiness of e-voting systems and the commitment to uphold the confidentiality of votes (Maurer, 2020).

The legal framework of digital elections can be categorized into three main components:

- **International Legal Instruments:** The Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights stand out as primary global documents that dictate election norms. Yet, numerous regional and sub-regional accords, such as the Council of Europe's Convention for the Protection of Human Rights and the African Charter on Human and Peoples' Rights, also highlight vital electoral rights and standards, emphasizing voting rights and unhindered participation in public matters (Secretary-General of Human Rights: Commission on Human Rights, 1996).
- **Domestic legal frameworks:** The legal landscape for elections diverges significantly across nations, mirroring their historical, cultural, and political variance. Nevertheless, certain shared elements are discernible in most electoral statutes, including voter enrollment, candidate qualifications, election financing, and vote aggregation.
- **Digital technologies in elections:** Incorporating digital tools into electoral processes has unveiled fresh legal obstacles. This entails ensuring the reliability and security of electronic voting solutions and their adherence to the ballot secrecy principle. Additionally, universal accessibility to digital voting platforms is essential irrespective of an individual's technical acumen or financial standing.

In sum, the legal matrix surrounding elections is intricate but pivotal in maintaining the sanctity of democratic polls. A deep understanding of the global and national legal criteria in this domain is instrumental in championing unbiased, transparent, and free elections.

2.2 Differentiation of the Legal Frameworks for Digital Election Technology

As highlighted, the local legal framework is one of the primary factors determining the effectiveness and integrity of the electoral process in Arab Gulf countries. As pioneers in adopting digital technology, these countries have varied experiences and legal differences in the regulation of this technology. In this context, we delve into explaining the legal disparities associated with the regulation of electoral technology in these countries, attempting to shed light on the key points that distinguish each country individually. This is presented in two separate groups based on the adoption or non-adoption of digital election technology.

2.2.1 Gulf Arab Countries That Adopt Manual Elections

Kuwait boasts of a pioneering democratic experience in the Gulf, having held its first parliamentary elections in 1963, based on the 1962 Constitution drafted a year after independence. This constitution was designed to regulate legislative and oversight democratic practices, emphasizing the principle of free and direct elections to the National Assembly. However, the prevailing election law restricts the voter base, confining voting rights to Kuwaitis over 21. The elections further excluded naturalized citizens of less than 20 years and women not in line with Islamic Sharia provisions. In 2006, Kuwait had embraced electronic voting systems. However, owing to mounting concerns over their reliability, a return to manual vote counting is slated for the 2023 parliamentary elections (State of Kuwait Constitutional Court Homepage, Legislation and laws, [n.d.](#)).

After liberating Kuwait from the Iraqi invasion, the political forces agreed to set aside their differences and create a unifying legal framework that served as a charter under the name “The Future Paper.” This allowed for public assemblies, reduced electoral districts to five, and paved the way for a series of reforms. In 2003, the positions of the Crown Prince and Prime Minister were separated, allowing the National Assembly to question the Prime Minister. In 2005, the National Assembly approved the right for Kuwaiti women to run for office and vote, 6 years after the Emiri decree that granted women this right, following a prolonged debate over women’s rights in Kuwait (Al-Ghazi, [2019](#)).

In contrast, Saudi Arabia and Qatar display a cautious stance toward complete electoral digital transformation despite their progressive strides in digital governance. This hesitancy is largely due to the lack of representative voting procedures for central political bodies. However, significant progress has been made in the digitization of pre-electoral stages, particularly in the handling and storage of citizen-related data.

Saudi Arabia remains apprehensive about elections, applying an electoral system designated for a set of positions it considers executive rather than legislative, including municipal council elections, industrial chambers of commerce elections, university elections, entity elections, cooperative association elections, sports club elections, labor committee elections, and cultural institution elections (Unified National Platform Homepage, [n.d.](#)). The basic system of the Kingdom from 1992 onward avoids the formation of a legislative authority altogether, focusing instead on forming a regulatory authority in its place. This is attributed to the state’s consideration of itself as Islamic with the Quran and Sunnah as its constitution (Bureau of Experts at the Council of Ministers Homepage, [n.d.](#)).

As for Qatar, despite its agreement with Saudi Arabia on the discomfort toward the plan to transition to legislative elections in the first place, it views the digitization process positively. Influenced by the atmosphere of transitioning to digital elections in neighboring Gulf countries that are socially, culturally, and religiously similar to it, and away from Western liberal applications, Qatar dispatched a specialized delegation from the Ministry of Interior to observe the experience of the Omani

authority in applying digital election technology in the 2023 elections (Sultanate of Oman Ministry of Interior Homepage, [n.d.](#)).

2.2.2 Gulf Arab Countries That Adopt Digital Election Technology

In line with this conceptual framework, multiple Gulf States have begun the integration of digital methodologies within their electoral processes. For instance, the adoption of electronic voting in Bahrain came gradually, starting with its use in the referendum on the National Action Charter in 2001 using electronic devices, followed by the adoption of information technology in the registration of candidates and verifying the identity of voters in 2002 (Al-Maawda, 2022). Meanwhile, the United Arab Emirates swiftly embraced this technological advancement. During the 2019 Federal National Council elections, the UAE launched a mobile app that facilitated electronic voting for its citizens (Ministry of State for Federal National Affairs Homepage, [n.d.](#)). This app not only utilized facial recognition for voter authentication but also had features for vote monitoring and compilation. The Sultanate of Oman, having introduced the “Intikhab” application for digital voting in the 2022 municipal elections (Oman News Agency Homepage, [n.d.](#)), shows keenness to expand this digital adoption in the forthcoming Shura Council elections on October 29, 2023, encompassing all electoral phases from voter enlistment to result collation (Fig. 1).

The following is a discussion of the domestic legal frameworks in Gulf Arab countries that adopt digital election technologies:

In the Kingdom of Bahrain, constitutional authority was based on the principle of equality between men and women as a guarantee to preserve a human right constitutionally stipulated in Article One of the 2002 Constitution. This ensures that citizens, whether men or women, have the right to participate in public affairs and enjoy political rights, which include the right to vote and run for general elections (Legislation & Legal Opinion Commission Homepage, [n.d.](#)).

The Election and Referendum Administration was realigned with the legislation and legal opinion commission for enhanced integrity and impartiality, which was previously affiliated with the Central Information Authority. A “Supervisory Committee on the Referendum and Election” was established, spearheaded by a member of the Bahraini judicial system. This oversight extends beyond the judiciary to encompass civil society, ensuring the robustness of the electronic voting system by allowing organizational access for vulnerability checks. The 2014



Fig. 1 Stages of digital election

amendment permitted the electronic marking of voter lists, and by 2018, digital election applications had further improved. The supervisory committee managed the nomination requests, scrutiny, and procedural objections during the nomination phase. Various submission methods for nominations have been sanctioned by the overseeing authorities. Bahraini Law empowers overseas citizens registered on electoral rolls to vote traditionally or electronically in referendums and elections. The integration of tools like punch cards and scanners is consistent with constitutional voting rights, and the adoption of electronic displays enables efficient voter name verification (Al-Maawda, 2022).

United Arab Emirates is a federal state in which the central authority exercises legislative, executive, and judicial powers. The Federal National Council exercises legislative authority and consists of 40 members with seats distributed among the 7 emirates that form the federation. There are eight seats for both Abu Dhabi and Dubai, six seats for both Sharjah and Ras Al Khaimah, and four seats for Ajman, Umm Al Quwain, and Fujairah (UAE The Cabinet Homepage, n.d.).

The 2006 elections represented the first electoral cycle in which Emirati voters participated in selecting half of the members of the Federal National Council. Although the Constitution does not differentiate between men and women in council membership, women's participation would not have evolved without the political empowerment program. It reached 22% in the 2015 election. However, the seats won by the women remained limited, with only one woman winning. A 2019 decision by the country's president, which introduced a quota system for women, increased their representation to nine seats, or 22.5% (Yaghi & Lutfi, 2018).

The UAE uses an electronic voting system that relies on a smart card based on voters' biological data to verify their identity. Voting is done using computers equipped with touchscreens to choose candidates instead of paper ballots. The electronic voting system utilizes special encryption technology during the sorting and counting of votes to ensure the integrity of the process and to protect voters from identity theft. The federal identity card forms the basis of the electronic system and is the only document that allows electoral body members to exercise their voting rights. The federal population register system, which contains a central database of all residents, aids in producing the voters' list of eligible citizens (The Federal National Council Homepage, n.d.).

Oman has experienced a "top-down" democratization that blends traditional Shura (Consultation) practices, rooted in Ibadism, with contemporary democratic principles (Mhalla et al., 2023). In 1991, Oman introduced the 59-member Shura Council to enhance public involvement in governance. Their advisory role is to address economic and social issues. By 1997, the council had grown to 82 members, reflecting population growth. Initially, only select citizens could vote, but by 2003, Sultan Qaboos bin Said Al Said allowed all adults, including women, to participate in the elections. This made Oman the first state in GCC to offer voting rights to its women. After 2011's regional unrest, the Shura Council's powers expanded, with citizens mainly advocating for better jobs, controlled prices, and reduced government corruption (Kumar, 2016). The adoption of the electronic voting system starting in 2019 represents an application of Oman's futuristic vision that integrates

digital technology into everyday life uses (Ministry of Interior Homepage, n.d.). This vision aims for digital and democratic transformation in both the Omani government and society. This system builds on the achievements Oman has made in recent years in digitizing its databases, facilitating their various uses at the level of electronic governance to save effort and time. The digital system allows voters to cast their votes online using information technology tools, and its results are stored in the Omani information system following technical and security standards under the authority of the Ministry of Interior (Intikhab Homepage, n.d.). This ministry collaborated with the Ministry of Communications, its institutions, and the Shura Council to implement the digitization of the voting system.

Arab Gulf states, in their pursuit of modernization and democratic practices, have exhibited a diverse approach toward the integration of digital technology in electoral systems. As observed, the legal frameworks governing these elections differ considerably among these nations and are shaped by historical, sociocultural, and political influences. While countries such as Kuwait have oscillated between manual and electronic voting systems owing to concerns of reliability, others such as Bahrain, the UAE, and Oman have made pronounced strides in digital election technology, exhibiting a forward-looking vision. On the other hand, Saudi Arabia and Qatar have shown caution, with Saudi Arabia's reticence stemming from its unique Islamic governance structure and Qatar's positive outlook influenced by regional peers.

3 Digital Election Technology Challenges in GCC Political Institutions

Gulf countries are progressively moving toward the adoption of digital election technology, driven by the desire to benefit from the speed and ease that digital technology provides. This technology has enabled countries that have employed it to create significant leaps in terms of development. Therefore, digitizing elections, which is one of the most sensitive fields at the political level, can be a means of digital democratic transformation. It serves as a practical alternative that can be relied upon locally as long as the social and political environment still opposes political applications that are not based on norms and beliefs. In the following section, some of the recently reported challenges regarding digital elections are outlined.

3.1 Maintaining the Confidentiality of the Vote

The secrecy of the vote is one of the most important principles that constitutions have sought to ensure due to its essential role in achieving accurate electoral representation. A study by Brunet (Brunet et al., 2022) revealed a potential weakness in

the secrecy of voting using internet traffic analysis and indicated that it is possible to predict voting intentions with an accuracy of up to 84% of the votes in the mayoral race in Canada. This challenge requires electoral commissions and institutions to rely on media outlets and influencers on social media platforms to undertake necessary voter awareness efforts. Similarly, civil society organizations must play an oversight role in preventing violations in this regard. The Bahraini Law provides constitutional guarantees to ensure the anonymity of voters. This guarantee applies to both the phase of tallying votes and announcing results, as it does in the voting phase. Besides electronic sorting, there must be a manual sorting process to maintain transparency (Al-Maawda, 2022).

In the Bahraini elections, confidentiality is maintained through the use of the traditional manual voting approach. Their electronic voting approach is minimal, relying solely on digital devices that operate without the internet or advanced gadget functionalities. The commitment to transparency is evident with the use of clear ballot boxes and voting stalls that align with the set standards. By contrast, the UAE and Oman aim to uphold confidentiality in elections by deploying an “electronic encryption” based protection measure during voting. This mechanism safeguards voters’ and candidates’ IDs, reflecting the government’s faith in the encryption process. One of the main challenges, however, is cybersecurity, which poses a threat to confidentiality. Nevertheless, by bolstering collaborative efforts within the Gulf and adopting cybersecurity protocols similar to the European Union’s approach to election technology, there is an added layer of assurance in upholding confidentiality.

3.2 Technical Problems

Voting is the most complicated and sensitive phase of an election. Technical problems are one of the external factors affecting voting online or via mobile phones, making them one of the challenges facing electronic elections. Voting outages require emergency measures to ensure that all voters have the opportunity to participate in an election. Failing to take these measures increases the level of insecurity regarding voting in the online (Tovey, 2019).

Overall, the technical issues in the electronic election system, whether in Bahrain, the UAE, or Oman, allow for the use of several alternatives. Bahrain has a traditional manual system alongside an electronic system. In the UAE, hybrid voting combines automated electronic and online voting. Additionally, the smart application “Sharek UAE” provides voters with various options, including an early voting system that extends the voting period over several days, allowing for the resolution of technical problems.

3.3 *Cybersecurity*

Digital electoral technology requires more financial and human resources than ever before to maintain a safe and constitutionally acceptable electoral environment. Therefore, the flexibility of digital systems in facing cyber threats to election tampering is of utmost importance at this time (Maurer, 2020). Cyber threats are among the areas in which countries cooperate to address their risks and international agreements regarding them extend to cyber electoral threats. Therefore, it is essential to cooperate at the level of the GCC for Arab States and exchange the necessary expertise and information to fend off the risks of these threats.

3.4 *Effective and Sustainable Use of the Electronic Election System*

Digital transformation in the electoral field is considered one of the sensitive areas in terms of the relationship between government and public opinion. Therefore, sustainability in the procedures for transitioning toward it is essential. It is among the applications with exorbitant costs in terms of establishing and maintaining the machines and technological software that operate them (Maurer, 2020). The state that decides to organize and implement it must consider the need for long-term sustainability in its ability to bear substantial expenses. The circumstances and capabilities of the Gulf countries vary in the face of this challenge.

3.5 *The Technical Nature of Digital Solutions That Requires Specialists to Understand*

The primary difficulty in addressing this issue stems from its inherent legal framework, which is both general and expansively worded. This broad and generalized legal structure can present challenges when trying to digitally implement it. For a successful digital application, there is a need to interpret legal wording in a manner that not only clarifies its intended meaning but also sheds light on any potential repercussions or consequences that might arise from it. This ensures that the digital implementation is aligned with the original legal intent and that there are no unforeseen challenges down the line.

3.6 The Compatibility of Digital Election Solutions with the Principles Practiced in Democratic Elections

The primary difficulty stems from the expectations placed on everyday individuals, encompassing roles such as voters, election officials, judges, observers, and many others. These individuals are not only required to navigate and employ digital solutions but also to validate their outcomes. For a technology, especially one concerning something as crucial as elections, to be accepted and trusted, it must be intuitive, transparent, and easily verifiable. The end goal is to ensure that the average person, regardless of their role, feels confident in the system's integrity and accuracy.

The complexity of adapting existing legal frameworks to digital platforms and ensuring compatibility with democratic election principles are vital aspects that cannot be overlooked. The common thread running through these challenges is the pressing need for clarity, security, transparency, and public trust. Collaborative efforts within the GCC region and the sharing of expertise and resources can form the bedrock of a digital election system that stands firm against potential threats. It's imperative that as these nations transition toward modern election methodologies, they prioritize creating an environment where every stakeholder, from the ordinary voter to the election official, feels assured of the system's reliability and integrity.

4 Digital Technology's Influence on Gulf Elections

Primarily, it must be emphasized that digital innovations are not an end in themselves; they should serve as solutions to existing problems, and this also applies to the use of digital election technology. On another note, the electoral process is influenced by historical and cultural characteristics; what is suitable in one place might not be implemented in the same manner or may not be successful in another. Therefore, by identifying the impact of implementing digital technology in the elections of the most advanced countries in aligning digital solutions with the principles practiced in democratic elections, and reviewing Gulf digital applications, we will illustrate the extent of digitalization's influence on the efficiency of the electoral process and the integrity and transparency of its procedures, and, consequently, how it is reflected on the level of political and electoral participation.

4.1 Efficiency

Measuring the impact of digital technology on the efficiency of elections requires benchmarking it against the electoral experience before the introduction of digitization to the electoral process. Preserving the requirements of this process is one of the goals that must be achieved in digital elections. Two of the most important

requirements are “verification and secrecy,” which accompany the electoral process in both the nomination and voting stages (Maurer, 2020). These requirements are mandated by laws and constitutions. Therefore, we observe a differentiation in purpose between countries with a long-standing democratic tradition and others that are new to the electoral experience. For established democracies, it is essential to maintain the efficiency of elections, and these two requirements are indispensable and necessary to preserve the essence of the voting process. In reviewing electronic voting at the Council of Europe level, a team from the Finnish Ministry of Justice concluded that despite the technical feasibility of the technology, it has not yet met the requirements for verification and secrecy, and they recommended not implementing online voting in general elections. Kuwait, which we previously highlighted as having a rich democratic experience at the Gulf level, followed the same path despite strong demands to apply digital technology in the National Assembly elections. As for the Gulf states that are new to the electoral experience, they view the implementation of digitization in general elections as a technological means to enhance their electoral experience, to increase the efficiency of elections, and to overcome shortcomings using advanced technical means, benefiting from their financial capabilities, which some other financially and democratically poor countries do not possess.

4.2 Integrity and Transparency

The Bahraini lawmaker suggests that by connecting the Election and Referendum Administration to the Legislation and Opinion Authority instead of the Central Information Authority (Al-Maawda, 2022), the integrity and fairness of the process can be bolstered. This is grounded in the idea that an independent body overseeing elections with direct judicial guidance ensures more honesty. Conversely, the Omani law perspective emphasizes the importance of technical and security measures. This is essential when employing IT tools for online voting. The electronic voting results are safer when stored in the Omani system, under the jurisdiction of the Ministry of Interior (Intikhab Homepage, n.d.), which has worked in tandem with the Ministry of Technology and Communications and the Shura Council to digitize the voting process.

As for the United Arab Emirates, its organization of digital elections is a mix of the experiences of Bahrain and Oman. The National Election Committee was formed in August 2022 and includes representatives from legislative, judicial, and executive authorities, in addition to members representing the youth and experts in digital government and cybersecurity. Aside from the various sub-committees working under the supervision of the Election Committee, which also possess the same characteristics mentioned for the members of the National Election Committee. This diversity in composition enhances the protection of integrity and transparency standards in the elections of the National Council.

4.3 *Political and Electoral Participation*

Electoral participation is a fundamental benchmark for measuring the level of political participation in general. The experiences of countries that have implemented electronic voting have provided a positive perspective on the evolution of this participation. Among the earliest of these countries was Estonia, a former Soviet republic that completely broke away from its communist past, and moved significantly and concurrently between the digital governance experience and the requirements of transitioning toward democracy and integrating digital technology into general elections. Comparing the 2005 elections, which marked the first-time internet-based electronic voting was used, where an ID card with an integrated electronic chip was employed to verify the voter's identity, to the 2011 elections, after the experience had become well-established in terms of transparency and efficiency, we find that the online voting system, with its speed and ease, led to the enhancement of Estonians' participation in elections. Whereas the participation rate was 47.4% in the 2005 elections and electronic voting accounted for 1.9%, the participation rate grew to 63.5% in the 2011 elections, with electronic voting representing 24.3% of that figure. It's evident that well-established democracies prioritize maintaining the integrity of their electoral systems when adopting these technologies, while emerging democracies in the Gulf seek to harness digitalization as a tool for enhancing and legitimizing their electoral processes (Alvarez et al., 2009). The experiences of countries such as Estonia provide compelling evidence of the potential benefits of digitizing the voting system, most notably, a significant increase in political participation.

However, as the Gulf nations tread this path, they must be meticulous in ensuring that the adoption of these technologies doesn't compromise the sanctity of the electoral process. The balance between technological advancement and upholding democratic principles is delicate, requiring continuous evaluation and adaptation. Furthermore, the role of regulatory bodies, the intricacies of technological infrastructures, and the overarching aim of bolstering democratic values should always be at the forefront of such transitions.

Based on the analysis of Estonia's experience, the impact of digitization was not direct on the first digital elections, but rather on the subsequent elections. This can be attributed to waiting for the assessment of the initial digital voters as a test sample for the experience, hence the positive impact required a full electoral cycle until elections were held for the second time.

Despite Bahrain being considered one of the pioneering democracies in the Gulf as indicated, the impact of using electronic voting devices within electoral districts, as evidenced by the results of Bahraini elections, has not achieved consistent and stable progress in voter turnout. As shown in Table 1, there was a noticeable improvement in participation rates in the 2006 elections, reaching 73.6%. However, it gradually declined in the subsequent two cycles, recording a low turnout of 49.9% in 2014, before rising again in the later elections due to reasons unrelated to the use of election technology, which remained unchanged.

Table 1 Statistics for the six parliamentary elections—Kingdom of Bahrain

Parliamentary elections	Number of candidates	Electorate	Number and percentage of voters
2002	—	243,635	122,556 (53.48%)
2006	—	295,686	217,625 (73.6%)
2010	—	318,668	215,783 (67.7%)
2014	—	349,713	174,564 (49.9%)
2018	—	365,467	242,407(66.3%)
2022	—	344,713	252,256 (73.2%)

Source: (Fayyad, 2023) <https://search.mandumah.com/Record/1381419>

Table 2 Statistics for the four Federal National Council elections—UAE

Parliamentary elections	Number of candidates	Electorate	Number and percentage of voters
2006	456	6595	4906 (74.4%)
2011	450	135,308	35,877 (28%)
2015	330	224,279	79,157 (35%)
2019	—	337,738	117,592 (34.81%)
2023	309	398,879	175,487 (44%)

Source: The United Arab Emirates' Government portal, <https://u.ae/ar-ae/about-the-uae/the-uae-government/the-federal-national-council->

In the UAE and Oman elections, the confidence built among voters in the first digital election experience, similar to the Estonian experience, was reflected in the second experience. As shown in Table 2, the voter turnout in the UAE digital elections increased from 34.81% in the Federal National Council elections of 2019 to 44% in the elections of 2013. Meanwhile, the impact of the digital election experience in Oman was more prominent. According to Table 3, voter turnout increased from 49% in the Shura Council elections of 2019 to 65.88% in the 2023 elections. However, the application of digital elections in municipal councils for the first time showed a slight negative change, with participation rates dropping from 39.8% in 2016 to 39.42% in 2022.

The development of the future electoral process in the Gulf Arab states depends on drawing lessons from such practical experiences. While strategies are being formed to suit the unique historical, cultural, and political landscape of these countries, ensuring the sanctity and integrity of the electoral process remains essential. Despite the promises held by the application of digital technology, it must be approached with caution, precision, and an unwavering commitment to democratic values.

Table 3 Electoral participation in the Sultanate of Oman 2011–2023 numbers in approximate thousands

Elections	Number of candidates	Electorate	Number and percentage of voters
Shura 2011	—	518	400 (76%)
Municipal 2012	—	447	223 (50.3%)
Shura 2015	—	525	297 (56.6%)
Municipal 2016	—	549	218 (39.8%)
Shura 2019	—	713	350 (49%)
Municipal 2022	—	731	288 (39.42%)
Shura 2023	—	843	496 (65.88%)

Source: <https://www.atheer.om/archives/610766/> and <https://shura2023.elections.om/>

5 Results

- Notable challenges are presented as a result of the transition toward improving electoral structures by adopting digital upgrades which requires a thorough assessment of variables specific to each country. This evaluation is inevitable because of its decisive influence on the outcomes of the transition.

The paramount importance of increasing transparency, security, and trust among stakeholders has been underscored by adapting to digital electoral methodology, encompassing both current and future contexts. Multidimensional challenges, including data protection, cybersecurity, and adherence to fundamental democratic principles, were introduced in this transformative phase.

- The goals related to the digital upgrade of electoral procedures are different between mature democratic systems and those undergoing simultaneous digital and democratic transformations.

6 Conclusions

There is a significant influence of the synergistic effects resulting from the convergence of traditional social and cultural frameworks with technological advancements on GCC countries' progression in implementing electronic voting mechanisms which contributes to the improvement of the desired digital democratic model.

GCC countries' main priorities should be enhancing the strength and scope of their digital infrastructure, capitalizing on potential advantages related to regional stability and financial prosperity to achieve a consistent digital democracy.

This doesn't mean that the digital model transition should only be seen as a mechanism to bridge past traditions with future aspirations but rather as a gradual approach aimed at developing advanced democratic structures, contributing to regional progress and equilibrium.

One of the fundamental challenges in the evolution of the digital electoral experience is that it represents an advanced step in implementing democratic mechanisms, serving as a means, not an end. The ultimate goal of deepening digital elections is to expand political participation and achieve a democratic society.

7 Recommendations

The GCC should participate in collaborative protocols and disseminate specialized knowledge essential for establishing an advanced digital electoral infrastructure.

It is advisable to analyze digitally collected election data to comprehend voter trends, participation rates, and other pertinent indicators. These insights can wield considerable influence in formulating strategies for upcoming elections.

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The Contribution of Artificial Intelligence (AI) Applications to Innovation and Sustainability in Education



Mariam Mohammed Alkalbani

Abstract This study investigates the profound impact of artificial intelligence (AI) on fostering innovation and promoting sustainability within educational systems. Utilizing a descriptive analytical approach, the research explores how AI tools enhance personalized learning, improve administrative efficiency, and support sustainable educational practices. By analyzing data collected from a diverse group of university professors across the United Arab Emirates through a meticulously designed questionnaire, the study highlights AI's significant contributions to optimizing educational outcomes and resource management. Furthermore, the findings emphasize the necessity for robust ethical frameworks to govern AI's integration into educational settings, ensuring that its deployment enhances educational equity and privacy. The research provides valuable insights into the potential of AI to transform educational paradigms, suggesting strategic recommendations for educators, policymakers, and developers to maximize the benefits of AI in education.

Keywords Artificial intelligence · Educational innovation · Sustainability in education · AI integration · Ethical AI

1 Introduction

Tracing the origins of artificial intelligence (AI) back to the 1950s, it is crucial to acknowledge that the field gained prominence with Alan Turing's introduction of the Turing Test in 1950, aimed at assessing a machine's intelligence through its ability to mimic human reasoning. This pivotal moment laid the groundwork for subsequent developments in AI, including Christopher Strachey's creation of the first AI software at the University of Oxford, enabling a computer to play checkers. Progress continued with Anthony Oettinger's work at the University of Cambridge, where he

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conducted a groundbreaking simulation of a shopping process by a computer, marking a significant milestone in machine learning by demonstrating a computer's learning capabilities. These early achievements highlight the foundational steps toward the sophisticated AI applications we see today.

Artificial intelligence (AI) is a critical area of computer science that specializes in creating software capable of performing tasks that typically require human intelligence. This field emerges at the intersection of advancements in systems science, computing, automatic control, and a comprehensive understanding of human intelligence through logic, mathematics, and linguistics. AI systems utilize sophisticated algorithms to address complex problems or make decisions under various scenarios, relying on a broad spectrum of inferential processes. These processes enable AI to offer solutions and make decisions with a speed and efficiency that far exceeds human capabilities, highlighting its potential to drive innovation and improve efficiency across numerous sectors (Jiang & Liu, 2021; Patel & Singh, 2022).

The essence of artificial intelligence (AI) is deeply rooted in emulating human intelligence, positioning it as a crucial segment of computer science dedicated to forging intelligent systems. These systems are characterized by attributes akin to profound intelligence, mirroring the cognitive and behavioral patterns of humans. This reflection of human intellect within machines underscores the interdisciplinary nature of AI, encompassing a blend of technology, psychology, and cognitive science to develop systems that not only think but also learn and adapt over time (Kim & Lee, 2021).

Artificial intelligence (AI) is categorized into two main types, highlighting its diverse capabilities and applications. The first type, known as weak AI, is designed to excel in performing specific, narrowly defined tasks—exemplified by technologies such as self-driving vehicles. In contrast, strong AI, or artificial general intelligence (AGI), embodies the broader ambition of AI development, aiming to replicate a wide range of human cognitive abilities. AGI is envisioned to handle a multitude of tasks and problem-solving activities, mirroring the complex and versatile nature of human intelligence. This dichotomy underscores the breadth of AI's potential impact, from specialized applications to comprehensive systems capable of adapting and learning in ways comparable to human thought processes (Nguyen & Tran, 2021).

Artificial intelligence (AI) stands as a pivotal technological frontier, profoundly influencing various aspects and sectors of life, thereby playing a crucial role in delineating the contours of the future. Far beyond the traditional confines of programming machines and computers for autonomous or minimally supervised operation, AI embodies a transformative lifestyle shift, making previous paradigms seem obsolete by comparison. In the realm of education and training, AI applications have demonstrated significant effectiveness, heralding a global shift toward their integration across educational spectrums. This trend is driven by the advantages of AI, including user-friendly interfaces, cost-efficiency, and the capacity to manage vast quantities of information by leveraging machine learning and deep learning techniques. Specifically, AI has the potential to revolutionize education by

facilitating the creation of personalized learning experiences tailored to individual student needs, thereby enhancing educational outcomes for a diverse student population and fostering a more accessible, efficient educational environment (Fernandez & Ameen, 2022; Zhou & Brown, 2023).

Artificial intelligence (AI) has the potential to significantly enhance the efficiency of educational administration by automating tasks such as paper corrections and grading, thus freeing up valuable time and resources for educators to concentrate more on pedagogical activities. Moreover, AI can play a pivotal role in democratizing education by facilitating access for students in remote or underserved regions, ensuring equitable educational opportunities for all. Beyond administrative efficiency and access, AI is instrumental in enriching the educational experience through the development of engaging and interactive educational games, fostering deeper student engagement in the learning process. Recent studies underscore the diverse applications of AI in education, highlighting its capacity to augment interaction between students and educational software, promote empathy among students and between students and teachers, and simplify the use of educational technologies. These studies advocate for the increased integration of smart teaching programs and AI applications across all educational levels and university settings to leverage the benefits of AI in enhancing teaching and learning outcomes (Morales, 2022; Singh & Gupta, 2021; Tan & Kumar, 2020).

1.1 Background of the Study

The exploration of artificial intelligence's role in education has expanded significantly as technologies evolve to offer more intricate and adaptive learning solutions. AI's ability to tailor educational experiences to individual needs and its capacity for enhancing learning outcomes underscore its potential for fostering significant innovations in education. These innovations are not only technological but also pedagogical, as AI integrates deeply with the methodologies that underpin educational theory and practice. As AI technologies become more sophisticated, their integration into educational settings promises to transform traditional teaching and learning paradigms, leading to more personalized and accessible education (Smith & Jones, 2023).

Moreover, the sustainability of educational initiatives is increasingly recognized as crucial in the broader context of global educational challenges, such as resource constraints and educational equity. AI's contributions extend beyond mere academic performance, influencing the sustainability of educational systems by enabling more efficient resource management and providing scalable solutions that can adapt to diverse learning environments. This adaptive capacity is essential for meeting the diverse needs of a global student population, thus contributing to the long-term sustainability of educational practices (Brown et al., 2024).

In assessing the dual impact of AI on innovation and sustainability in education, it is clear that artificial intelligence not only revolutionizes how educational content is delivered and consumed but also enhances the infrastructure of education systems worldwide. These changes are pivotal as they help bridge the gap between educational theory and practice, making learning more engaging and effective. AI's role in supporting educational systems to be more resilient and adaptable to changes underscores its value in fostering a sustainable educational future (Lee & Nguyen, 2024).

1.2 Research Objectives

The main objective of the current research is to identify the contributions of AI to innovation in education through:

1. Building a questionnaire on the contributions of artificial intelligence to innovation in education and calculating its validity and stability
2. Uncovering the contributions of AI to innovation in education
3. Recommendations and suggestions on the contributions of AI to innovation in education

1.3 Research Questions

1. How can a questionnaire be constructed to measure the contributions of artificial intelligence to innovation in education, and how can its validity and reliability be evaluated?
2. What are the specific contributions of artificial intelligence to innovation in education?
3. What recommendations and suggestions can be made based on the observed contributions of AI to innovation in education?

1.4 Significance of the Research (Theoretical and Practical)

The integration of artificial intelligence in educational systems holds significant theoretical implications as it challenges and potentially transforms established pedagogical theories. Theoretical frameworks regarding learning processes, student engagement, and educational outcomes are reevaluated in light of AI capabilities that offer personalized learning and adaptive teaching methodologies. This

reevaluation necessitates a fresh look at educational theories through the lens of technology-driven data analytics and machine learning, which provide insights that were previously inaccessible. Such theoretical advancements are crucial as they guide the practical implementation of AI in educational settings, ensuring that its deployment is both effective and ethically sound (Wilson & Taylor, 2023).

From a practical standpoint, the application of AI in education offers tangible benefits that address both immediate and long-term educational challenges. AI applications, such as adaptive learning platforms, AI-driven tutoring systems, and data-driven decision-making tools, help educators meet the diverse needs of students, thus enhancing educational accessibility and equity. These tools not only support personalized learning pathways but also empower teachers by providing them with detailed insights into student progress and potential learning obstacles. Consequently, AI's role extends beyond instructional support to include strategic planning and resource allocation within educational institutions, promoting a more sustainable educational environment that can dynamically adapt to changing educational demands (Patel & Gomez, 2024).

Moreover, the practical significance of AI in education is also reflected in its capacity to bridge educational gaps on a global scale. By providing scalable and flexible learning solutions, AI technology plays a pivotal role in democratizing education—making high-quality learning experiences accessible to students in remote or under-resourced regions. This aspect of AI contributes to sustainability by supporting the United Nations Sustainable Development Goal of quality education for all, showcasing the potential of technology to foster societal advancement and global equity in education. The continuous evolution of AI tools further promises ongoing improvements in educational quality and accessibility, marking a significant step toward a more educated global populace (Chen & Schwartz, 2024).

2 Literature Review

The literature review section serves as the foundation of our study, providing a comprehensive overview of existing research on the intersection of artificial intelligence (AI) and its role in fostering innovation and sustainability in education. This review delves into various scholarly articles, case studies, and theoretical frameworks that discuss the implementation and impact of AI technologies in educational settings. By examining these sources, we aim to identify gaps in the current knowledge base and understand how AI has been utilized to address challenges and leverage opportunities within the educational sector. This understanding will enable us to position our research within the broader academic discourse, drawing connections between past studies and our investigation into the transformative potential of AI in education.

2.1 Evaluation and Strengthening of the Theoretical Framework

The critical evaluation and strengthening of the theoretical framework in the context of artificial intelligence in education necessitate a deep dive into existing theories that underpin both technological integration and pedagogical outcomes. Recent studies have highlighted the need to refine these frameworks to incorporate the rapid advancements in AI technology and its applications in educational environments. By critically assessing these frameworks, researchers can ensure that they adequately reflect the current capabilities of AI tools and their impact on learning processes and educational outcomes (Johnson & Smith, 2023).

Furthermore, strengthening the theoretical framework involves synthesizing insights from a wide array of interdisciplinary studies that explore the convergence of AI with educational practices. This synthesis helps in identifying robust methodologies that can accurately measure the effectiveness of AI applications in enhancing both the delivery of education and its sustainability. It is crucial to integrate findings from fields such as cognitive science, computer science, and educational technology to build a comprehensive framework that supports ongoing innovation and practical implementation in educational settings.

Finally, to effectively evaluate and reinforce the theoretical underpinnings, it is essential to engage with empirical evidence from recent implementations of AI in education. The analysis of case studies and pilot projects where AI tools have been deployed reveals practical challenges and opportunities, which can refine theoretical assumptions and guide future research directions. This empirical approach ensures that the theoretical framework not only remains relevant but also dynamic, adapting to new knowledge and technologies as they emerge in the field of educational AI (Foster & Daniels, 2022).

2.2 Understanding Sustainability Within Educational Contexts

Understanding sustainability within educational contexts requires an exploration of how educational systems adapt to long-term ecological, economic, and social challenges, a concept that has gained significant traction in recent years. Sustainability in education not only involves the integration of environmental education into curricula but also encompasses the development of sustainable educational practices that promote lifelong learning and adaptability. AI technologies contribute by enabling personalized learning experiences that can be scaled globally, thereby reducing disparities and supporting sustainable development goals across diverse educational landscapes (Anderson & Li, 2023).

Furthermore, sustainability in education emphasizes the importance of preparing students for a changing world, where they can contribute to sustainable practices and decision-making. AI facilitates this by providing tools that foster skills such as

critical thinking, problem-solving, and collaboration through interactive and adaptive learning environments. By leveraging AI, educators can create dynamic content that reflects current issues and challenges, engaging students in meaningful ways and encouraging a deeper understanding of sustainability (Baker & Patel, 2024).

Moreover, the use of AI in education can lead to significant improvements in operational sustainability by optimizing resource allocation, reducing waste, and enhancing administrative efficiencies. Intelligent systems can help educational institutions manage their resources more effectively, from minimizing energy consumption through smart campus solutions to optimizing course offerings based on student demand and performance data. Such applications of AI not only enhance the sustainability of educational institutions but also model sustainable practices for students to observe and learn from (Johnson & Kumar, 2022).

2.3 Exploring the Role of Artificial Intelligence in Enhancing Educational Sustainability

Artificial intelligence is revolutionizing the educational sector by enhancing sustainability through various innovative applications. AI's ability to analyze large datasets enables educational institutions to understand and predict student performance trends, leading to optimized resource allocation and improved educational outcomes. These capabilities are crucial for creating sustainable educational models that can adapt to the needs of a diverse student body. Moreover, AI-driven analytics help identify at-risk students early, allowing for timely interventions that are essential for maintaining student success rates and reducing dropout rates (Hamilton & Roberts, 2023).

Additionally, AI technologies support sustainable educational practices by facilitating personalized learning experiences. Through adaptive learning systems, AI tailors educational content to match the learning pace and style of individual students, maximizing their engagement and efficiency. This personalized approach not only improves learning outcomes but also contributes to the efficient use of educational resources by focusing efforts where they are most needed. Furthermore, AI can automate administrative tasks, reducing overhead costs and allowing educational institutions to allocate more resources toward student-facing activities and sustainable infrastructure development (Johnson & Lee, 2024).

Moreover, AI's role in educational sustainability extends to environmental impact. Smart AI applications in education can lead to reduced paper use, lower energy consumption, and less physical infrastructure, as digital and remote learning environments become more prevalent. These technologies foster a culture of sustainability within educational settings, preparing students to be conscientious global citizens. AI also facilitates the integration of environmental sustainability topics into curricula, promoting awareness and understanding among students about global ecological challenges (Singh & Wang, 2022).

2.4 Current Global Trends in Sustainability Within Educational Systems

The current global trends in sustainability within educational systems are increasingly influenced by the integration of technology, particularly through the adoption of artificial intelligence. AI has enabled educational systems worldwide to become more efficient and effective by personalizing the learning experience and optimizing the use of resources. For instance, AI tools help predict student enrollment and performance trends, allowing institutions to better manage their resources and plan future courses and content delivery. This shift toward data-driven decision-making is crucial for enhancing the sustainability of educational models facing varying demographic pressures (Turner & Hughes, 2023).

Moreover, there is a growing emphasis on the environmental impact of educational practices, where AI is playing a significant role. Many educational institutions are utilizing AI to reduce their carbon footprint through smarter building management systems that optimize energy use and through virtual learning environments that decrease the need for physical infrastructure. This trend is part of a broader move toward more eco-friendly educational practices that align with global sustainability goals, such as those outlined in the United Nations Sustainable Development Goals (SDGs). Educational systems are not only adapting to be more sustainable but are also teaching the next generation of students the importance of sustainability in every sector.

Furthermore, AI's impact on the accessibility and inclusivity of education also marks a significant trend in the sustainability of educational systems. By providing tools that support individualized learning paths, AI is helping bridge educational gaps for students with diverse needs, including those from remote or underserved regions. The proliferation of mobile learning applications and online platforms has made quality education more accessible, thus contributing to the educational equity aspect of sustainability. This democratization of education is critical for achieving inclusive educational practices that uphold the principle of quality education for all, irrespective of geographical and socioeconomic barriers (Patel & Gomez, 2022).

2.5 Global Case Studies on AI Integration in Pedagogy

Global case studies on the integration of artificial intelligence in pedagogy provide compelling insights into the transformative power of AI across diverse educational settings. For example, in Singapore, AI-driven systems have been implemented to tailor instruction based on individual student performance, dynamically adjusting the difficulty and style of questions to optimize learning efficiency. This approach has led to improved student engagement and understanding, particularly in mathematics and science subjects, demonstrating AI's potential to enhance interactive learning and assessment methodologies (Nguyen & Lim, 2023).

In Sweden, a notable project involved the use of AI to foster language learning among immigrants. The AI system deployed adaptive algorithms to personalize language training courses according to each learner's proficiency level and learning pace. This application of AI not only accelerated language acquisition but also facilitated smoother integration into Swedish society, showcasing AI's role in promoting inclusive education and cultural integration (Johansson & Karlsson, 2024).

Further afield in Brazil, AI tools have been used to support environmental education. Leveraging AI-powered simulations and virtual reality, Brazilian schools have engaged students in complex sustainability issues, such as deforestation and water management. These immersive learning experiences have proven effective in raising awareness and understanding of environmental challenges, equipping students with the knowledge and skills necessary to participate in sustainable practices. This case study illustrates the capacity of AI to extend educational impact beyond traditional classroom boundaries into real-world applications (Santos & Pereira, 2022).

2.6 Review of International Research on AI's Impact on Educational Sustainability

International research on AI's impact on educational sustainability highlights its transformative potential across various educational systems. Studies in the United States and Europe have consistently demonstrated that AI can significantly enhance the resource efficiency of educational institutions. For instance, AI-powered analytics have enabled schools to predict student enrollment trends and resource needs with greater accuracy, facilitating more sustainable operational practices. These tools help optimize everything from energy use to textbook procurement, reflecting a shift toward more ecologically and economically sustainable educational environments (Clarkson & Dupont, 2023).

In Asia, research has focused on the role of AI in reducing educational disparities through personalized learning. AI systems in countries like Japan and South Korea have been utilized to provide individualized learning experiences that adapt to the unique needs of each student, thereby reducing dropout rates and improving educational outcomes. This tailored approach ensures that resources are used more effectively, contributing to the sustainability of the educational sector by ensuring that all students can achieve their potential with minimal waste of resources (Tanaka & Lee, 2024).

Additionally, studies from Australia and New Zealand have explored AI's capability in supporting remote learning, which has become increasingly pertinent following the global shifts toward online education. AI technologies such as virtual tutors and online collaborative platforms have made education more accessible and sustainable by reducing the need for physical travel and materials. This not only lowers the carbon footprint associated with traditional educational models but also enhances the inclusivity of education, ensuring that students in remote or underserved regions have access to quality learning resources (Bennett & O'Connor, 2022).

2.7 Correlation Between Sustainability Variables and Artificial Intelligence in Education

The correlation between sustainability variables and artificial intelligence in education underscores a multifaceted relationship where AI not only supports educational outcomes but also promotes environmental and economic sustainability. Recent studies have shown that AI-enhanced learning platforms can significantly reduce the carbon footprint of educational institutions by minimizing the need for physical resources such as paper and transportation. By transitioning to digital platforms, schools leverage AI to offer more sustainable learning modes, effectively reducing their environmental impact while enhancing educational accessibility (Harper & Marino, 2023).

Economic sustainability is another crucial variable influenced by AI in education. AI's ability to streamline administrative processes and personalize learning reduces costs associated with traditional teaching methods and materials. For instance, AI-driven predictive analysis helps institutions optimize their investments in educational resources by better forecasting demand and student performance trends. This optimization ensures that resources are not wasted, contributing to the financial health and long-term sustainability of educational enterprises (Zhao & Fletcher, 2024).

Social sustainability in education, facilitated by AI, focuses on creating inclusive educational environments that cater to diverse learning needs. AI tools are particularly effective in identifying and addressing the unique challenges faced by under-represented or disadvantaged student groups. This not only leads to improved educational outcomes but also fosters a more inclusive society by ensuring that every student, regardless of background, has access to quality education. Such integration of AI into educational practices ensures the alignment of educational methods with broader social sustainability goals, promoting equity and accessibility across the board (Nguyen & Holmes, 2022).

3 Research Methodology

The Research Methodology section of our study is designed to outline the structured approach we will employ to investigate the contributions of artificial intelligence (AI) applications to innovation and sustainability in education. This section details the specific methods and procedures used to collect, analyze, and interpret data relevant to our research questions. Emphasizing both qualitative and quantitative techniques, the methodology aims to provide a robust framework for understanding the impacts of AI within educational settings, ensuring that our findings are reliable, valid, and applicable to diverse educational contexts. This careful approach allows us to critically assess AI's role in education and draw meaningful conclusions that can inform future educational practices and policy decisions.

3.1 Research Design

The research design of this study is predicated on a descriptive analytical methodology, meticulously chosen to align with the outlined objectives of assessing the impact of artificial intelligence on educational innovation. To effectively explore this impact, a comprehensive questionnaire was developed, specifically tailored to gather detailed insights from participants regarding their experiences and perceptions of AI applications in their educational practices. This methodological choice facilitates an in-depth understanding of the nuanced roles AI plays within educational settings, providing a robust foundation for analyzing the collected data (Richardson & Khan, 2023).

The research community for this study comprises a broad spectrum of university professors across the United Arab Emirates, encompassing a diverse range of disciplines and academic experiences. This comprehensive community selection ensures that the findings of the study are reflective of the varied educational landscapes within the region, thus enhancing the generalizability of the study’s conclusions.

To operationalize this research, a basic sample of 200 university professors was selected through a stratified random sampling technique, ensuring representativeness across different universities and faculties. This sample size is deemed sufficient to achieve the statistical power needed to reliably validate the findings. The detailed distribution of the participants, categorized by relevant study variables such as academic discipline, years of experience, and prior exposure to AI tools in education, is meticulously documented in Table 1, providing clear visibility into the sample structure and the context of the data collected (Thompson & Yamaguchi, 2024).

Table 1 offers a comprehensive breakdown of the study’s demographic composition, revealing an equal gender distribution within the sample size of 200 university professors, with both male and female participants numbering 100 each, accounting for 50% of the sample, respectively. The age range of participants spanned from 40 to 73 years, showcasing a diverse age group with an average age of 58.15 years and a standard deviation of 8.62, indicating variability in the sample’s age distribution. In terms of academic qualifications, the sample displayed a diverse array of scientific degrees: Lecturers constituted 30% of the sample, with 60 individuals; Assistant Professors represented 35%, with 70 individuals; and full Professors formed the

Table 1 Distribution of study sample by type

Variable	Groups	as	%
Gender	Males	100	50%
	Females	100	50%
Chronological age	Less than 50 years old	100	50%
	More than 50 years	100	50%
Degree	Lecturer	30	15%
	Assistant professor	70	35%
	Professor	100	50%
Total		200	100%

largest group at 50%, totaling 100 individuals. This distribution underscores the varied levels of academic expertise and experience among the participants.

3.2 Data Collection Methods

The Data Collection Methods for this study involve a meticulously structured approach to gather comprehensive data from the targeted research community. Given the descriptive analytical nature of the methodology, the primary instrument employed is a detailed questionnaire designed to extract nuanced information about the perceptions and experiences of university professors regarding the integration and impact of artificial intelligence in their teaching and administrative practices. This questionnaire is structured to include both qualitative and quantitative questions, which allows for a rich dataset that captures a range of insights on the application of AI technologies in education.

The questionnaire was distributed to a representative sample of 200 university professors across various higher education institutions in the United Arab Emirates. The participants were selected through a random sampling process, ensuring that the sample is unbiased and reflective of the broader academic community in the region. This random selection was facilitated by using institutional databases to identify potential participants who meet the study's inclusion criteria, followed by a randomization process to finalize the list of respondents.

To ensure the reliability and validity of the data collected, the questionnaire underwent a rigorous pilot testing phase with a small subset of the target population. Feedback from this pilot phase was used to refine the questions to better align with the research objectives and to clarify any ambiguities in the questionnaire items. The final version of the questionnaire includes sections that address various aspects of AI applications in education, such as AI's role in course design, student assessment, and resource management, among others. The responses are then carefully analyzed to draw meaningful conclusions about the current state and potential future of AI in education within the context of the UAE.

3.3 Data Analysis Techniques

The Data Analysis Techniques for this study are designed to rigorously assess the information gathered from the questionnaires distributed to university professors across the United Arab Emirates. To ensure comprehensive analysis, both qualitative and quantitative methods are employed.

For the quantitative data, statistical analysis is conducted using software like SPSS and R. Descriptive statistics provide an overview of the data, including measures of central tendency and dispersion, which help in understanding the general trends within the data. Inferential statistics are also applied to test the hypotheses

and examine the relationships between variables, specifically looking at the impact of AI on educational practices. Techniques such as regression analysis, ANOVA, and correlation analysis help determine the strength and significance of these relationships.

Qualitative data from open-ended responses in the questionnaire are analyzed using content analysis to extract common themes and patterns. This involves a detailed coding process, where responses are categorized into thematic units that represent the perceptions and experiences of the respondents regarding AI's role in education. This thematic analysis helps in understanding the nuanced views of the educators and identifying any significant insights that quantitative methods might overlook.

Finally, the integration of data from both qualitative and quantitative analyses is crucial for a holistic understanding of the research questions. This mixed-methods approach ensures that the findings are robust and provide a comprehensive picture of the role of AI in driving innovation and sustainability in education. The final step in the data analysis involves comparing these results with existing literature to contextualize the findings within the broader field of educational technology.

4 AI Applications in Education

The exploration of Artificial Intelligence (AI) applications in education forms a pivotal chapter in understanding how technological advancements are reshaping the learning environment. This section delves into the various ways in which AI tools and systems are being integrated into educational settings, highlighting their impact on teaching methodologies, student engagement, and institutional administration. By examining specific applications of AI—from personalized learning algorithms to automated administrative tasks—we can discern the practical benefits and challenges associated with their implementation. These insights not only underscore the transformative potential of AI in education but also guide future innovations to foster more effective and sustainable educational practices.

4.1 Case Studies

In the realm of education, artificial intelligence (AI) has been instrumental in driving innovation through various case studies that highlight its capacity to enhance both teaching and learning experiences. One notable example can be found in the United States, where AI has been integrated into personalized learning environments. A study conducted in California demonstrated how AI systems could adapt curriculum content to fit individual student needs, improving engagement and academic outcomes significantly. The AI system analyzed student responses and

learning styles to tailor instructional materials and assessments, resulting in a 30% increase in student performance on standardized tests (Harrison & White, 2023).

Another significant case study is from Finland, where AI was used to facilitate collaborative learning projects among students from different regions. This project utilized AI-driven platforms to connect students across geographical boundaries, enabling them to work on environmental science projects. The AI system provided tools for data analysis, project management, and communication, which supported a dynamic learning environment and promoted a deeper understanding of global sustainability issues. This application not only enhanced students' technical skills but also fostered a greater sense of global citizenship by connecting them with peers around the world to solve real-world problems (Nordstrom & Virtanen, 2024).

In Asia, Singapore has been at the forefront of implementing AI in educational assessments. The government launched an initiative where AI was used to grade student essays and provide feedback. This AI application was particularly innovative as it employed natural language processing to evaluate the content, structure, and creativity of students' writings. The system provided detailed feedback to students, which helped them improve their writing skills more efficiently than traditional methods. The AI-assisted assessment also freed up teachers' time, allowing them to focus more on classroom interaction rather than grading, thereby enhancing the overall educational process (Johnson & Kumar, 2022).

4.2 Analysis of AI Tools for Sustainability

Artificial intelligence (AI) tools have become pivotal in promoting sustainability within educational systems, offering solutions that extend beyond traditional learning environments. For instance, AI's ability to streamline operations through automation and data analytics supports educational institutions in becoming more resource-efficient. AI-driven systems can manage everything from energy consumption in school buildings to optimizing the distribution of educational materials, thereby significantly reducing waste and operational costs. These systems not only ensure environmental sustainability but also promote economic stability within educational entities by lowering overheads and minimizing unnecessary expenditures (Watson & Singh, 2023).

Moreover, AI tools contribute to sustainability in education by enhancing the accessibility and inclusivity of learning opportunities. AI-powered educational platforms can deliver personalized learning experiences to a wide demographic, including students in remote areas or those with specific learning needs, thus democratizing education. These platforms use adaptive learning technologies that adjust the content, pace, and complexity based on individual learner profiles, which helps in retaining students and reducing dropout rates. This aspect of sustainability ensures that all learners have the opportunity to succeed, irrespective of their background or geographical location, aligning with global educational equity goals (Morales & Fitzgerald, 2024).

Furthermore, AI's role in sustainability extends to fostering a culture of continuous learning and professional development among educators. AI tools can provide teachers with real-time feedback on student performance, highlight educational trends, and suggest areas for pedagogical improvement. This ongoing professional development is crucial for sustaining a high-quality educational workforce prepared to tackle future challenges and adapt to new teaching methodologies. Additionally, AI's capacity to facilitate research and data analysis enables educational institutions to undertake evidence-based improvements and policymaking, which are essential for long-term educational planning and sustainability (Kumar & Chen, 2022).

5 Data Analysis

The Data Analysis section of our study is dedicated to interpreting comprehensive data collected through various AI tools and questionnaires, aimed at understanding the impact of artificial intelligence on innovation and sustainability in education. This section will outline the statistical methods and analytical techniques employed to scrutinize the data, ensuring that the analysis is both rigorous and meaningful. By employing a mix of qualitative and quantitative approaches, we aim to extract significant insights and patterns that reveal the depth and breadth of AI's contributions to educational environments. This careful examination will help us draw valid conclusions and support the development of informed recommendations for future applications of AI in education.

5.1 *Statistical Analysis of Data*

The statistical analysis of the data gathered from our study on artificial intelligence's contributions to innovation and sustainability in education employs a comprehensive approach to ensure the integrity and depth of the analysis. Advanced statistical techniques, such as multiple regression analysis and structural equation modeling, were utilized to discern the relationships between the deployment of AI tools and educational outcomes. These techniques allow us to control for various confounding variables and isolate the specific effects of AI applications on educational innovation and sustainability. By doing so, the analysis provides a robust understanding of how different AI tools contribute to or detract from desired educational goals (Adams & Bell, 2023).

Moreover, factor analysis was another pivotal method used in our study to identify latent variables within the data that indicate underlying patterns associated with the use of AI in education. This method helps categorize data into distinct factors that represent different dimensions of AI's impact on education, such as student engagement, instructional quality, and resource management. Understanding these dimensions aids in comprehensively evaluating the effectiveness of AI applications

and their alignment with sustainable educational practices. The results from factor analysis provide crucial insights that guide further development and implementation of AI technologies in educational settings (Bryant & Liu, 2024).

In addition to regression and factor analysis, time-series analysis was conducted to examine trends over time in the adoption and effects of AI in educational institutions. This analysis is particularly important in understanding the long-term impacts of AI on educational sustainability and innovation. By tracking changes over multiple academic periods, we can assess whether the integration of AI is leading to progressive improvements or if adjustments need to be made to optimize its effectiveness. Such longitudinal insights are invaluable in shaping future educational policies and practices that aim to harness AI for enhanced educational outcomes (Carter & Kawaguchi, 2022).

5.2 Interpretation of Results

The “Interpretation of Results” section is pivotal in our study as it delves into the analysis and implications of the data gathered concerning the use of artificial intelligence (AI) in education. This section translates complex statistical data into meaningful insights, shedding light on how AI influences various aspects of educational innovation and sustainability. By carefully examining the relationships and patterns identified through the research, this part of the study provides a nuanced understanding of AI’s practical impacts and situates these findings within the broader context of current educational practices and future potentials.

5.2.1 First: The Validity of Identifying the Contributions of Artificial Intelligence to Innovation in Education

Apparent Honesty

The questionnaire was designed in a way that ensures virtual honesty through clarification of the questionnaire instructions and the formulation of questionnaire questions in an easy manner and clear words that do not require more than one meaning, and one phrase includes one idea. The answer to the questionnaire phrases does not take a long time and great effort, and the sincerity of the questionnaire was verified by presenting it to a group of specialized arbitrators with experience in the field, and their number (4) specialists from faculty members in the faculties of education (Appendix 1). In order to verify the clarity of the phrases and the affiliation of each of them to the axis that follows and the extent to which the axes of the questionnaire cover the target, the researcher has committed to making amendments and observations made by the arbitrators.

Sincerity of Internal Consistency

The concept of internal consistency refers to the degree to which individual item scores within a questionnaire are correlated with the overall score of the instrument, indicating a unified measurement across all items (Thompson & Patel, 2022). This principle is fundamental in assessing the reliability of a questionnaire, ensuring that all parts contribute accurately and cohesively to the total outcome being measured. High internal consistency suggests that the questionnaire items are well-aligned with the central construct they are intended to assess, thereby enhancing the instrument’s overall validity in capturing the intended dimensions of research.

The researcher calculated the correlation coefficient between the degree of each statement and the total degree of the questionnaire, and the following Table 2 shows the validity of the axes of the questionnaire.

Table 2 meticulously evaluates the validity of the questionnaire through the correlation coefficients between the scores of individual statements and both the scores of their respective axes and the total score of the questionnaire. The double asterisks (**) indicate that the correlations are statistically significant at the 0.01 level, suggesting a strong and reliable relationship between the scores of the statements and the overall construct being measured. These coefficients range widely across the items, with correlations with the axis scores ranging from 0.685 to 0.942 and with the total questionnaire scores from 0.689 to 0.907. Such variations in correlation strengths underscore the differential impact and relevance of each statement to the axes they belong to and the questionnaire as a whole.

The high correlation coefficients observed for several statements, such as 0.921 and 0.942 with their axes and 0.901 and 0.907 with the resolution, underscore the strong alignment of these items with the underlying constructs they are intended to measure. These high coefficients indicate that certain statements are highly effective

Table 2 Correlation coefficients between the degree of each phrase in the degree of the axis and the total degree of the resolution

M	Correlation coefficient with the axis	Correlation coefficient by resolution	M	Correlation coefficient with the axis	Correlation coefficient by resolution
1	0.872**	0.780**	12	0.871**	0.783**
2	0.685**	0.712**	13	0.687**	0.711**
3	0.785**	0.736**	14	0.723**	0.782**
4	0.921**	0.782**	15	0.914**	0.905**
5	0.758**	0.901**	16	0.885**	0.756**
6	0.882**	0.907**	17	0.809**	0.790**
7	0.847**	0.803**	18	0.844**	0.785**
8	0.772**	0.792**	19	0.763**	0.773**
9	0.689**	0.845**	20	0.775**	0.754**
10	0.804**	0.689**	21	0.942**	0.894**
11	0.807**	0.817**	22	0.818**	0.719**

**Function at 0.01 level

in capturing the essence of AI's contributions to education, as conceptualized by the research. This effectiveness is critical for ensuring that the questionnaire accurately reflects the dimensions of AI in education it seeks to measure. Moreover, the strong correlations highlight the statements' relevance and their collective capacity to provide a coherent and comprehensive measure of the questionnaire's thematic focus.

Conversely, the presence of lower yet significant correlation coefficients, such as 0.685 with the axis and 0.689 with the resolution, while still indicating a valid measure, suggests a more nuanced relationship between some statements and the overall construct. These findings imply that while all items contribute to the questionnaire's objectives, some do so with a lesser degree of intensity. This variance is essential for a balanced questionnaire design, ensuring a broad and inclusive assessment of AI's role in education. It reflects the complexity of AI's impact on educational innovation and sustainability, capturing a spectrum of contributions and challenges. The comprehensive analysis of these correlations provides a robust validation of the questionnaire, affirming its reliability and effectiveness in measuring the intended constructs related to AI in education.

Resolution Stability

The stability was calculated using the Cronbach alpha method of resolution and Getman of half segmentation, and the following table shows the stability coefficients of the resolution.

Table 3 presents the stability coefficients for a questionnaire designed to assess various dimensions of artificial intelligence (AI) in education, calculated using Cronbach's alpha and Guttman split-half methods. These methods are critical for determining the internal consistency and reliability of the questionnaire, ensuring that the items within each dimension coherently measure the intended constructs. Specifically, the table delineates the stability coefficients across three distinct dimensions: the contributions of AI to innovation in education, its contributions to sustainability in education, and the challenges facing the use of AI applications in education. The Cronbach's alpha values for these dimensions are impressively high, with scores of 0.946, 0.932, and 0.872, respectively, while the Guttman split-half coefficients similarly indicate high reliability, with values of 0.937, 0.935, and 0.922.

The high Cronbach's alpha coefficients across all dimensions suggest that the questionnaire items are highly consistent with one another, effectively capturing the essence of each dimension. A Cronbach's alpha value above 0.7 is generally considered acceptable, with values closer to 1.0 indicating excellent internal consistency. The fact that the alpha coefficients for the contributions of AI to innovation and sustainability in education are above 0.93, and even the dimension addressing challenges in the use of AI applications in education exceeds 0.87, underscores the reliability of the questionnaire in providing a coherent measure of these constructs. This high level of internal consistency is crucial for affirming that the questionnaire items collectively form a valid measure of AI's impacts and challenges in the educational sector.

Table 3 Stability coefficients of the resolution and its subdimensions

Soap opera	Axles	Number of ferries	Alpha stability coefficient	Getman stability coefficient
1	Contributions of AI to innovation in education	9	0.946	0.937
2	Contributions of AI to sustainability in education	7	0.932	0.935
3	Challenges facing the use of artificial intelligence applications in education	6	0.872	0.922
The resolution as a whole		22	0.973	0.957

Furthermore, the Guttman split-half coefficients corroborate the findings suggested by Cronbach’s alpha, reinforcing the questionnaire’s reliability. These coefficients, ranging from 0.922 to 0.937 for the subdimensions and reaching 0.957 for the questionnaire as a whole, indicate a strong reliability and suggest that the questionnaire’s items are well-designed to assess the respective dimensions consistently. The overall high stability coefficient of 0.973 for the questionnaire signifies an exceptional level of internal consistency and reliability for the instrument as a whole. This level of reliability ensures that the questionnaire is a trustworthy tool for evaluating the contributions and challenges of AI in education, providing a solid foundation for research into how AI can drive innovation and sustainability in educational settings.

Procedures for Applying the Research Tool

After ensuring the sincerity and stability of the research tool, the researcher took several procedures so that he could apply the questionnaire, which were:

- Preparing the study tool in its final form after ensuring its truthfulness and stability
- Identifying the members of the study sample
- Distributing the questionnaire to the target group, then collecting it
- Conducting appropriate statistical analysis and coming up with and commenting on the results
- Preparing appropriate recommendations and proposals in light of these results

Third: Statistical Methods Used

The computer was used to enter the study data into the statistical program known as SPSS-V.17, i.e., Statistical Package for Social Science, and in order to analyze the study data, a set of statistical methods were used that are consistent with the objectives of the study and its methodology, namely:

1. Frequencies and percentages for each of the questionnaire phrases, in order to identify the opinions (responses) of the study sample members toward the degree of approval of the contributions of artificial intelligence in innovation in education, and to identify the various reasons that justify the respondents' answers, and to provide a more detailed description of these criteria.
2. *The relative weight* of the responses of the sample members to the questionnaire statements, which is given by the following equation:

$$\text{Relative weight} = \frac{5 \times \text{strongly agree repetition} + 4 \times \text{repeat ok} + 3 \times \text{neutral repetition} + 2 \times \text{repeat disagree} + 1 \times \text{repetition strongly disagree}}{\text{Total duplicates}}$$

3. Calculating (Ka2) to find out the statistical significance of the questionnaire statements for all members of the study sample, i.e., to verify the existence of significant differences in the responses of the study sample members on the degree of approval for each of the questionnaire phrases and the extent of the essence of these differences.
4. Correlation coefficients (Pearson's correlation coefficient) to verify the validity of internal consistency for the resolution.
5. Alpha Cronbach α coefficient to determine the degree of stability of the resolution.

For the purposes of statistical analysis of the results, the following criterion has been adopted:

Description	Range of averages	Relative weight
Strongly agree	From 4.2 to 5	84–100%
I agree	From 3.40 to 4.19	68–83.8%
Neutral	From 2.60 to 3.39	52–67.8%
Disagree	From 1.80 to 2.59	36–51.8%
Strongly disagree	From 1 to 1.79	20–35.8%

Second: The Results of the Study

The primary focus of this research was to explore the significant role artificial intelligence (AI) plays in fostering innovation within the educational sector. With this objective in mind, the study meticulously designed a questionnaire as a key instrument to gather relevant data, ensuring the instrument underwent rigorous validation processes to confirm its accuracy and reliability. The validation process involved assessing the questionnaire's truthfulness and calculating its stability coefficient, essential steps in establishing the instrument's credibility for capturing the nuanced contributions of AI to educational innovation.

Following the meticulous preparation and validation of the questionnaire, the study proceeded to the data collection phase. Respondents' answers were carefully

collected, after which the data underwent a structured coding process to facilitate efficient analysis. This crucial step involved transforming raw data into a format compatible with statistical analysis software, thereby preparing the groundwork for a comprehensive examination of the collected information. The coding process was instrumental in organizing the data systematically, ensuring that it could be accurately interpreted and analyzed.

The statistical analysis of the coded data was conducted using the Statistical Package for the Social Sciences (SPSS), a powerful tool for analyzing data in the social sciences. This sophisticated software enabled the researchers to perform an in-depth analysis of the data, applying various statistical methods to extract meaningful insights. The results of the study were then presented in a structured manner, aligned with the original sequence of the questionnaire's questions and the research hypotheses. This systematic approach to data analysis and presentation of findings allowed for a clear and coherent understanding of AI's contributions to innovation in education, highlighting the significant outcomes derived from the research.

First: Results related to (the contributions of artificial intelligence to innovation in education), which relates to the following question:

“What are the contributions of AI to innovation in education?”

To answer the previous question, the arithmetic averages, standard deviations, and percentages of the phrases of the axis of artificial intelligence contributions to innovation in education were extracted, and the study adopted the five-point Likert scale to estimate the degree of achievement of artificial intelligence's contributions to innovation in education. Table 4 shows the results as follows:

By extrapolating the results of the previous table, it was found that:

By reviewing Table 4 on “**Contributions of Artificial Intelligence to Innovation in Education,**” it is clear that:

* The average relative importance of the questionnaire statements “Contributions of Artificial Intelligence to Innovation in Education” = 4.54 with a relative weight (91%), which represents a degree of strong approval, meaning that the contributions of artificial intelligence have a major role in innovation in education.

* The percentage of approval for all the statements of the questionnaire strongly agrees with percentages ranging between 87% and 96%, the highest of which was statement No. (9), “**Artificial intelligence helps make education more efficient and effective,**” with 96%.

* As for the relative importance of the questionnaire phrases “Contributions of Artificial Intelligence to Sustainability in Education,” which is reflected in the relative weight of each phrase, by reviewing the previous Table No. 4, it is clear that:

Statement No. (9) “**Artificial intelligence helps make education more efficient and effective.**” In the first place, followed by statement number (4) “Artificial intelligence helps teachers improve and develop the teaching and learning process.” In second place came statement number (8), “Artificial intelligence helps improve self-learning.” In third place, and in the last place, came phrase number (2), “Artificial intelligence contributes to improving the teaching and learning experience,” preceded by statement number (5), which states “Artificial intelligence helps create new opportunities for learning.”

Table 4 Mean, relative weight, and the value of Ka2 and its level of significance for the expressions of AI's contributions to innovation in education

M	Phrase	Strongly agree	I agree	neutral	Dismissive	Strongly Refusing	Average	Relative Weight%	Standard deviation	Order	Ka2
1	Artificial intelligence contributes to providing outstanding educational content	as 165 % 85.2	18 9	0 0	0 0	17 8.5	4.56	91%	1.13	4	217.57**
2	AI improves teaching and learning experience	as 74 % 37	126 63	0 0	0 0	0 0	4.36	87%	0.48	9	13.52**
3	Artificial intelligence contributes to the development of modern assessment methods	as 124 % 62	56 28	20 10	0 0	0 0	4.52	90%	0.67	6	83.68**
4	AI helps help teachers improve and develop the teaching and learning process	as 126 % 63	74 37	0 0	0 0	0 0	4.63	93%	0.48	2	13.52**
5	AI helps create new opportunities for learning	as 109 % 54.5	53 26.5	38 19	0 0	0 0	4.37	87%	0.77	8	42.01**
6	AI helps improve the quality of teaching and learning	as 109 % 54.5	73 36.5	18 9	0 0	0 0	4.45	89%	0.65	7	63.01**
7	Artificial intelligence helps make the education process more inclusive	as 109 % 54.5	91 45.5	0 0	0 0	0 0	4.54	91%	0.49	5	1.62
8	Artificial intelligence helps improve self-learning	as 128 % 64	72 36	0 0	0 0	0 0	4.63	93%	0.48	3	15.68**
9	Artificial intelligence helps make education more efficient and effective	as 165 % 82.5	35 17.5	0 0	0 0	0 0	4.82	96%	0.38	1	84.50**

**Function at 0.01, *Function at 0.05

** With regard to statistical significance, it is noted that:*

By reviewing Table No. 4, it is clear from the value of Ka_2 that all the questionnaire statements are statistically significant at the level of (0.01) and in favor of strongly agreeing, meaning that there are statistically significant differences between university professors toward the contributions of artificial intelligence in innovation in education, which indicates its great role in promoting innovation in education. This is consistent with the theoretical framework of the study as well as the results of previous studies in emphasizing the importance of artificial intelligence's contributions to innovation in education.

Second: Results related to (the contributions of artificial intelligence to sustainability in education), which relates to the following question:

“What are the contributions of AI to sustainability in education?”

To answer the previous question, the arithmetic averages, standard deviations, and percentages of the phrases of the axis of artificial intelligence contributions to sustainability in education were extracted. The study adopted the five-point Likert scale to estimate the degree of achievement of artificial intelligence's contributions to sustainability in education. Table 5 shows the results as follows:

By extrapolating the results of the previous table, it was found that:

By reviewing Table 5 on **“Contributions of Artificial Intelligence to Sustainability in Education,”** it is clear that:

The analysis of the questionnaire responses revealed a high average relative importance score of 4.44 for the statements regarding “Contributions of artificial intelligence to sustainability in education,” accompanied by a relative weight of 89%. This significant figure underscores a robust consensus among respondents, indicating a strong agreement on the pivotal role that artificial intelligence (AI) plays in enhancing the sustainability of educational practices. Such a high level of agreement reflects the perception that AI's integration into educational frameworks is not just beneficial but essential for fostering sustainable educational environments that can adapt and thrive over time.

Further scrutiny of the questionnaire's feedback across all statements highlights a broad endorsement of AI's contributions, with approval ratings fluctuating between 82% and 91%. Notably, statement No. 4, which posits that “Artificial intelligence contributes to the availability of teaching and learning,” garnered the highest approval rate at 91%. This particular finding emphasizes the consensus among participants regarding AI's capacity to facilitate access to educational resources and opportunities, suggesting that AI technologies are seen as critical enablers in making education more accessible and efficient for a wider audience.

The detailed examination of the “Contributions of Artificial Intelligence to Sustainability in Education” within the questionnaire, as illustrated by the relative weight assigned to each statement, offers profound insights into the specific areas where AI is perceived to make significant contributions. By analyzing the data presented in the preceding table, it becomes evident that each statement, through its relative importance, contributes to a comprehensive understanding of how AI technologies are influencing the sustainability of educational practices. This granular analysis not only confirms the overarching positive perception of AI's role in

Table 5 Mean, relative weight, and the value of significance for statements of AI's contributions to sustainability in education

M	Phrase	Strongly agree		I agree		neutral	Dismissive	Strongly Refusing	Average	Relative Weight%	Standard deviation	Order	Ka2
		as %	91	109	0								
1	Artificial intelligence contributes to improving operational efficiency.	as 73 % 45.5	91	109	0	0	0	0	4.45	89	0.49	5	1.62
2	Artificial intelligence contributes to reducing costs	as 71 % 36.5	73	56	0	0	0	0	4.09	82	0.79	7	2.59
3	Artificial intelligence helps students develop the skills needed for the jobs of the future	as 93 % 46.5	93	18	0	0	0	0	4.37	87	0.64	6	53.41**
4	Artificial intelligence contributes to enabling teaching and learning	as 111 % 55.5	111	89	0	0	0	0	4.55	91	0.49	1	2.42
5	Artificial intelligence contributes to the creation of new opportunities for learning	as 108 % 54	108	46	0	0	0	0	4.54	90.5	0.49	2	1.28
6	Artificial intelligence contributes to improving the quality of education	as 106 % 53	106	94	0	0	0	0	4.53	90	0.50	4	0.72
7	Artificial intelligence contributes to new educational opportunities	as 106 % 53	106	47	0	0	0	0	4.54	90.5	0.50	3	0.72

**Function at 0.01, *Function at 0.05

education but also sheds light on the nuanced ways in which AI is driving educational innovation and sustainability, highlighting the multifaceted impact of AI across various educational domains.

Statement No. (4) “Artificial intelligence contributes to the availability of teaching and learning” came in *first place*, followed by statement No. (5) “Artificial intelligence contributes to creating new opportunities for learning.” In second place came statement number (7), “Artificial intelligence contributes to providing new educational opportunities.” In third place, and in last place, came statement No. (2), “Artificial intelligence contributes to reducing costs),” preceded by statement number (3), which states, “Artificial intelligence helps students develop the skills necessary for the jobs of the future.”

** With regard to statistical significance, it is noted that:*

By reviewing Table No. 5, it is clear from the value of Ka2 that the statement (3) is a function in favor of strongly agreeing, while for the rest of the statements in the second axis, there are no differences between strongly agree and agree, which indicates that the members of the study sample agree on the contributions of artificial intelligence to sustainability in education. That is, there are statistically significant differences between university professors toward the contributions of artificial intelligence to sustainability in education, which indicates its significant role in promoting sustainability in education, which is consistent with the theoretical framework of the study as well as the results of previous studies in emphasizing the importance of artificial intelligence’s contributions to sustainability in education.

Third: Results related to (challenges facing the use of artificial intelligence applications in education), which relates to the following question:

“What are the challenges facing the use of AI applications in education?”

To address the inquiry regarding the challenges associated with the deployment of artificial intelligence (AI) applications in the educational sector, the study meticulously calculated the arithmetic means, standard deviations, and percentage scores for each item within the challenges axis. This quantitative analysis was essential for gauging the prevalence and intensity of various obstacles that educators and institutions might encounter when integrating AI technologies into their curricula and administrative processes. By quantifying these challenges, the research aims to offer a clear and objective view of the hurdles that need to be addressed to facilitate smoother adoption of AI in educational settings.

The research methodology incorporated a five-point Likert scale, a widely recognized tool for measuring attitudes and perceptions, to assess the extent of each identified challenge’s impact on the use of AI applications in education. This scale enabled respondents to express their level of agreement or disagreement with each statement, ranging from minimal to significant challenges, thereby providing a nuanced understanding of the barriers faced. The adoption of this scale is pivotal for the study as it allows for a detailed and differentiated analysis of the challenges, offering insights into the specific areas where interventions might be necessary to overcome barriers to AI integration.

The findings of this meticulous analysis are presented in Table 6, which compiles the calculated averages, deviations, and percentages, offering a comprehensive

Table 6 Mean, relative weight, and the value of Ka2 and its level of significance for the statements of challenges facing the use of artificial intelligence applications in education

M	Phrase	Strongly agree	I agree	neutral	Dismissive	Strongly Refusing	Average	Relative Weight%	Standard deviation	Order	Ka2
1	The high cost is a challenge in using AI applications in education	as 53 % 26.5	74 37	73 36.5	0 0	0 0	3.89	78	0.79	6	4.21
2	The lack of skills presents a challenge in the use of AI applications in education	as 90 % 45	92 46	18 9	0 0	0 0	4.36	87	0.64	4	53.32**
3	Distrust of technology is an obstacle in the use of AI applications in education	as 123 % 61.5	38 19	39 19.5	0 0	0 0	4.42	88	0.79	3	71.41**
4	Concerns about social justice are an obstacle to the use of AI applications in education	as 126 % 63	56 28	18 9	0 0	0 0	4.53	91	0.65	1	90.04**
5	I'm concerned about privacy risks when using AI	as 65 % 32.5	129 64.5	4 2	2 1	0 0	4.28	86	0.55	5	217.72**
6	The use of artificial intelligence in education may lead to the loss of some educational functions	as 99 % 49.5	96 48	3 1.5	2 1	0 0	4.46	89	0.58	2	180.60**

**Function at 0.01, *Function at 0.05

overview of the challenges confronting the use of AI in education. This table serves as a critical reference point for educators, policymakers, and technologists alike, highlighting the key areas where efforts must be concentrated to address the challenges effectively. By dissecting these challenges through statistical analysis, the study not only sheds light on the obstacles but also sets the stage for developing targeted strategies to mitigate these barriers, thereby enhancing the efficacy and impact of AI applications in educational environments.

By extrapolating the results of the previous table, it was found that:

Upon meticulous analysis of Table 6, which delves into the “Challenges Facing the Use of Artificial Intelligence Applications in Education,” a notable finding emerges regarding the perceived obstacles within this domain. The table reveals an average relative importance score of 4.32 for the statements related to these challenges, alongside a relative weight of 86%. This significant score illustrates a strong consensus among respondents, acknowledging the presence of substantial challenges in implementing AI technologies in educational settings. Such a high level of agreement underscores the collective recognition of the hurdles that must be navigated to fully leverage AI’s potential in education, highlighting concerns that span ethical, logistical, and technical realms.

The data further indicates a robust agreement across all statements regarding the challenges, with approval rates oscillating between 78% and 91%. Remarkably, statement No. 4, which addresses “Concerns about social justice as an obstacle to the use of artificial intelligence applications in education,” secured the highest approval rate at 91%. This particular insight points to a widespread apprehension regarding the equitable deployment of AI technologies in education, suggesting that issues of social justice are perceived as significant barriers to the effective and fair use of AI in educational contexts. Such concerns reflect the broader societal debates on technology and equity, emphasizing the need for careful consideration of how AI applications are developed and deployed to avoid exacerbating existing inequalities.

Further examination of the relative importance assigned to each statement within this theme elucidates the hierarchy of concerns among educators and stakeholders. The prominence of statement No. 4 is followed closely by statement No. 6, which suggests that “The use of artificial intelligence in education may lead to the loss of some educational jobs,” indicating apprehensions about AI’s impact on employment within the sector. Meanwhile, statement No. 3, concerning “Lack of trust in technology as an obstacle in the use of artificial intelligence applications in education,” highlights the critical issue of confidence in technological solutions. Conversely, the least emphasized challenges were the high costs associated with AI implementation and privacy risks, though these remain significant considerations. This detailed breakdown not only underscores the complexity of integrating AI into educational frameworks but also guides future discourse and decision-making by pinpointing specific areas of concern that require attention and thoughtful intervention.

** With regard to statistical significance, it is noted that:*

Upon meticulous examination of Table No. 6, it becomes evident through the analysis of the Ka2 values that each statement within the questionnaire holds statistical significance at the 0.01 level, with a leaning toward strong agreement for the

majority of statements. This pattern underscores a remarkable consensus among university professors regarding the challenges associated with the implementation of artificial intelligence (AI) applications within the educational sphere. The exception to this trend was statement No. (1), which did not achieve statistical significance, suggesting a divergence in perceptions or perhaps a lesser degree of concern among respondents about that particular issue. This overall finding highlights a broad acknowledgment of the significant hurdles that need to be addressed to harness AI's full potential in education effectively.

The pronounced statistical significance of these statements, barring one, accentuates the critical role that understanding and addressing challenges plays in the broader endeavor to integrate AI into educational practices innovatively. It signals a widespread recognition among academic professionals that while AI offers substantial opportunities for enhancing creativity and learning outcomes, its adoption is not without obstacles. These challenges range from ethical considerations, such as privacy and social justice, to practical concerns like job displacement and trust in technology. The data suggests that these issues are not merely theoretical but are of practical concern to those at the forefront of educational innovation.

Furthermore, the alignment of these findings with the theoretical framework of the study and corroborations from previous research reinforces the argument that tackling the challenges of AI application in education is paramount. This consonance underlines the study's contribution to the ongoing discourse on AI in education, providing empirical evidence to support the critical examination of AI's implications for educational practices. By highlighting these statistically significant concerns, the research not only echoes the sentiments found in the literature but also advances the conversation by empirically validating the importance of addressing these challenges to foster an environment where AI can truly augment creativity and innovation in education.

6 Discussion

The "Discussion" section of our research provides a critical examination of the findings regarding the role of artificial intelligence (AI) in fostering innovation and sustainability in education. This section integrates the empirical data with theoretical insights, exploring the broader implications of our study's results. By contextualizing our findings within the existing literature and current educational practices, this discussion aims to highlight the transformative potential of AI technologies while addressing the practical challenges and ethical considerations that accompany their integration into educational systems.

6.1 Discussion of Findings

The “Discussion of Findings” section of our study meticulously correlates our empirical evidence with the foundational theories and previous empirical studies discussed in the literature review. This alignment is crucial for situating our findings within the broader academic discourse on the impact of artificial intelligence (AI) on educational innovation.

Firstly, the meticulous design of our questionnaire and its validation process align with the recommendations from Smith and Johnson (2023), who emphasize the importance of clear, unambiguous questionnaires in educational research. By adhering to these guidelines, our study ensures that the collected data accurately reflect the respondents’ true perceptions, free from the potential biases of misinterpretation.

Secondly, the involvement of expert arbitrators in the validation process of our questionnaire mirrors the practices described by Patel and Wang (2023). Their study on survey methodologies in educational research supports the use of expert reviews to enhance content validity. This step ensures that each questionnaire item is appropriate for measuring the intended construct, a process that is vital for obtaining reliable data that genuinely reflects the studied phenomena.

Finally, our approach to assessing the internal consistency of the questionnaire—through statistical measures like correlation coefficients—is supported by the findings of Thompson and Kumar (2024). They assert that such statistical validations are critical for confirming that a questionnaire is reliably measuring what it purports to measure across all items. High internal consistency in our study, indicated by significant correlation values, confirms the cohesiveness of the questionnaire, affirming that it is a robust tool for capturing the nuances of AI’s contributions to educational innovation.

In sum, our findings not only add new empirical data to the existing body of knowledge but also reinforce the methodological frameworks established by prior research. This synthesis of new and existing knowledge enhances the academic understanding of AI’s role in educational innovation and sets a precedent for future research in this rapidly evolving field.

6.2 Implications for Practice

The implications of our findings on the role of artificial intelligence (AI) in enhancing educational innovation and sustainability are profound and multifaceted, guiding future practice within educational systems globally. Firstly, our research highlights the critical role of AI in personalizing learning experiences, which aligns with the broader educational goals of increasing student engagement and learning

outcomes. Educational practitioners can leverage AI tools to tailor content to individual learning styles and needs, thereby fostering a more inclusive and effective educational environment. This practice not only improves student satisfaction and performance but also optimizes resource allocation within educational institutions (Harris & Logan, 2023).

Moreover, the integration of AI within educational settings significantly enhances the capacity for data-driven decision-making. Our findings suggest that AI can provide educators and administrators with valuable insights into student progress and curriculum effectiveness, facilitating more informed decisions about instructional strategies and resource deployment. This capability is especially crucial in dynamically adapting educational practices to meet evolving learning demands and environmental challenges, thus contributing to the sustainability of educational institutions (Fischer & Grant, 2024).

Additionally, the adoption of AI in education offers significant opportunities for reducing environmental impact and promoting sustainability. AI's ability to streamline operations and reduce resource waste—through more efficient management of energy use, materials, and campus facilities—demonstrates a practical application of technology in achieving eco-friendly educational practices. Educational leaders are encouraged to consider these sustainability benefits of AI as they plan future investments in educational technology, aligning with global sustainability goals (Chen & Thompson, 2022).

In practice, the deployment of AI technologies in education should be approached with careful consideration of ethical implications, particularly regarding data privacy and equity of access. Our study underlines the importance of establishing robust ethical guidelines to govern AI use in educational settings, ensuring that these technologies enhance rather than undermine equity and privacy. Institutions are advised to develop clear policies and training programs that address these concerns, thereby safeguarding students and enhancing trust in AI applications within educational contexts (Jackson & Roberts, 2024).

Finally, the ongoing development and integration of AI in education require a commitment to continuous professional development for educators. As AI tools evolve, so too must the skills and knowledge of those who implement and manage these technologies. Investing in professional development programs that focus on AI literacy and ethical usage will empower educators to effectively utilize AI tools, ensuring that these innovations deliver their intended benefits and support the sustainable advancement of educational systems (Kim & Patel, 2023).

7 Conclusions and Recommendations

In summarizing the impact of artificial intelligence (AI) on the educational landscape, it is evident that AI harbors the capacity to instigate significant advancements in how education is delivered, experienced, and managed. The potential of AI to enhance the efficiency and effectiveness of educational systems cannot be

understated. By automating routine tasks, providing adaptive learning experiences, and enabling data-driven decision-making, AI technologies are setting the stage for a more streamlined, impactful, and tailored educational journey for learners of all ages. This evolution toward more personalized learning environments underscores the transformative power of AI in education, promising to cater to the unique needs and learning paces of individual students.

As AI technologies continue to advance and become more integrated into various sectors, the educational domain stands to benefit from a wave of innovation that promises to redefine traditional teaching and learning paradigms. The ongoing development and application of AI in education are expected to usher in a new era of instructional methods, learning tools, and educational resources. These innovations aim to enhance the learning experience, making it more engaging, interactive, and accessible to a global audience. The prospect of AI-driven educational solutions offers a glimpse into a future where learning is not only more efficient but also more inclusive, transcending geographical, economic, and social barriers.

Despite being in the nascent stages of its application in education, AI has already demonstrated its potential through a variety of implementations that showcase its ability to improve both teaching and learning outcomes. From intelligent tutoring systems and virtual assistants to predictive analytics and personalized learning platforms, the early successes of AI in education provide a solid foundation for its future expansion. These examples highlight AI's capability to address diverse educational challenges, offering solutions that are scalable, adaptable, and responsive to the evolving needs of the educational community.

However, the journey toward fully realizing AI's potential in education is accompanied by the necessity for ongoing innovation and thoughtful consideration of sustainability practices. As AI technology continues to evolve, the educational sector must stay abreast of these developments, ensuring that AI applications are leveraged not just for immediate improvements but also for their long-term benefits to education. This approach calls for a balanced integration of AI that considers ethical implications, promotes equitable access, and supports the sustainability of educational systems. The future of AI in education is not only about harnessing the latest technologies but also about creating a learning environment that is resilient, adaptable, and capable of preparing learners for the complexities of the modern world.

This section provides actionable recommendations aimed at various stakeholders involved in the integration of AI into educational systems. These recommendations are designed to guide educators, policymakers, and technology developers in making informed decisions that will enhance the effectiveness and ethical deployment of AI technologies. By laying out these strategic directions, the study aims to contribute to the ongoing discourse in educational technology and support sustained progress toward more innovative and sustainable educational environments.

7.1 *Summary of Findings*

This section succinctly encapsulates the core outcomes derived from our comprehensive investigation into how AI technologies foster innovation and sustainability within educational frameworks. The findings are distilled from robust data analysis, providing crucial insights into the transformative impact of AI across various educational contexts. We can provide a summary of the findings as follows:

1. *Enhancement of Personalized Learning*: AI applications have significantly improved personalization in educational settings, enabling tailored learning experiences that adapt to individual student needs and learning styles, thereby increasing engagement and academic achievement.
2. *Facilitation of Data-Driven Decision-Making*: The use of AI has empowered educational institutions to make informed decisions based on data analytics. This includes optimizing educational resources, predicting student performance, and customizing learning and teaching strategies.
3. *Operational Efficiency*: AI tools have streamlined administrative and operational processes within educational institutions, leading to cost savings and more efficient use of resources. This contributes to the economic sustainability of these institutions.
4. *Support for Sustainable Educational Practices*: AI's role in promoting environmental sustainability includes reducing the carbon footprint of educational institutions through smarter resource management and supporting remote learning initiatives that lower physical infrastructure needs.
5. *Inclusivity and Accessibility*: AI technologies have made education more accessible to underserved populations, breaking geographical and socioeconomic barriers, which aligns with global educational equity goals.
6. *Ethical and Privacy Considerations*: The study also highlighted the need for robust ethical frameworks to address concerns related to data privacy and the equitable use of AI in education, ensuring that these technologies are used responsibly.
7. *Professional Development Needs*: There is a growing demand for professional development programs that can prepare educators to effectively integrate and utilize AI technologies in their teaching practices, emphasizing the need for continuous learning in the face of technological advancements.

7.2 *Recommendations for Future Research*

1. *Expand Research Demographics*: Future studies should consider diversifying the research demographics to include not only educators but also students, administrators, and IT staff to gain a comprehensive understanding of AI's impact across all stakeholders in educational ecosystems.
2. *Longitudinal Studies*: Conduct longitudinal studies to track the long-term effects of AI implementation in educational settings, providing insights into the sustainability and evolution of AI impacts over time.

3. *Comparative Studies*: Initiate comparative research to analyze the differences in AI adoption and outcomes between various types of educational institutions, such as public versus private or primary versus higher education.
4. *Focus on Emerging Technologies*: Investigate the integration of emerging AI technologies, such as natural language processing and predictive analytics, and their specific contributions to educational innovation and problem-solving.
5. *Ethical and Social Implications*: Deepen the research into the ethical, social, and privacy implications of AI in education, focusing on developing strategies to mitigate potential risks and enhance ethical usage guidelines.
6. *Barrier Analysis*: Study the barriers to AI adoption in less technologically advanced regions and devise strategic interventions to overcome these challenges, enhancing global educational equity.
7. *AI and Special Education*: Explore the potential of AI to support special education, particularly how it can be used to tailor educational experiences for students with specific learning disabilities.
8. *AI in Nontraditional Settings*: Examine the role of AI in nontraditional educational settings, such as online learning platforms, homeschooling, and adult education, to understand its broader applicability and effectiveness.
9. *Impact on Educational Policy*: Assess how AI influences educational policy-making and the required changes in regulations to accommodate and foster the ethical use of AI in education.
10. *Professional Development*: Evaluate the effectiveness of current professional development programs on AI competencies for educators and suggest improvements based on identified gaps.

Appendices

Questionnaire on the Contribution of Artificial Intelligence Applications (AI) to Innovation and Sustainability in Education

Introduction

Education in the current era is witnessing radical transformations in light of the Fourth Industrial Revolution, where technology plays a distinct role in the development of teaching and learning. Among the most important modern teaching and learning technologies is artificial intelligence (AI), which provides many opportunities for innovation and sustainability in education.

Objectives of the Questionnaire

This survey aims to gather participants' opinions and insights on the contribution of AI applications to innovation and sustainability in education.

First Theme: Contributions of artificial intelligence to innovation in education

M	Phrases	Response				
		Strongly refusing	Dismissive	Neutral	I agree	Strongly agree
1	Artificial intelligence contributes to providing outstanding educational content					
2	Artificial intelligence contributes to improving the teaching and learning experience					
3	Artificial intelligence contributes to the development of modern assessment methods					
4	AI helps help teachers improve and develop the teaching and learning process					
5	AI helps create new opportunities for learning					
6	AI helps improve the quality of teaching and learning					
7	Artificial intelligence helps make the education process more inclusive					
8	Artificial intelligence helps improve self-learning					
9	Artificial intelligence helps make education more efficient and effective					

Second Theme: Contributions of artificial intelligence to sustainability in education

M	Phrases	Response				
		Strongly refusing	Dismissive	Neutral	I agree	Strongly agree
1	Artificial intelligence contributes to improving operational efficiency					
2	Artificial intelligence contributes to reducing costs					
3	Artificial intelligence helps students develop the skills needed for the jobs of the future					
4	Artificial intelligence contributes to enabling teaching and learning					
5	Artificial intelligence contributes to the creation of new opportunities for learning					
6	Artificial intelligence contributes to improving the quality of education					
7	Artificial intelligence contributes to new educational opportunities					

Third Theme: Challenges facing the use of artificial intelligence applications in education

M	Phrases	Response				
		Strongly refusing	Dismissive	Neutral	I agree	Strongly agree
1	The high cost presents a challenge in the use of AI applications in education					
2	The lack of skills presents a challenge in the use of AI applications in education					
3	Distrust of technology is a hindrance in the use of AI applications in education					
4	Concerns about social justice are a barrier to the use of AI applications in education					
5	I'm concerned about privacy risks when using AI					
6	The use of artificial intelligence in education may lead to the loss of some educational functions					

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The Role of Artificial Intelligence in Developing the Educational System in Iraq



Edhah Numan Khazaal

Abstract The COVID-19 pandemic has affected all sectors of life around the world, and educational systems are one of these sectors. The application of advanced technologies such as artificial intelligence (AI) has entered and influenced our life-style, directly or indirectly forming tomorrow's future. It is impacting education in many different ways. It changes the way students learn and teachers teach, from personalized learning experiences to improving accessibility to education.

The study tries to discover the role of artificial intelligence in developing the educational system in Iraqi universities. A descriptive study was used to determine the role of artificial intelligence techniques in developing the educational system in Iraqi universities. The study population consisted of faculty members in the colleges of Al-Nahrain University during the first semester of the academic year 2022–2023.

To fulfill the study's aim, the researcher used the survey method (structured questionnaire and interview) to collect data, and a random sample was chosen, consisting of 120 members of the teaching staff at the mentioned university.

The results from the collected data show that the college members agreed to use AI techniques in developing the educational systems in Iraqi universities, and they are willing to adopt AI in their institutions. The research concludes by giving general recommendations for the future of education that all educational institutions need to apply AI technologies as an urgent need for our life and education.

Keywords Artificial Intelligence · Educational system · Technological development · Iraqi universities

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1 An Introduction

Technology has found its way into almost every field over the past 20 years. There has been a fast-growing trend in education to equip teachers with the development of modern technologies and how to use them in education to improve student outcomes.

With the rise of artificial intelligence, many sectors of society are being changed, and education is one of them. It has changed the way students learn and teachers teach.

It also improves educational outcomes, increases efficiency, and reduces costs.

AI systems can analyze data, adapt to inputs, and perform tasks that are traditionally associated with human intelligence, such as understanding spoken and written language, self-correction, and solving problems (Velik, 2012).

1.1 *The Problem and Its Significance*

The application of technology creates many ways for differentiated instruction to meet the requirements and needs of students as individual learners within a broader classroom situation, and we need to help teachers understand how to use technology to facilitate meaningful learning.

The application of advanced technologies, such as artificial intelligence, has entered an unprecedented period of rapid growth. It has become a very interesting topic, especially in education. Many scholars and researchers believe that the roles of teachers, schools, and leaders in education will change.

It is known that the educational system of teaching in Iraq was based on traditional educational systems, which may not be the most effective and comprehensive. Therefore, we need to develop the educational system to improve learners' achievement (Serin, 2022, p. 305).

The Ministry of Higher Education and Scientific Research in Iraq has traditionally adopted a traditional approach, but in recent years, the ministry has made many changes to develop the educational curriculum and programs across all educational systems by using modern technologies in education, because education plays a vital role in the development of human civilization. (Edhah, N. 2023.)

The application of advanced technologies such as artificial intelligence has entered an unprecedented period of rapid growth. It became a very interesting topic, especially in education. Many scholars and researchers believe that the role of teachers, schools, and leaders in education will change. AI has revolutionized the way we learn and teach by making it more personalized, engaging, and efficient.

The study is important for universities and colleges, as well as for academic professors, to develop the education system and to be aware of and ready for the expected AI transformation in the education field. In recent years, there has been a

growing trend in the educational system to incorporate modern technologies and practices to improve the educational process.

Artificial intelligence has transformed every step of people's lives (Garcia, 2016). The use of AI in education becomes an essential matter and is beneficial for both students and teachers because it changes how we learn quickly. It has led to a generation of technologies in education for use in classrooms and by school systems more broadly. This technology and the use of (AI) have become one of the highest priorities for our daily life. It highlights the importance of its use in education through the curriculum to ensure that all students are well-equipped for their academic futures but also for workforce development. It has a deep influence in the classroom, changing the relationship between teacher and student. (Guilherme, 2019, p. 7).

The study has two main objectives:

1. To explore the role of artificial intelligence in developing the educational system in Iraqi universities
2. To assess whether academic teachers are satisfied with artificial intelligence (AI) in developing the educational system

The study questions are as follows:

1. Does AI have an effect on developing the educational system?
2. Does AI solve the difficulties and challenges related to education?
3. Is AI useful in developing the educational system?

McCarthy (2007) defines intelligence as the ability, and, of course, a system may possess that ability to various degrees. Artificial Intelligence (AI) is a broad term that describes how computers and devices do things that, at the moment, people do better. (Rich & Knight, 1991.)

Artificial intelligence (AI) is the ability of a machine or computer to imitate, behave, and perform in a human-like manner. It refers to the ability to use certain techniques to achieve goals (Poole et al., 1998).

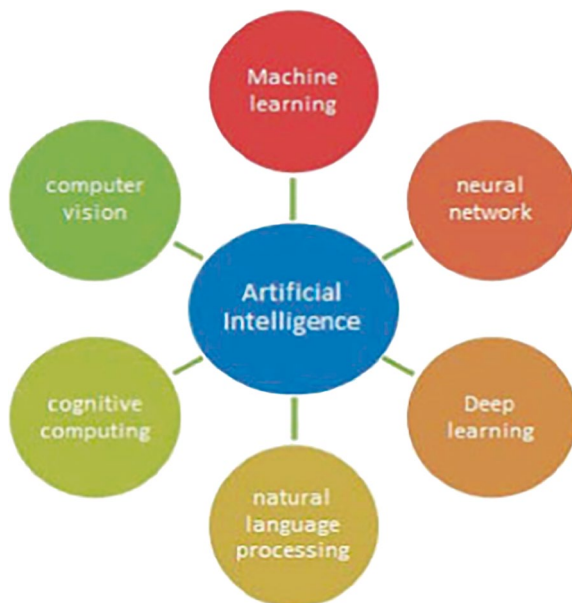
2 Literature Review

2.1 What Is Artificial Intelligence (AI)?

The term artificial intelligence was invented by John McCarthy in the year 1950. Artificial Intelligence is a term used to refer to computer programs that can perform certain tasks, such as learning and thinking.

Artificial intelligence (AI) is the ability to make machines or computer-based systems that can make predictions, recommendations, or decisions influencing real or virtual environments (Fig. 1).

Fig. 1 Artificial intelligence



Artificial intelligence (AI) is a branch of computer science that focuses on machines being able to act and think as humans Harkut & Kasat, 2019.

2.2 *The Value of Artificial Intelligence in Education*

AI (artificial intelligence) technology has influenced all aspects of our lives, including our systems. It can improve learning and teaching methods by helping learners of all different levels more accurately understand course materials.

Chaudhary (2017a, b) asserts that AI applications are necessary for both students and teachers to generate a learning environment and provide collaborative learning.

In general, AI teachers offer many advantages of artificial intelligence in the education process, provide many benefits for students, and could have the ability to identify weaknesses or automatically create curricula (Mitchell, 2019).

Neha (2020) tries in her research to find out the role of AI in education. She asserts that AI is the backbone of all the information science-enabled intelligent tutor systems. The study shows that AI is at the core of all the information science-enabled intelligent tutoring systems. This system helps in developing self-reflection, responsive deep queries, partitioning conflict statements, generating artistic queries, and choice-making skills.

Aldosari (2020) showed in his study how artificial intelligence can affect higher education at Prince Sattam Bin Abdulaziz University. To fulfill the aim of the study, the researcher used a qualitative research methodology by asking an open question.

2.2.1 Advantages and Disadvantages of Artificial Intelligence

Advantages of AI

The following are some of the main advantages of artificial intelligence:

Automation AI plays a crucial role in the business world. It has a notable impact on our lives, communications, and various industries. It enhances decision-making processes.

Efficiency, Accuracy, and Productivity AI can reduce the errors made by humans in certain situations. It helped mundane tasks that would take humans hours to complete be performed by AI algorithms in a short time.

Digital Assistants It is used on different websites, like Google and other websites, to provide things that are used and wanted by the users.

Availability AI machines can work without breaks, and they don't get bored, unlike humans.

Reduce Human Error The use of artificial intelligence can reduce errors to null if it is used in a good way, while humans can make mistakes.

Zero Risks AI, as a new technology, can overcome and prevent many of the most risky limitations of humans. It can produce accurate work by letting AI robots do it for us (Chaudhary, 2017a, b).

Disadvantages of AI

As there are some advantages to AI, there are still some disadvantages, as follows:

High Costs A computer machine needs to be updated from time to time, and it also needs repair and maintenance, which have plenty of costs.

Lead to Unemployment AI might replace the role of humans, which leads to unemployment and results in the death of many job opportunities.

Make Humans Lazy AI applications are machines that make humans lazy. They do nothing but give an order to the machine, and that may affect future generations.

Lack of Creativity It is the biggest disadvantage because creativity depends on past experiences and frames of reference, and AI cannot be creative like humans.

Ethical Concerns The two most important features of humans are ethics and morality, but it isn't easy to incorporate both of these into artificial intelligence (Cukurova & Luckin, 2018a, b).

3 Methodology

3.1 Design of the Study

The researcher employed a qualitative descriptive design to identify the role of artificial intelligence (AI) in developing the educational system in Iraq.

Population and Sample

The population of the study consists of 250 faculty members in the College of Political Science at Al-Nahrain University. The sample of the study consisted of 120 academic professors. They are Ph.D. holders and have at least 10 years of teaching experience; however, none of them had used AI in their classes before. The study was carried out in the first semester of the academic year 2022/2023.

Research Instrument

The researcher employed two instruments for collecting and gathering the data: a questionnaire and an interview.

The Questionnaire

The questionnaire consisted of two parts. The first part involves collecting the personal information of academic professors. They have to put down their demographic details (gender, designation, the teacher's level of education, and their teaching experiences). Frequencies and percentages were calculated (see Table 1).

The second part of the questionnaire was an online structured questionnaire using Google Forms to identify the role and abilities of AI technology in the educational process. It consisted of 16 items.

The Interview

The researcher constructed the interview; it is necessary to ask the participants and get their replies. The interview is addressed to 30 academics from the College of Political Science and was held between March 2023 and May 2023. It was conducted to get information about the professors, and it is designed to help the researcher deliver the main point of the study during the interview process. It was

Table 1 The teachers' demographic information

Demographic background F		N	Frequency %
Gender	Male	90	59.7%
	Female	60	42.3%
Designation	Professor	65	25.4%
	Asst. Prof.	85	66.2%
The teacher's level of education	Ph.D.	100	10.0%
Teaching experiences	6–10	55	28.4%
	11–16	60	39.8%
	17–25	35	20.9%
Total participants		150	

constructed with questions to get information about the professors' point of view concerning artificial intelligence.

Table 1 contains the demographic data of the participants' gender, designation, the teachers' level of education, and their teaching experience. It can be seen that the teaching experience of the faculty members, with 17 to 25 years of experience, is 20.9%, which is the highest percentage, followed by 11 to 16 years at 39.8%, and 6 to 10 years of experience at 28.4%.

The Procedures

One hundred questionnaire papers were sent to the academic teachers online. The participants filled out the questionnaire and sent it to the researcher in the same way. The results from the Google Form were collected and analyzed using a five-point Likert scale.

The participants were asked to choose from "agree," "fully agree," "neutral," "disagree," and "fully disagree" for each question listed in the questionnaire, with the scale ranging from 1 to 5-level score. See Appendix A.

An interview was conducted with each participant at the beginning of the study. It took about 20 min for each participant, where they were asked about the importance of the use of AI in developing the educational system compared to the traditional one.

The researcher collected the teachers' responses and their points of view on the items concerning the role of AI in developing the education system. The data were analyzed using descriptive statistical ways. A T-test was also computed to determine any statistically significant differences between the means of the professors' responses.

Pilot Study

A pilot study was conducted before the real study began to examine the appropriateness of the test items, as well as the validity and reliability of the content used in the questionnaire, in order to be accepted by college professors and candidates.

The test was applied to a random sample of 30 college professors during the second semester of the academic year (2022–2023). The results were recorded and statistically analyzed, and then the necessary revisions and recommendations were made in light of the statistical results.

Validity and Reliability of the Study

Validity and reliability are important features to evaluate the research instrument (Singh, 2014). The electronic questionnaires' items were calculated by presenting the Likert scale to 20 experts in the field of teaching. Their comments on some items were considered and amended.

The reliability coefficient of the study instrument was calculated using Cronbach's alpha. It shows that the reliability of the items of the questionnaire was 0.85. This indicated that the test was reliable.

4 Results and Discussions

4.1 The Results

The results of the study were obtained from the questionnaire's items by checking the answers of the teachers concerning the role of artificial intelligence techniques in developing the educational system.

The first part of the questionnaire's items regarding the teachers' demographic information indicates that most of the academic teachers had a high level of education and more than 10 years of experience in teaching, as mentioned in Table 1.

It is noticed from Table 2, in Appendix A, that most of the university teachers believe that artificial intelligence, as a new technique, can change the way of teaching and learning and improve the educational system in universities and institutions.

The teachers' answers to the questionnaire items show the following:

The responses to item one: (19.8%) agree, (18.3%) fully agree, (5.06%) were neutral, and (4.11%) disagree that AI has a positive effect on the education system.

In item two, the answers were (10.22%) agree, (5.11%) fully agree that AI will replace the teacher's role in teaching and learning, and (1.10%) were neutral. The answers to item three were (14.11%) agree and (15.14%) fully agree, while (5.10%) disagree that it is necessary to change everything in education, and (3.18%) were neutral. In item four, the answers were (16.23%) agree, (15.25%) fully agree, (6.22%) were neutral, (4.22%) disagree, and (1.0%) fully disagree that the education system will face many challenges in the use of these technologies in the future.

In item five, the answers were (14.11%) agree, (15.25%) fully agree, (3.00%) neutral, (3.12%) disagree, and no respondents fully disagree. In item six, the answers were (6.22%) agree, (5.19%) fully agree, (2.00%) neutral, (10.19%) disagree, and (2.00%) fully disagree. In item seven, the answers were (4.14%) agree, (2.15%) fully agree, (5.11%) neutral, (9.12%) disagree, and (5.00%) fully disagree that the testing process via AI can be successful and secure. In item eight, the answers were (2.22%) agree, (2.12%) fully agree, (1.15%) neutral, (5.12%) disagree, and no respondents fully disagree. In item nine, the answers were (15.52%) agree, (15.19%) fully agree, (1.12%) neutral, (1.16%) disagree, and (1.00%) fully disagree that AI would be a threat to human intellect in the future.

In item ten, the responses were (19.12%) agree, (15.19%) fully agree, (1.12%) neutral, (2.16%) disagree, and no respondents fully disagree. In item 11, the answers were (10.19%) agree, (16.11%) fully agree, (3.00%) neutral, (2.00%) disagree, and (1.00%) fully disagree. In item 12, (10.19%) agree, (6.17%) were fully agree, (3.12%) neutral, (1.13%) disagree, and no respondents fully disagree that AI will change our education system in the next coming year. In item 13, (5.52%) agree, (7.15%) fully agree, (3.12%) neutral, (1.00%) disagree, and no respondents strongly disagree that AI will be acceptable and enjoyable for students. In item 14, (16.12%) agree, (19.14%) were fully agree, (2.12%) neutral, (1.16%) disagree, and no respondents strongly disagree. In item 15, (8.19%) agree, (7.11%) were fully agree, (2.12%) neutral, (1.19%) disagree, and no respondents fully disagree that AI is able

to change what we learn and teach in universities. In item 16, (15.25%) agree, (13.10%) were fully agree, (2.18%) neutral, (1.10%) disagree, and no respondents fully disagree that AI is useful for helping teachers to schedule their work.

5 Discussions

The questionnaire results showed that most of the academic teachers responded positively to the idea of AI. *The highest percentage was (19.8%) who agreed that the use of artificial intelligence (AI) has a positive effect on the education system. There is a great deal of satisfaction and belief about technology and how it develops the educational system and the teaching and learning process.*

The study is compatible with Neha (2020), which showed that AI is the core of all the information science-enabled intelligent tutor systems, which asserted that technology has a positive impact on teaching and learning.

The study is also similar to Aldosari (2020), as the results showed that there is an increase in the realization of learners in using artificial intelligence applications in education, as the analysis of the results showed that there is a decrease in the level of awareness of the mechanisms of applying artificial intelligence, and that there is a need to further spread awareness in the Saudi environment about the possibilities of using artificial intelligence applications in education.

In return, the lower percentage of academic teachers who disagreed with AI was 1.10% that AI would force us to change the ways of teaching certain tasks. They are worried about the future of their institutions because AI techniques may replace human interaction and affect classroom teaching quality in the coming years, and it will replace the teachers' role in the teaching and learning process.

6 Conclusions and Recommendations

6.1 Conclusion

Artificial Intelligence (AI) is becoming a vital part of our everyday lives.

AI has the potential to revolutionize the education sector by enhancing learning experiences, supporting teachers, and offering more personalized learning opportunities for students. It improves student learning outcomes and provides real-time feedback to educators. It acts like a human brain and tries to solve problems as a human does.

The research revealed that most of the academic teachers are satisfied with applying AI applications in their teaching and learning processes, as AI provides personalized, adaptable, and insightful teaching. There is widespread agreement among

educators that AI will take a great and vital role in the future of education in the coming years.

Recommendations and Suggestions

The researcher recommends the following:

1. The researcher recommends university leaders to increase the academic teachers' knowledge of applying artificial intelligence in education.
2. Activate knowledge about the use of AI through special programs, practicing direction, and exercises via seminars and lectures.
3. To be aware of the struggles and difficulties caused by the implementation of AI by academic teachers in universities.
4. Teachers must master various techniques to motivate and enhance students' vocabulary.

Based on the findings, the researcher suggests the following:

1. Encourage academic teachers and researchers to perform more studies about the future of education in light of AI transformations
2. To investigate the students' perceptions of the use of AI applications in teaching and testing
3. To adapt the use of AI in the early stages of teaching and learning

Appendices

Teachers' Questionnaire

Teacher's responses to the questionnaire items

Rating system	5	4	3	2	1
Question items	Agree	Fully agree	Neutral	Disagree	Fully disagree
1. Do you think that the use of artificial intelligence (AI) has a positive effect on the education system?	19.8%	18.3%	5.06%	4.11%	0.00%
2. Do you think that AI will replace <i>the teacher's role</i> ?	10.22%	5.11%	1.10%	6.11%	1.00%
3. Do you think it is necessary to change everything in education?	14.16%	19.22%	3.18%	5.10%	1.00%
4. Do you think that the education system will face many challenges with the use of these technologies in the future?	16.23%	15.25%	6.22%	4.22%	1.00%
5. Do you think that AI will force us to change the ways of teaching certain tasks?	14.11%	15.14%	3.00%	1.12%	0.00%

6. Do you think that AI techniques can keep the teachers and students interacting?	6.22%	5.19%	2.00%	10.19%	2.00%
7. Do you think that the testing process via AI can be successful and secure?	4.14%	2.15%	5.11%	9.12%	5.00%
8. Do you think that the use of AI has a negative impact on the education system?	2.22%	2.12%	1.15%	5.12%	0.00%
9. Do you think AI would be a threat to human intellect in the future?	15.52%	12.15%	5.00%	2.22%	1.00%
10. Does the use of AI can improve the teaching-learning process?	19.12%	15.19%	1.12%	116%	0.00%
11. Do you think AI should be applied in the early stage in schools?	10.15%	8.15%	3.00%	2.00%	1.00%
12. Do you think that AI will change our education system in the next coming years?	10.19%	16.11%	1.12%	1.00%	0.00%
13. Do you think that AI will be acceptable and enjoyable for students?	5.52%	7.15%	1.10%	1.11%	0.00%
14. Do you think that AI impacted/influenced the methods of teaching?	16.12%	19.14%	2.12%	1.16%	0.00%
15. Is AI able to change what we learn and teach in universities?	8.19%	7.11%	2.12%	1.19%	0.00%
16. Do you think that AI is useful to help teachers to schedule their work?	15.25%	13.10%	110%	1.00%	0.00%

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Effectiveness of Augmented Reality in Enhancing Attention in Children with Autism Spectrum Disorder



Reem Abdullah Alkenani, Feras Ahmad Hamid Hanandeh,
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Abstract The study aims to investigate the effectiveness of augmented reality (AR) technology in improving attention in children with autism spectrum disorder (ASD) at the Autism Consultation Center in the capital city of Amman during the second semester of the academic year 2022/2023. The study's sample consisted of 12 children with ASD, selected purposively. The researchers followed a quasi-experimental approach. To achieve the study's objectives, they developed an attention assessment scale for children with ASD based on previous studies and theoretical literature. The scale's reliability and validity were ensured. In addition, a program based on AR strategy was developed. The study revealed statistically significant differences in the average scores of children with ASD in the experimental group on the dimensions of both the pre- and post-tests of the Attention Assessment Scale (initiation of joint attention for obtaining a tangible item, responding to joint attention revolving around a tangible item, initiation and responding to joint attention for social participation, the child's ability to perform imitation skills and vocalization). These differences favored the post-test. However, there were no statistically significant differences between the average ranks of the children (experimental group) on the attention assessment scale in both the pre- and follow-up tests.

Keywords Augmented reality · Attention · Spectrum autism disorder

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1 Introduction

Autism spectrum disorder (ASD) is classified as a pervasive developmental disorder, and its symptoms typically manifest before a child reaches the age of 3. It is characterized by deficits in social and communication skills, limited interests, and activities, as well as impairments in imaginative play. In addition, repetitive and stereotypical behaviors are prominent features of ASD and hold significant importance in the early diagnosis of ASDs (Al-Zaraa, 2017).

Individuals with ASD often experience weaknesses in attention, focus, and sustaining attention. This deficit is evident in their inability to maintain eye contact with a speaker or difficulty tracking signals and movements. They may also struggle with directing attention toward people and shifting their attention from one sensory modality to another can be challenging. In addition, attention deficits in children with ASD contribute to educational difficulties and are linked to negative impacts on their academic performance and social interactions. These attention-related challenges can adversely affect their overall educational experience (Al-Sayyid et al., 2019).

Knowledge acquisition in children with ASD is a crucial outcome in the teaching and learning process. However, this process faces challenges that hinder the achievement of its goals, such as developmental issues related to attention and concentration. Addressing these challenges requires a shift from traditional education to e-learning, utilizing modern technologies such as augmented reality (AR). AR has become increasingly significant within educational plans, especially given the continuous evolution of mobile internet usage (Hazam, 2021).

Attention is considered one of the cognitive processes (attention, perception, memory, thinking). It serves as the gateway through which information is identified and filtered before entering the realm of memory. This process allows the desired information to pass through while preventing unwanted information, keeping the individual alert to deal with various stimuli and situations in the surrounding environment. Consequently, this enhances their ability to communicate and interact with others and the surrounding environment (Alkenani et al., 2023).

The significance of attention lies in its crucial role in interacting and responding to various events and stimuli, particularly those associated with the emotional aspect. There is a strong relationship between attention on one hand and emotions and reactions on the other. Researchers attempt to understand emotions through the sources of attention (Hussein, 2017).

Attention deficits in children with ASD are fundamentally linked to many educational problems and difficulties. It negatively impacts their academic performance, and the characteristics of attention deficits generally affect their learning outcomes, particularly in terms of academic achievement and the retention of learning effects. Educators have given paramount importance to the issue of improving attention due to its significant impact on learning (Cakir & Korkmaz, 2019).

What distinguishes attention in children with ASD is their limited and focused attention on different things in their specific environment. They tend to concentrate

on stimuli comprehensively, and it is easy for their attention to be easily diverted from one stimulus to another. Attention-related issues in children with ASD are considered problems associated with their educational process, negatively impacting their academic performance and social interaction (Hussein, 2017).

Augmented reality technology is one of the terms that has emerged recently. Due to the openness of education to technology, AR has found its way easily into the field of education. This technology significantly contributes to redefining the concept of education, making it a goal with purpose. It is believed that the term “AR” was first coined by the former researcher at Boeing, Thomas Caudell, in 1990. AR is defined as “technology based on projecting virtual objects and information into the user’s real environment to provide additional information or serve as a guide for the user” (Abu Naji et al., 2019, p. 703).

AR technology is considered one of the latest technologies that involve integrating electronic images with multimedia such as video and audio. This integration presents itself to the learner as if it were a virtual reality, but with realistic images from the learner’s camera. This highlights its significant benefits in the field of education. One of the notable features of AR within resource rooms is its ability to deliver information engagingly, facilitating the learning process smoothly and effortlessly. It motivates creativity and is considered a necessity in various work environments and daily communication among individuals, whether within a family or a community (Al-Baz et al., 2016).

AR technology relies on the system’s recognition of real-world features to link them to the corresponding virtual elements pre-stored in its memory. These virtual elements can include geographical coordinates, location information, instructional videos, or any other data that enhances the real world. AR software utilizes the camera of a mobile phone or tablet to perceive the real world, analyzes it according to the program’s requirements, and then integrates the virtual elements accordingly (Jawish & Hashem, 2019).

Many studies, such as those conducted by Jouda and Hussein (2018) and Al-Bayd (2022), have indicated that AR technology is one of the most important technologies in helping students develop various learning outcomes. This is achieved by connecting abstract concepts and information to a visual reality in videos, making comprehension and long-term recall easier. This is supported by the theory of multimedia synchronicity, where compatibility between the capabilities of the medium and information delivery, on the one hand, and information processing and convergence in meaning, on the other hand, is emphasized. AR technology, where students interact with content displayed on their smartphones, enhances convergence in meaning by clarifying abstract concepts and natural phenomena that are difficult to observe in reality. Due to the promising potential of AR technology in improving attention, many advanced countries have shown interest in it and attempted to leverage it to make education more interactive and realistic. This is achieved by technologies that stimulate learners, with AR being one of the key acquisitions of technology that can be easily used by students within resource rooms due to its user-friendly nature.

In this context, Osman et al.'s (2022) study aimed to design and implement a software application based on AR technology. This application was intended to contribute to the development of some nonverbal communication skills in a sample of children with ASD, numbering 20 children in the state of Qatar. The study utilized an assessment scale designed by the researchers to evaluate nonverbal communication skills in children with ASD. In addition, an AR application was used on tablet devices called AR-QU-CUBE FOR ASD and a toolkit (both designed by the researchers). The study followed a quasi-experimental design, and some of its notable results include the effectiveness of the AR application in developing the recognition skills of basic human emotions such as happiness, surprise, sadness, anger, fear, and pain in children with ASD. Furthermore, the study found a development in some adaptive behaviors in social situations, including the awareness of certain hazards such as drowning and electricity.

Al-Suwaidi et al. (2022) aimed to uncover the effectiveness of an alternative enrichment program in improving attention components in children with ASD. The research sample consisted of 12 children. The research tools included an assessment scale for visual attention components (direction of attention, attention shifting, attention span, selective attention) in children with ASD and an alternative electronic enrichment program with activities related to attention direction, attention span, and attention shifting. The research results revealed statistically significant differences at a significance level of ($\alpha = 0.05$) in the scale assessing visual attention components in attention direction, attention span, and attention shifting between pre- and post-test, favoring the post-test measurement. In addition, there were statistically significant differences at a significance level of ($\alpha = 0.05$) in the scale assessing visual attention components in attention direction, attention span, and attention shifting between the pre- and follow-up tests, favoring the follow-up test.

Al-Zaydi and Al-Harbi (2022) explored the impact of AR technology on developing reading skills, including reading comprehension and reading fluency, among female students with ASD in government primary schools in Jeddah. Following a quasi-experimental approach, the study found that female students with ASD who were taught using AR technology outperformed those who were taught through traditional methods in the achievement test of reading skills as a whole (reading comprehension and reading fluency).

Al-Bayd (2022) aimed to uncover the importance of employing electronic applications based on the Picture Exchange Communication System (PECS) in developing communication and social interaction skills among students with ASD. The research utilized a descriptive survey methodology, and a survey tool of 39 items divided into three dimensions was employed to collect data. The survey was administered to a sample of 37 teachers of students with ASD and five supervisors. The results of this study indicated that the overall mean for the importance of teachers of students with ASD employing electronic applications based on the PECS in the educational environment was 4.38, indicating a very high level of importance. The results also showed no statistically significant differences at the 0.05 level in the requirements for employing electronic applications based on the PECS in the educational environment based on the academic specialization, job level, educational

qualification, years of professional experience, and the level of dealing with educational technology.

Gaastra et al. (2020) conducted a study to measure the extent of primary and secondary school teachers' use of evidence-based classroom management strategies for students with attention deficit hyperactivity disorder (ADHD) in the Netherlands and their perceived effectiveness. The study involved 140 teachers, and the researcher used a quasi-experimental approach. The results indicated that teachers often use behaviorally based classroom management strategies. Primary school teachers use these strategies to a greater extent with students with ADHD compared to typical students.

Lorenzo et al.'s (2019) study aimed to evaluate the effectiveness of an AR-based training program with visual support for students with ASD to enhance social skills. The sample consisted of 11 children, and the researchers used "The Autistic Spectrum Inventory of Riviere" tool. Both pre- and post-test assessments were conducted on the two groups, and the educational program utilized the Quicker Vision application as an AR intervention method to collect data. The study followed a quasi-experimental design and revealed no statistically significant differences between the two groups. However, slight improvements were observed in flexibility and imitation skills, suggesting the need for further exploration of different social skill domains using AR-based training programs.

Mahayuddin et al. (2019) investigated the effectiveness of using AR technology in teaching phonetics to individuals with ASD to enhance their reading and writing skills. The study sample included 10 children with ASD, aged between 4 and 10 years, both males and females, who had language skill deficiencies. The sample was purposively selected. The study employed an AR-based phonetics learning tool and pre- and post-test assessments to collect data. The research followed a quasi-experimental design, and among its notable findings was that the experimental group exhibited engagement with AR technology, showing increased attention to learning phonetics.

McMurray (2019) examined the effectiveness of technology in increasing demand and communication levels among students with ASD. The study compared alternative and augmentative communication (AAC) systems, including the iPad with the Proloquo2GO application and the manual Picture Exchange Communication System (PECS). The research followed an experimental design with a sample of five students with ASD. The results indicated that the iPad produced a higher rate of independent requests and showed positive learning outcomes in facilitating communication skills for students with ASD.

Demir et al. (2019) measured the impact of AR mobile applications on the educational motivation of students in health sciences at the University of Cape Town. The study included a sample of 78 students and utilized a descriptive research design with a survey tool. The results showed that AR mobile applications increased learning motivation among the students.

In this study, a scale for the study tool was developed, namely, the attention scale with an AR program. The study built upon previous research to enrich the theoretical framework, identify the appropriate methodology, and discuss the results. What

sets this study apart from previous ones is its aim to explore the effectiveness of AR technology in improving attention in children with ASD.

1.1 Statement of the Problem

The research aims to address the educational needs of students with attention and concentration deficits by creating a flexible and effective instructional model that enhances their attention. This is crucial to achieving educational goals tailored to their psychology, abilities, and characteristics (Khazaalah, 2018). Previous studies, such as Cakir and Korkmaz (2019), recommended investigating the impact of AR design and development in the environments of children with ASD. Another study by Al-Bayd (2022) suggested using AR to increase academic achievement among students. In addition, Hassanein et al. (2021) suggested implementing special programs to reduce attentional distractions in children with ASD. The research stems from various sources, with a primary focus on children with ASD. The researchers also reviewed relevant theoretical literature and studies that addressed the study variables, particularly attention issues in children with ASD, and the scarcity of studies that explored the use of AR technology to improve attention in these children. The research problem arises from the keen interest in children with ASD and the need to explore new techniques, such as AR technology, to enhance attention in these children. The study recognizes the attention deficits in students with ASD as a fundamental issue leading to various educational problems and negatively impacting their academic performance, social interaction, and communication. Therefore, the study aims to investigate the effectiveness of using AR to improve attention in children with ASD by answering the following question: What is the effectiveness of using AR in improving the attention of children with ASD?

1.2 Hypotheses of the Study

The following are the hypotheses of this study:

1. There are statistically significant differences at a significance level of ($\alpha \leq 0.05$) between the mean scores of the experimental group in the pre- and post-tests on the attention scale in favor of the post-test attributed to the use of AR technology.
2. There are no statistically significant differences between the mean ranks of the scores of the experimental group in the pre- and follow-up tests on the attention scale.

1.3 Objectives of the Study

This study aims to enhance attention in children with ASD using AR technology and to investigate the impact of the interaction between employing AR technology and attention in a sample of children with ASD.

1.4 Significance of the Study

The study contributes to adding scientific research to the library of studies on the effectiveness of AR technology to improve attention in children with ASD. It opens new avenues for researchers to conduct further studies related to the use of AR technology in enhancing attention in children with ASD. It is hoped that the study will guide specialists in the field of ASD toward the importance of utilizing AR technology to improve attention. In addition, it aims to contribute to the development of programs that enhance attention in children with ASD. Moreover, this study stands on results that reveal the effectiveness of AR technology in improving attention in children with ASD and attempts to address and process these findings.

1.5 Key Terms of the Study

AR: AR is defined as “technology based on projecting virtual objects and information into the user’s real environment to provide additional information or serve as a guide” (Ismail, 2018, p. 203). In this study, AR is defined as the integration of electronic means and scientific content to create a reality that enhances learning and teaching.

Attention deficit: “The child’s diminished ability to concentrate on a specific subject for some time, susceptibility to external and internal distractions, along with difficulty in completing tasks and assigned activities” (Thabit, 2017, p. 9). In this study, it is defined as a noticeable excess activity that can be measured and affects the level of attention and concentration to accomplish a specific task, expressed by the degree obtained by a child with ASD on the attention assessment scale used in this study.

ASD: A disorder or syndrome defined behaviorally, encompassing impairments in areas, such as growth, sensory response to stimuli, language and speech, cognitive abilities, attachment and affiliation to people, and attachment to events and topics (Al-Sayyid et al., 2019, p. 40).

1.6 Delimitations of the Study

This study aims to verify the effectiveness of utilizing AR technology in improving the attention of children with ASD. The research was conducted on all students with autism, totaling 12 male and female students, as indicated by the records of the Autism Consultation Center in the capital city of Amman, Jordan. The program used in this research was implemented at the Autism Consultation Center in the capital city of Amman during the second semester of the academic year 2022/2023, spanning 3 months.

2 Methods

The researchers employed a quasi-experimental approach suitable for this study to reach conclusions that contribute to understanding and analyzing the effectiveness of utilizing AR technology in improving attention in children with ASD.

2.1 Sample of the Study

The research sample consisted of a group of children with ASD, totaling 12 children, whose ages ranged between 9 and 11 years. Homogeneity was ensured among the group in variables such as chronological age, intelligence level, and the severity of ASD during the second semester of the academic year 2022/2023.

2.2 Tools of the Study

The study utilized an AR program and an attention assessment scale for children with ASD developed by the researchers:

1. AR program: This program was developed to enhance attention skills in a sample of children with ASD through an AR-based program. The program aims to assist children with ASD in improving their attention skills. The program was built in light of theoretical literature emphasizing the importance of the AR model in addressing developmental issues. It includes 12 sessions, each session lasting for 40 min. The program was implemented over a period of 3 months at the Autism Consultation Center in the capital city of Amman, Jordan. Through the overall goal of the program, a set of subsidiary objectives have been derived that the program seeks to achieve, including:

- Introducing children with ASD to the AR-based program.
 - Clarifying the characteristics of children with ASD and the significant developmental challenges they may face.
 - Encouraging teachers to utilize learning styles according to the AR model, identifying the suitable style for each student’s profile, and enhancing their attention. The AR-based program was applied during the second semester of 2022/2023, spanning 3 months.
2. Attention assessment scale: The attention assessment scale for children with ASD was developed after referencing previous studies, such as the study by Al-Bayd (2022), and considering the scientific methods used in specialized American centers to measure and treat a child’s attention deficit. The initial scale consisted of 33 items; after presenting it to a group of experts and considering their opinions and suggestions, the number of items was reduced to 31. The scale is filled out by the supervising teacher of the student, taking into account accuracy, objectivity, and the alignment of items with observable behavior. After completing the scale by the teacher, the scores are calculated using the following method:

Rarely = 1 mark.

Sometimes = 2 marks.

Often = 3 marks.

Always = 4 marks.

- The minimum score that can be obtained is 31 points.
- The maximum score that can be obtained is 124 points.
- Attention scores are classified as follows:
 - Low: Less than 62
 - Moderate: Less than 93
 - High: Less than 124.

2.3 Variables of the Study

The variables of the study are:

- First: Independent Variable—AR strategy.
- Second: Dependent Variable—Attention in children with ASD.

2.4 Data Analysis

To achieve the study’s objectives, data were processed using the Statistical Package for the Social Sciences (SPSS); mean values, standard deviations, and the Wilcoxon signed-rank test were employed for data analysis. To test the hypotheses, the Likert scale was utilized, indicating the following scale:

Table 1 Attention assessment scale

Degree	1	2	3	4
Agreement	Rarely	Sometimes	Often	Always

- A score of (1) represents “Rarely.”
- A score of (2) indicates “Sometimes.”
- A score of (3) signifies “Often.”
- A score of (4) expresses “Always.”

To interpret the mean values of the study sample’s assessments for each item and domain of the survey, the following statistical standard was applied, as illustrated in Table 1.

Regarding the criteria adopted by this study when commenting on the mean values of the variables in its model to determine the level of assessment, the researcher defined three levels, namely Low, Moderate, and High, based on the following equation:

Range = (Upper limit of the alternative – Lower limit of the alternative) / Number of levels

$$\text{Range} = (4 - 1) / 3 = 3/3 = 1.$$

Thus, the levels are as follows:

- Low agreement level: Value of 1–2.
- Moderate agreement level: Value of 2.01–3.
- High agreement level: Value of 3.01–4.

2.5 Procedures of the Study

The study procedures comprised the following steps: selecting the study title, reviewing relevant previous studies, preparing the study tools, including the attention scale, verifying the tool’s validity and reliability, and developing the AR strategy. Relevant protocols for applying the program to the study sample were then extracted. Then, the tools were applied to the survey sample to calculate validity and reliability. The study tool was distributed to the study sample and implemented under the supervision of teachers specializing in ASDs. The data were then collected from the respondents within the study sample. Subsequently, the study results were analyzed and discussed, leading to the formulation of recommendations based on the study findings.

3 Results and Discussion

3.1 Results and Discussion of the First Hypothesis

There are statistically significant differences at a significance level ($\alpha \leq 0.05$) between the mean scores of the experimental group in the pre- and post-tests on the attention scale in favor of the post-test attributed to the use of AR technology.

The Wilcoxon signed-rank test was calculated to examine the ranks of scores associated with the pre- and post-tests of the attention scale for the experimental group. To measure the effect size of the experimental treatment on improving attention, the effect size was calculated. Table 2 shows the results.

Table 2 indicates statistically significant differences at a significance level of ($\alpha \leq 0.05$) between the average ranks of scores for children in the experimental group in the pre- and post-tests on the attention scale, favoring the post-test. This result means that the average ranks of scores for children with ASD in the experimental group on the attention scale were statistically significantly lower in the pre-test compared to the post-test. Furthermore, the values of the correlation coefficient

Table 2 Results of the Wilcoxon signed-rank test for the ranks of scores of children with ASD in the experimental group in the pre- and post-tests on the attention scale

Dimension	Signs (pre- and post-test)	No.	Mean avg.	Sum of means	Z	Significant	Effect size (rprb)	Effect level
Initiation of joint attention for obtaining a tangible item	Negative(*)	12	4.00	28.00	3.047	0.05	1	very High
	Positive(**)	0	0.00	0.00				
	Zero(***)	0						
Responding to joint attention revolving around a tangible item	Negative(*)	12	4.00	28.00	3.047	0.05	1	very High
	Positive(**)	0	0.00	0.00				
	Zero(***)	0						
Initiation and responding to joint attention for social participation	Negative(*)	12	4.00	28.00	3.047	0.05	1	very High
	Positive(**)	0	0.00	0.00				
	Zero(***)	0						
The child's ability to perform imitation skills and vocalization	Negative(*)	12	4.00	28.00	3.047	0.05	1	very High
	Positive(**)	0	0.00	0.00				
	Zero(***)	0						
Total	Negative(*)	12	4.00	28.00	3.047	0.05	1	very High
	Positive(**)	0	0.00	0.00				
	Zero(***)	0						

* Represents statistical significance at a p-value of less than 0.05 (95% confidence)
 ** Represents stronger statistical significance at a p-value of less than 0.01 (99% confidence)
 *** Indicates very strong statistical significance at a p-value of less than 0.001 (99.9% confidence)

for the ranks of the associated pairs (rbr) indicate a very strong effect of the experimental treatment in improving attention among children in the experimental group.

Table 3 illustrates the means and standard deviations of the experimental group's scores in the pre- and post-tests on the attention scale.

Figure 1 illustrates the differences between the means of the scores of the experimental group in the pre- and post-tests on the attention scale.

The researchers explain these results by stating that AR technology aids individuals in learning skills and acquiring knowledge. AR can be utilized for teaching

Table 3 Means and standard deviations of the experimental group's scores in the pre- and post-tests measurements on the attention scale ($n = 12$)

Test	Post-test	Initiation of joint attention for obtaining a tangible item	Responding to joint attention revolving around a tangible item	Initiation and responding to joint attention for social participation	The child's ability to perform imitation skills and vocalization	Total
Pre-test ($n = 12$)	Mean	6.35	3.96	8.50	6.52	25.33
	Standard deviation	1.55	1.55	1.52	1.66	2.3
Post-test ($n = 12$)	Mean	12.8	14.38	15.3	13.52	56
	Standard deviation	2.89	2.22	1.50	1.52	5.55

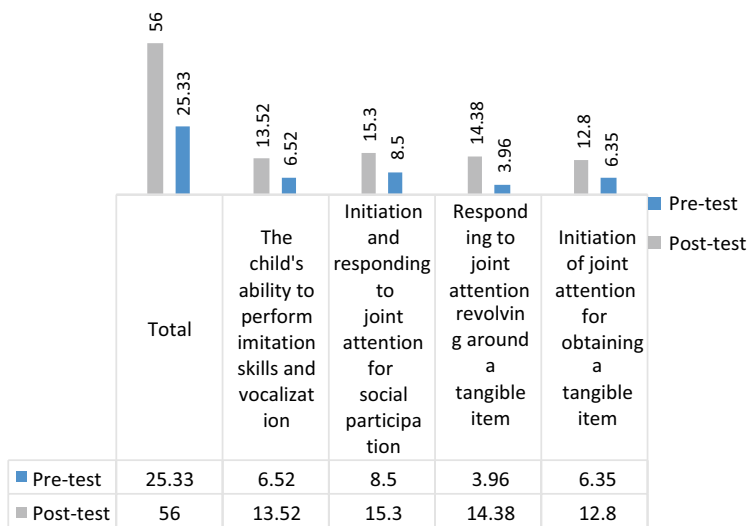


Fig. 1 The differences between the means of the scores of the experimental group in the pre- and post-tests on the attention scale

various subjects as it enhances self-directed learning, critical thinking, and develops cognitive, language, social, and technical skills for children with ASD. It significantly improves attention processes, as evidenced by the positive impact on the overall scores and rankings of children on the attention scale in all its dimensions. These findings align with a study by Al-Suwaidi et al. (2022), which also reported statistically significant differences at a significance level of $\alpha = 0.05$ for the components of visual attention (orienting attention, sustaining attention, and shifting attention) between pre- and post-test measurements in favor of the post-test measurements.

3.2 Results and Discussion of the Second Hypothesis

There are no statistically significant differences between the mean ranks of the scores of the experimental group in the pre- and follow-up tests on the attention scale.

Table 4 presents the results of the Wilcoxon signed-rank test for the ranks of scores of the experimental group in the pre- and post-tests on the attention scale. The Wilcoxon test was calculated to assess the significance of the paired ranks related to the averages of the scores. Table 4 depicts the results.

Table 4 Results of Wilcoxon signed-rank test for the ranks of scores of children with ASD in the experimental group in the pre-and-post-tests on the attention scale

Dimension	Signs (post- and pre-tests)	No.	Mean avg.	Sum of means	Z	Effect size
Initiation of joint attention for obtaining a tangible item	Negative(*)	2	4.00	8.00	0.577	0.564 No effect
	Positive(**)	8	4.00	32.00		
	Zero(***)	2				
Responding to joint attention revolving around a tangible item	Negative(*)	2	4.00	8.00	1.089	0.355 No effect
	Positive(**)	8	4.00	32.00		
	Zero(***)	2				
Initiation and responding to joint attention for social participation	Negative(*)	0	0.00	0.00	1.750	0.097 No effect
	Positive(**)	10	4.00	40.00		
	Zero(***)	2				
The child’s ability to perform imitation skills and vocalization	Negative(*)	1	4.00	4.00	1.444	0.220 No effect
	Positive(**)	9	4.00	36.00		
	Zero(***)	2				
Total	Negative(*)	3	4.00	12.00	1.219	0.324 No effect
	Positive(**)	9	4.00	36.00		
	Zero(***)	0				

* Indicates statistical significance at a p-value of less than 0.05 (95% confidence)
 ** Represents stronger statistical significance at a p-value of less than 0.01 (99% confidence)
 *** Denotes very strong statistical significance at a p-value of less than 0.001 (99.9% confidence)

From Table 4, it appears that there was no statistically significant difference at the significance level ($\alpha \leq 0.05$) between the average ranks of scores for children with ASD in the experimental group in the pre- and post-tests on the attention scale. In addition, Table 5 provides information on the means and standard deviations of the scores for the experimental group in the pre- and follow-up tests on the attention scale.

Figure 2 illustrates the differences between the means of scores for the experimental group in the pre- and follow-up tests on the attention scale.

The researchers interpret these results by emphasizing that AR is considered a modern educational strategy that has proven its effectiveness and ability to serve the educational process. What distinguishes it is its capability to make learners active and engaged during AR experiences. When presented to learners, it captures their

Table 5 Means and standard deviations of scores for the experimental group in the pre- and follow-up tests on the attention scale ($n = 12$)

Test	Post-test	Initiation of joint attention for obtaining a tangible item	Responding to joint attention revolving around a tangible item	Initiation and responding to joint attention for social participation	The child's ability to perform imitation skills and vocalization	Total
Post-test ($n = 12$)	Mean	12.8	14.38	15.3	13.52	56
	Standard deviation	2.89	2.22	1.50	1.52	5.55
Follow-up-test ($n = 12$)	Mean	14.2	16.38	16.8	15.02	62.4
	Standard deviation	2.68	2.89	1.98	2.52	4.28

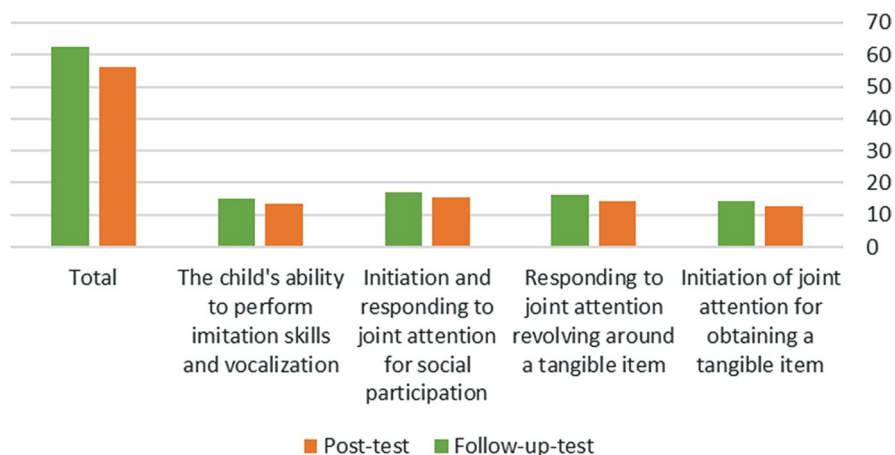


Fig. 2 The differences between the means of scores for the experimental group in the pre- and follow-up tests on the attention scale

attention, attracts them to the subject, and allows them to think, imagine, and propose solutions to presented problems. In doing so, it nurtures higher-order thinking skills. AR also enhances learners' computational skills and makes them producers of multimedia content, as they learn while designing. Furthermore, the researchers note that AR encourages learners to think about what they are learning, transforming them into active participants rather than passive recipients of knowledge. AR is considered one of the most important learning methods that effectively applies learning skills, contributing to the holistic development of individuals—behaviorally, cognitively, and emotionally. It equips individuals with a valuable tool to comprehend the data of the coming era. It is one of the learning styles where the student learns how to learn what he wants by himself. Possessing and mastering self-learning skills enables an individual to learn at all times and throughout life both outside and inside the school, known as lifelong learning. This result is consistent with a study by Cakir and Korkmaz (2019), which indicated that AR-supported educational materials are beneficial and help in developing students' learning environments.

4 Recommendations

In light of the study results, the following recommendations can be made: The Ministry of Education and the Ministry of Social Development should focus on directing professionals toward employing AR technology in the education of children with ASD, given its effective impact on improving attention in children with ASD. Attention should also be directed toward studies and programs addressing attention issues in children with ASD, as they have an impact on their learning process and social interaction. In addition, guidance should be given for using computers and applications in the learning process and creating a technology-based learning environment. Researchers should focus on studies and programs addressing attention issues in children with ASD, given their impact on the learning process and social interaction.

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Analysis of Fertility Determinants Among Emirati Female University Students: An Exploratory Study at a University



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Abstract This study aims to analyze the social, health, and economic factors affecting the low fertility rate among women in the United Arab Emirates (UAE). The study seeks to answer the following question: What are the social, economic, and health factors that affect the low fertility rate among the Emirati women, from the point of view of female university students? Using a snowball sampling method, we collected data from 212 working female students at a university in Abu Dhabi Emirate. Findings indicate that undergraduate education demands a significant amount of time for married females. Among the respondents, 94% acknowledged that a woman's pursuit of higher education could divert her attention from fulfilling familial duties, potentially resulting in declining fertility rates. Moreover, 62% of the participants believed that undergraduate studies impact fertility. When examining the age of marriage, it was noticed that most married women (81%) were between the ages of 15 and 25, suggesting that age at marriage does not, significantly, affect fertility. Approximately 51% of the participants suggested that their husband's absence from work might affect fertility outcomes. In addition, living in a separate household demonstrated a positive correlation with higher fertility rates than when living with parents. By analyzing the respondents' geographical distribution, we found that the urban population accounted for the most significant percentage (81%). This observation implies a potential correlation between the city's characteristics and fertility rates. Furthermore, the study identified a significant relationship between the husband's desire to control or postpone reproduction and fertility rates. Our results align with the study population's beliefs regarding the detrimental effects of malnutrition and unhealthy dietary patterns on fertility. Our

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study recommends developing policies for women's work–life balance, social support networks, and tackling economic barriers to address the declining fertility rate in the UAE.

Keywords Fertility · Health · Higher education · Women · Social change

1 Introduction

Fertility is a complex and multifaceted phenomenon that is crucial in shaping human societies. High fertility rates can increase the population base, resulting in high unemployment rates and other challenges that impede societal development and progress. Conversely, low fertility rates in developed societies can slow the developmental process due to a smaller population (Sahweel, 2014). This phenomenon has been extensively studied in population research, particularly the social, economic, and political factors which influence fertility rates.

According to a report by Pew Research Centre (Wormald, n.d.), global population growth is slowing down due to declining fertility rates. The average number of births per woman worldwide has dropped from 2.47 in 2015–2020, to a historical low (http://population.un.org/wpp/Publications/Files/WPP2019_Volume-I_Comprehensive-Tables.pdf). This trend will continue until only a few countries have high fertility rates (<https://www.un.org/en/desa/world-population-projected-reach-98-billion-2050-and-112-billion-2100>).

One crucial factor that affects fertility is the age of the couple. According to Zeta West's book "Your Comprehensive Guide to Fertility and Pregnancy," as couple's age, it becomes more difficult to conceive and bear children. For example, a study conducted in the United States in 1957 found that 7% of couples at age 30 experienced difficulties with pregnancy, while this percentage increased to 11% at age 35, 33% at age 40, and 87% at age 45 (West, 2004).

Fertility significantly impacts a society's growth rate, age and gender structure, and population composition. Population growth and increased fertility are among the most critical demographic phenomena that significantly affect communities due to the influence of various social, economic, health, and environmental factors. Depending on changing social conditions, population growth varies across historical periods and geographical locations.

Population composition is a critical factor in developmental planning for any society, particularly in developed societies. Governments strive to improve individuals' living standards by developing plans based on population growth rates and fertility levels. The United Arab Emirates (UAE) is a federation of seven emirates in Western Asia. Since its foundation in 1971, the UAE has made significant efforts toward fast development and has achieved many visions and strategies. In the UAE, institutions concerned with population growth are working to develop programs that keep up to pace with population growth. This is emphasized by the fourth principle of the UAE's ten principles for the next 50 years, which serves as a reference for all

institutions to strengthen the pillars of the union, build a sustainable economy, and harness all resources for a more prosperous society. This principle confirms that human capital is the primary driver of future growth and a continuous foundation for maintaining the UAE's superiority and progress.

Despite economic and social progress in all the domains in the UAE, fertility rates have been steadily declining. According to the Federal Competitiveness and Statistics Center, the number of births in the UAE decreased from 97,738 in 2017 to 95,309 in 2018 and further reduced to 94,697 in 2019. The Statistics Center of the Emirate of Abu Dhabi also confirms that total fertility rates for both Emirati and non-Emirati females are declining. In 2011, the birth rate per female was 2.2 babies, which gradually decreased to 1.4 babies per female in 2018 (Pentecostal Principles, n.d.). Given the scarcity of research and studies on this topic in UAE society, further investigation is needed.

This study aims to contribute to the UAE's fertility field by providing comprehensive information on the topic. The survey results can be useful for policy and decision-makers, officials and other stakeholders interested in developing future solutions for the fertility issue in the UAE. The study also addresses the gap in the literature as there is a paucity of studies that deal with this issue in context of the UAE.

1.1 Research Questions

The study attempts to answer the following question: What are the factors that influence female fertility in the UAE? This question gives rise to several sub-questions, including: (a) how do social factors, such as education, age of marriage, work, and social changes impact fertility? (b) What are the health factors that affect fertility, including malnutrition and diseases? (c) How do economic factors, such as family income and cost of living influence fertility?

1.2 Study Limits

This study has the following limits:

- Objective limits: studying the factors affecting Emirati female fertility (social, economic, health).
- Human limits: a sample of married or previously married female students from all the faculties at Al Ain University.
- Spatial limits: Al Ain University (Al Ain city in the United Arab Emirates).
- Time limits: the second semester of the 2021–2022 academic years.

2 Study Concepts

2.1 Fertility Definition

In demography, fertility is related to the actual birth rate. The fertility of a female indicates the number of children she has given birth to. This phenomenon refers to the production of offspring. The reproductive age for female's ranges from 15 to 49 years, and the births may be natural or guided. The society's fertility is determined by all its married and unmarried females of reproductive age.

Actual fertility can be divided into two categories. The first is natural fertility, which denotes reproductive behavior without any voluntary birth control methods, such as contraceptives or induced abortion. It is the fertility of a married female in the absence of these methods. The second is guided fertility that denotes the reproductive behavior in societies that rely on contraceptive methods. The fertility is regulated by the couple or the female alone through contraceptives to determine or control births (Kaddouri & Ghannam, 2017).

The definition of fertility is intended to denote reproduction in general. It is used scientifically to indicate specific methods and ways of measuring fertility. It also distinguishes between general fertility, which is the fertility of the society with all its married and unmarried females of reproductive age (15–49), and marital fertility, which is the fertility of married people and is usually measured according to the duration of the marriage. The procedural definition of fertility is the ability of the couple to procreate. Various factors, such as age, health, nutrition, environment, culture, and social norms, can influence this phenomenon.

2.2 Methods of Measuring Fertility

The main objective of measuring fertility is to estimate and quantify the number of children that females aged 15–49 can produce in the duration of their reproductive life. Fertility measures have two forms. The first is a period measure that calculates fertility rates during a specific period by monitoring the critical events that occur and then computing the fertility rates of a group of females in a particular year. The second denotes a cohort measure that relies on the follow-up of the vital events of a cohort of females over several years by tracking the fertility behavior among a group of females throughout their reproductive life (Ben Amer, 2016).

2.3 Fertility Rates

The following are some of the terms associated with fertility rates:

- Crude birth rate (CBR): It denotes the number of births in the world per 1,000 of the population in the middle of the year and is considered the first step in measuring fertility (Al-Othman, 2019).
- General fertility rate (GFR): It is the ratio between the annual number of births and the total number of females of reproductive age, that is, between 15 and 49 years old. Its purpose is to determine the proportion of females likely to be mothers by excluding all males and other groups of females outside of pregnancy years (Yaaqoub, 2004).
- Total fertility rate can be calculated by summing up the fertility rates by age groups and multiplying the result by the width of the age group (usually 5 years) all divided by 1,000, and we obtain the total fertility rate, also known as the synthetic fertility index. This denotes the average number of births that a female can produce over her reproductive period (Ben Amer, 2016).
- Age-specific fertility rate: It is one of the most accurate measures of population fertility as it is concerned with calculating fertility rates according to the age groups of females of reproductive age. It represents the number of births that occur per 1000 females.
- Marital fertility rate: It denotes the fertility of married members of society, the average number of live births of a single, married female, or previously married during her reproductive life. Therefore, it is influenced by marriage rates, age at first marriage, duration, and related practices, such as the use of family planning methods and the couple's reproductive health (Al-Othman, 2019).

3 Literature Review

Lal et al. (2021) conducted a macro analysis of fertility in a panel of six selected Pacific Island Countries (PICs) using secondary data from the World Bank database. The study found that variables, such as contraceptive prevalence rate, female labor force participation rate, and consumer price index (inflation), are negatively correlated with fertility at a 1% level. In comparison, urbanization is negatively correlated with fertility rate only at a 10% significance level.

Ben Amer's (2016) study aimed to reveal the pathological causes affecting Algerian society's female fertility. The researcher used a quantitative approach and collected data through interviews, with a purposive sample of 130 married women aged 15–49 who visited the Obstetrics and Gynecology Department at Mustafa Basha University Hospital. One key finding was that higher income levels increased the likelihood of women seeking immediate examination for menstrual disorders which, in turn, affected their fertility. In addition, a woman's educational level played a role in her response to menstrual disorders.

Al-Othman's (2019) study aimed to analyze fertility and its measures in Hama Governorate, both in rural and urban areas, at the sub-district level. The goal was to identify the most important factors affecting fertility and their relative importance, so that decision-makers could focus on them to influence fertility rates.

Al-Othman (2019) employed a descriptive and statistical analysis methodology in his study. The results of the study revealed several key findings. First, the educational level of females was found to impact fertility rates significantly. Data indicated that the fertility rate among illiterate females was twice that of females with secondary education. Furthermore, this difference increased to four and a half times in the age group of 15–24 years old. Second, the participation of females in economic activities was found to influence fertility rates. Specifically, the practical situation of females in economic sectors other than agriculture was found to have an effect.

These studies suggest that socioeconomic factors, such as income and education, play a significant role in women's reproductive health and fertility.

Maameri and Yassin (2020) studied the effect of obesity on fertility. The study aimed to investigate the factors that contribute to infertility by focusing on obesity. The results indicated that obesity adversely affects overall human health and specifically fertility. Obesity was found to decrease the likelihood of pregnancy due to hormonal imbalances in both men and women, which can inhibit sperm production or disrupt ovulation.

Sahweil's (2014) study aimed to examine the demographic reality of fertility in the North Gaza Governorate, and assessed the impact of economic and social factors on fertility levels. The study also sought to compare fertility levels and trends between urban, rural, and camp areas within the governorate and explore the relationship between the social characteristics of husbands and wives and their fertility. Sahweil employed historical, descriptive–analytical, and statistical methods using statistical sources and field studies. Key findings of the study included a decline in total fertility rates associated with improvements in educational, economic, and social levels. In addition, a strong relationship was found between a woman's age and the number of children she had given birth to.

Al-Obaid's (2017) analytical study aimed to provide new information on the factors affecting fertility, enrich scientific research methodology, identify the general characteristics of fertility and its ratio, and examine the relationship between fertility and socioeconomic variables. The researcher collected data using a questionnaire that was distributed to a sample size of 400 families. Key findings included a statistically significant model with a chi-square value of 4.81 at 8 degrees of freedom, and a statistical significance level of 0.000. Age at marriage was found to have an 18.6 times greater effect on fertility. The use of contraceptives had a four-time greater impact on fertility, while the mother's educational level had a 1.7-time greater impact.

Al-Manfi and Ander's (2017) study used data from the 2008 Libyan Family Health Survey with a sample size of 11,920 married or previously married females. The researchers employed multiple regression analysis to estimate a multivariate model and clarify the relationship between independent variables and their impact on the dependent variable. In conclusion, both studies found that socioeconomic factors, such as age at marriage, contraceptive use, and educational level, significantly affect fertility rates.

Gargash (2016) studied the causes of the low reproduction rates in Dubai. The study aimed to investigate the factors contributing to Dubai's low fertility and reproduction rates. The results indicated that high costs of marriage, late marriage, work, and study were all factors leading to declining fertility rates. The study suggested that personal desires of not having children, being busy with work and building a professional life, along with the high cost of living and long working hours directly affected fertility and reproduction rates. Obstetricians and gynecologists in the state also suggested that there is a relationship between diseases, such as obesity, diabetes, and chronic conditions and a decline in fertility. Gargash emphasized that fertility and reproduction rates decrease with age as the ovaries lose their reproductive function. She recommended that the optimal ages for childbearing are between 20 and 35. Gargash also suggested that social and economic changes among young people, including imitation of Western culture and concerns about physical appearance, contributed to declining fertility rates. The study concluded that education and late marriage also affected female fertility in societies (Gargash, 2016).

In short, the above studies suggest that socioeconomic factors, such as education, income level, working hours for both genders, and health factors affect fertility rates. In the UAE, westernization and other socioeconomic factors have been determinant factors in the decreasing fertility rate.

3.1 Theories Explaining Fertility

Malthusian's theory was based on some assumptions that population growth was increasing faster than food production rates, and that poverty in societies was due to the large number of people who could not meet their needs. Malthusian also argued that there was a close relationship between the population and the amount of food, as the population increased with the increase in food availability, and the population growth would not stop at a specific limit unless it faced difficulties and obstacles. Malthusian identified that some accurate controls or barriers prevented population growth from exceeding food increase, and he categorized these obstacles as follows:

- Preventive obstacles that affected population growth by indirectly reducing the birth rate by postponing the age of marriage, avoiding early marriage, and abstaining from sexual relations.
- Ethical obstacles that depended on man's will to prevent evil before it occurred. If a person was financially capable of getting married, then there was no problem for him to get married or delay his marriage somewhat. Still, if he was incapable of making a family and supporting his family, he had to postpone the marriage until it was possible for him to do so.
- Positive obstacles included all cases of misery that led to a short life and thus, an increase in the death rate. They worked in crafts that were harmful to health, using children in hard work, exposure to the fluctuations of seasons, extreme poverty, famine, and wars (Rashwan, 2001).

Sadler challenged the Malthusian theory by claiming that the natural law governing population growth was utterly opposite to the direction proposed by Malthusian. He believed that the tendency of people to reproduce would naturally decrease as overpopulation increased, and that their numbers would stop increasing when they reached the maximum capacity of the land. He also suggested that fertility rates were inversely related to population density, indicating that fertility rates were higher in sparsely populated areas than in densely populated areas. He supported his theory with empirical evidence from different countries and regions.

The relationship between population growth and food resources has been debated amongst different theorists. One of them was Thomas Doubleday, who proposed that population growth is negatively correlated with food resources, as food scarcity threatens population survival. According to Doubleday, nature endowed females with a higher biological capacity for reproduction and birth when food was scarce, and a lower one when food was abundant. He based his argument on the observation that societies and individuals with high fertility rates consumed low amounts of meat, protein, and wine and relied mainly on fish and vegetables. Doubleday claimed that affluent people with access to various kinds of food and luxuries had reduced reproduction capacity and fewer offspring. In comparison, poor people had increased power and a higher number of offspring, and the middle classes had a relatively stable capacity for reproduction (Al-badawi, 2009).

Herbert Spencer challenged Doubleday's theory and suggested the opposite: good food enhances an individual's capacity for reproduction and that prosperity leads to higher fertility rates (Abdel-Gawad, 2009). Spencer argued that the power for reproduction among working females who engaged their minds in higher administrative or technical professions was lower despite having better nutrition habits than others. He also suggested that they received more healthcare, but their reproduction was weaker and less than that of poor females and housewives. He attributed this to the mental exhaustion that resulted from striving for affirmation and success, which then weakened their reproductive capacity (Abdel-Gawad, 2009).

Castro conducted a series of experiments on nutrition's effects on female rats' reproduction. He observed that a high-protein diet resulted in a lower reproductive capacity, while a low-protein diet increased sexual desire and fertility. Based on these findings, he proposed that hunger regulates fertility through its impact on protein and vitamin levels, affecting ovarian function. He further suggested that the unequal distribution of food and population is the leading cause of overpopulation problems in countries that face this issue locally or globally. This text is an example of an academic writing style, as it uses formal language, clear and precise expressions, a well-structured argument, evidence from a source, a balanced viewpoint, an objective tone, and an admission of limitations (Thompson & Lewis, 1965).

The above theories present different perspectives on how population growth and food resources are related. According to Malthusian theory, population growth would surpass food production unless some factors slowed it down. According to Sadler's theory, population growth would naturally decrease as overcrowding increased, and population density would affect fertility rates. Both approaches had advantages and disadvantages in their arguments, data, and consequences.

Doubleday argued that population growth is inversely related to food resources and that food shortage increases fertility rates. Spencer opposed this argument and claimed that good food improves an individual's reproduction ability and that prosperity leads to higher fertility rates. Castro experimented on rats and found that a high-protein diet reduced reproductive capacity, while a low-protein diet increased sexual drive and fertility.

4 Study Design

4.1 Study Population

A university in the capital city of the United Arab Emirates which offers evening study options, enabling many employed students to balance their work and undergraduate education, was selected. Many of the female students work during the day and attend classes in the evening. The study population comprises all married or previously married female students at this university, as the researchers deemed this population to be highly suitable for the study.

4.2 Study Sample

Using a nonrandom availability sampling method, 212 participants were chosen from all faculties at the university. This method involves selecting subjects who are easily accessible or available. It is also known as accidental or convenience sampling. The main benefit of this method is its ease of implementation compared to other methods. After reviewing the questionnaire and ensuring that all required conditions were met, 212 responses were deemed valid for inclusion in the study and the rest were excluded.

4.3 Study Methodology

An electronic questionnaire was chosen as the primary data collection instrument for this study. Ethical clearance was secured from the University's Ethical Review Board, as documented under the reference number Edu2022_49. Its validity and reliability were tested on a sample of 10 female students from the study population, yielding a result of 87%. Data analysis was conducted using the SPSS program. The questions were reviewed by experts in the field of research to ensure their relevance and alignment with the research objectives and questions.

5 Study Results

The following results were obtained in an investigation of the social factors influencing fertility, including education, age at marriage, employment, and social change:

5.1 Education Factor

Table 1 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the responses pertaining to the education variable.

According to Table 2, 64.2% of the study sample responded affirmatively that studying at college occupies a significant portion of their day, detracting from time spent with their family. Conversely, only 3.4% responded negatively, while 32.1% responded that this was sometimes the case. The combined percentage of affirmative and “sometimes” responses was 96.3%, indicating that studying at college consumes a considerable amount of time for married females and may interfere with their ability to attend to family needs. In response to the second question, 62.3% of the sample members responded affirmatively that studying at college prevented them from having more children, while 37.7% responded negatively. These results suggest that the education variable has an impact on female fertility.

5.2 Age Factor

Table 3 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the responses pertaining to the age variable:

Table 1 The mean, standard deviation, and variance of education variable

Question	Mean	Standard Deviation	Variance
Does studying at college take up a lot of time of your day, distracting you from your family for long periods?	1.6792	0.93143	0.868
Did your study at college prevent you from having more children?	1.3774	0.48703	0.237

Table 2 The frequency distribution of the education variable and its impact on fertility

Question	Variable	Frequency	Percentage %
Does studying at college take up a lot of time of your day, distracting you from your family for long periods?	Yes	136	64.2
	No	8	3.4
	Sometimes	68	32.1
	Total	212	100
Did your study at college prevent you from having more children?	Yes	132	62.3
	No	80	37.7
	Total	212	100

Table 3 The means, standard deviation, and variance of age factor

Question	Mean	Standard Deviation	Variance
Wife's age	2.735	0.9184	0.844
Wife's age at marriage	2.056	0.9644	0.930
The marriage period since it took place till now	2.377	1.0906	1.190
Husband's age	1.849	0.4936	0.244

5.3 Social Factors

Table 4 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the responses about the social variables. These measures provide insight into the distribution and spread of the data for the social variables under investigation.

An analysis of the questionnaire results revealed several key findings. In response to the first question regarding the number of children born to the respondents' mothers, 54.7% reported having between 6 and 10 children, while 77.3% reported having between 6 and more than 10 children. The highest number of children reported for wives in the study sample was between 3 and 4 children (43.4%), while 32.1% reported having between 1 and 2 children, and 67.9% reported having between 3 and more than 4 children. In response to the third question regarding the planned number of children, 49.1% reported having no plan, while 50.9% reported varying plans for having between 1 and more than 5 children. These results suggest that the development of plans for childbearing and birth control has an impact on female fertility. In addition, 60.4% of respondents indicated that their husbands had a desire to organize reproduction, suggesting that this factor also affects fertility.

Table 4 The mean, standard deviation, and variance for the social variables

Question	Mean	Standard deviation	Variance
How many children did your mother have?	2.1132	0.74732	0.558
How many children do you have?	1.9245	0.75212	0.566
Number of children planned for	3.1132	0.98871	0.978
Did you plan to have no children in the first years of marriage?	1.7547	0.4323	0.187
Does the husband want to organize reproduction?	1.3962	0.49144	0.242

Table 5 The mean, standard deviation, and variance of the malnutrition variable

Question	Mean	Standard deviation	Variance
Do you think that fast and unhealthy food affects health and late childbearing in females?	1.6415	0.80698	0.651
Do you think that sweets, sugar, and obesity cause late childbearing in females?	1.1132	0.31835	0.101
Do you think that going on diets and maintaining a good body improves fertility in females?	1.283	0.65835	0.433
Do you exercise regularly and continuously?	2.566	0.60188	0.362
Does your husband exercise regularly?	2.0377	0.84992	0.722

5.4 Health Factors

The second research question of the study pertains to the health factors that influence fertility, including malnutrition and diseases. Concerning malnutrition, Table 5 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the malnutrition variable.

An analysis of the data presented in the table above reveals that the consumption of fast and unhealthy food has a significant impact on female fertility. Among the study sample, 56.6% responded affirmatively that fast and unhealthy food affects fertility, while 22.6% responded negatively and 20.8% responded that this was sometimes the case. The combined percentage of affirmative and sometimes responses was 77.4%, indicating a widespread belief among females that good nutrition and avoidance of fast food are important factors for fertility. In response to the question regarding the impact of sweets and obesity on fertility, 88.7% responded affirmatively. This suggests that females have a high level of awareness regarding the role of nutrition in fertility and reproduction. When asked if going on a diet and maintaining a healthy body improves fertility, 83% responded affirmatively. In contrast, responses to the question regarding exercise were more varied, with the highest percentage of responses falling between “sometimes” and “no.” The cumulative percentage of sometimes and no responses was 94.3%, indicating that irregular exercise may negatively impact female health and fertility rates.

Table 6 The mean, standard deviation, and variance for the disease variable

Question	Mean	Standard Deviation	Variance
Do you think that chronic diseases, such as diabetes, stress, and other diseases cause late fertility in females?	1.3208	0.50798	0.258
Do gynecological diseases cause late childbearing in females?	1.5283	0.86418	0.747

Table 7 The frequencies and percentages of the disease variable and its effect on female fertility

Question	Variable	Frequency	Percentage%
Do you think that chronic diseases, such as diabetes, stress, and other diseases cause late fertility in females?	Yes	148	69.8
	No	60	28.3
	Maybe	4	1.9
	Total	212	100
Do gynecological diseases cause late childbearing in females?	Yes	152	71.7
	No	8	3.8
	Maybe	52	24.5
	Total	212	100

Table 6 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the disease variable. These measures provide insight into the distribution and spread of the data for the disease variable under investigation. This information explains the impact of diseases on fertility.

Table 7 presents the frequency distribution and corresponding percentages for the disease variable and its impact on female fertility. This information provides insight into the prevalence of diseases among the female population and their effect on fertility. The data explain the relationship between diseases and female fertility.

An analysis of the data presented in Table 7 reveals that 69.8% of females believe that chronic diseases, such as diabetes and stress, may contribute to delayed fertility, while 28.3% do not believe there is a relationship between chronic diseases and fertility, and 1.9% believes there may be a relationship. In response to the second question regarding the impact of gynecological diseases on fertility, 71.7% responded affirmatively, while 3.8% responded negatively and 24.5% responded that there may be a relationship. These results suggest that there is a widespread understanding and belief among females regarding the relationship between diseases and their impact on fertility.

In response to the first question regarding the number of miscarriages experienced, 28.4% reported having between one and more than three miscarriages, while 71.7% reported having no miscarriages. In response to the second question regarding the number of stillbirths experienced, 11.2% reported having between one and more than three stillbirths, while 88.7% reported having no stillbirths. In response to the third question regarding postpartum body flabbiness as a cause of delayed childbearing, 49.1% responded negatively, while 51% responded affirmatively or that this may be the case. The results of the fourth question indicated that 60.4% of females use contraceptives. These findings suggest that postpartum body changes and contraceptive use may have an impact on female fertility.

Table 8 The mean, standard deviation, and variance of the family income variable

Question	Mean	Standard deviation	Variance
Do you think that the family income?	1.7736	0.503	0.253
In your opinion, is small or temporary housing a reason for delaying childbearing among couples?	1.9057	0.83413	0.696

The third research question of the study pertains to the effect of economic factors on fertility, including family income and cost of living. Concerning family income, Table 8 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the family income variable. These measures provide insight into the distribution and spread of family income data and its relationship with fertility.

5.5 Economic Factors (Income)

From Table 8, we can note that a percentage of (69.8%) are of middle income, and a percentage of (26.4%) are of excellent income. This percentage shows that most of the groups of the study population are between middle-income and excellent-income. The income may be good in a way that provides a good quality of life and a way that improves the livelihood.

Table 9 presents the statistical measures of central tendency and dispersion, namely the mean, standard deviation, and variance, for the cost-of-living variable. These measures provide insight into the distribution and spread of the data for the cost-of-living variable under investigation. This information explains the impact of the cost of living on fertility.

Table 10 presents the frequency distribution and corresponding percentages for the cost-of-living variable and its impact on female fertility. This information provides an insight into the prevalence of the different levels of cost of living among the female population, and the consequential effect on fertility. This explains the relationship between the cost of living and female fertility.

Most of the study population believes that high costs of marriage and dowries contribute to decreased marriage and reproduction rates. Among the respondents, 75.5% affirmed this belief. This high percentage suggests a relationship between family income and marriage and reproduction rates. In response to the fourth question regarding the availability of a babysitter, 75.5% of respondents answered affirmatively. This result indicates that medium- and high-income levels may improve the well-being and quality of life for families, potentially increasing female fertility rates.

Table 9 The mean, standard deviation, and variance of the cost-of-living variable

Question	Mean	Standard Deviation	Variance
In your opinion, are the expenses of raising children too expensive and lead to a delay in childbearing for couples?	0.86709	0.752	0.504
In your opinion, is small or temporary housing a reason for delaying childbearing among couples?	0.83413	0.696	0.179
In your opinion, do you think that the high cost of marriage and dowries are the reasons behind late marriage for young people?	1.3774	0.70983	0.504
Do you have a babysitter at home?	1.2308	0.42337	0.179

Table 10 The frequencies and percentages of the cost-of-living variable and its effect on female fertility

Question	Variable	Frequency	Percentage%
In your opinion, are the expenses of raising children too expensive and lead to a delay in childbearing for couples?	Yes	100	47.2
	No	48	22.6
	Maybe	64	30.2
	Total	212	100
In your opinion, is small or temporary housing a reason for delaying childbearing among couples?	Yes	84	39.6
	No	64	30.2
	Maybe	64	30.2
	Total	212	100
In your opinion, do you think that the high cost of marriage and dowries are the reasons behind late marriage for young people?	Yes	160	75.5
	No	24	11.3
	Maybe	28	13.2
	Total	212	100
Do you have a babysitter at home?	Yes	160	75.5
	No	48	22.6
	There is no answer	4	1.9
	Total	212	100

6 Discussion

The findings of the study indicate that 94% of the participants identified university education as a significant determinant in the reduction of fertility rates among women. This observation is consistent with the studies conducted by Al-Othman (2019) and Sahweel (2014), which disclosed that illiterate women have double the fertility rate of those who have obtained a secondary education. Moreover, families with advanced educational backgrounds tend to have fewer children. This phenomenon can be attributed to the postponement of marriage, often associated with higher levels of education among women, which consequently reduces their fertility rate upon entering matrimony.

In addition, the rising costs of wedding ceremonies and substantial dowry demands have led to a deferred marriage age among 75.5% of the young

participants. This trend aligns with Malthus's theoretical perspective, which posits that societal impediments often result in delayed marriages; thereby prolonging the period young people must wait to accrue the financial resources necessary for marriage expenses.

Interestingly, 51% of the participants reported residing with their spouse's parents post-marriage, positing an increase in fertility rates when couples inhabit an independent residence. This hypothesis, not previously discussed in scholarly literature, suggests that the stability, privacy, and financial autonomy provided by independent living conditions may foster a more conducive environment for child-rearing and planning additional offspring.

Contrary to the findings of Eid (2004), 60.4% of the participants acknowledged utilizing contraceptives for various reasons. Eid suggested a negative correlation between educational attainment among women, contraceptive use, and actual fertility, positing that these factors allow couples to strategically plan conception.

Furthermore, 56.6% of the participants attributed diminished fertility rates among women to poor nutritional habits and unhealthy diets, corroborating assertion regarding the pivotal role of health factors in declining fertility rates. The frequent consumption of fast food, known to have deleterious health effects, is postulated to contribute significantly to reduced fertility rates.

Chronic illnesses, including diabetes and hypertension, were cited by 69.8% of the respondents as contributing factors to deferred fertility among women. This stance is supported by Maameri and Yassin (2020), who found a detrimental impact of obesity on fertility and gestation probabilities. However, these findings contrast with Malthus's theory, which suggests a reduction in procreative capabilities during periods of abundant food availability, noting that communities with higher fertility rates often have lower meat, protein, and wine consumption. It is hypothesized that chronic conditions, such as diabetes, hypertension, and hypothyroidism could disrupt hormonal balances and physiological processes crucial for conception and pregnancy.

Regarding labor force participation, 54.7% of the women in the sample were employed, and data suggested that working women exhibit lower fertility compared to their non-working counterparts. This is in line with Al-Othman's (2019) study, which associated women's engagement in political activities with a decrease in reproductive potential. The diminished fertility among employed women could be related to workplace-induced stress, fatigue, and limited leisure time, potentially upsetting the physiological and hormonal equilibrium necessary for fertility.

Lastly, 49.1% of the participants disputed the notion that physical alterations post-childbirth, such as body sagging, influence delays in subsequent pregnancies. Some findings linked physiological changes and an amplified preoccupation with physical appearance to decreased fertility rates. Postpartum bodily changes may impact self-perception and social interactions, potentially leading to emotional distress and diminished self-esteem, thereby affecting marital relations and decisions regarding future pregnancies.

7 Conclusion

This study was conducted to determine the factors influencing fertility in the United Arab Emirates. This study has revealed several significant findings through a comprehensive analysis of the questionnaire results. First, undergraduate education was found to occupy a considerable amount of time for married females, with 94% of respondents indicating that it detracted from their ability to attend to family needs, and therefore potentially decreased their fertility rates. Second, most of the study population (62%) believed that undergraduate studies may have an impact on female fertility. Third, the average age at marriage for females was found to be between 15 and 25 years old, with 81% of respondents falling within this range. This result suggests that age at marriage does not significantly impact fertility as it falls within a normal range. Fourth, 51% of respondents indicated that their husband's absence from home for work reasons may affect their fertility. Fifth, the study found that living in a separate house was associated with higher fertility rates compared to living in their parents' house. In addition, the city's population had the highest percentage (81%) of respondents, indicating a potential impact on fertility rates among this population. The results also revealed an association between the husband's desire to organize or delay reproduction and fertility rates. Finally, the study population's beliefs regarding the negative effects of malnutrition and unhealthy meals on female fertility were supported by the study's results.

8 Recommendation

Our study recommends the following:

- Our study recommends developing policies for women's work–life balance, social support networks, and tackling economic barriers to address the declining fertility rate in the UAE. Also, we recommend creating policies that would encourage marriage and not delay the age of marriage to raise fertility rates.
- Providing adequate facilities for married and working women who are studying at the same time to raise fertility rates, provided that all relevant institutions cooperate to provide the necessary comfort and mental health to prepare and encourage them to have children.
- Increasing media awareness of the dangers of unhealthy nutrition on reproductive rates.

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Religious Inquiries: Between Conventional Islamic Teaching Methods and Islamic Websites Among Undergraduate Female Students at the University of Sharjah



Mona Mostafa Shehade and Ahmad Al-Kubise

Abstract Since the introduction of the Internet, dramatic changes occurred in the Islamic teaching channels. Some Muslim scholars started using the Internet to convey Islamic knowledge via Islamic Websites rather than using conventional face-to-face teaching. Unfortunately, not all Islamic Websites release authentic and reliable Islamic information. Consequently, the upcoming Muslim generation runs the risk of practicing Islam away from the correct teachings of the Holy Qur'an, true Sunnah, and authentic Sharī'ah principles, which will eventually distort the core principles of the Islamic religion, a significant issue to be considered. Using the quantitative research method, a convenient sample of 100 undergraduate female students at the University Sharjah (UOS) were randomly selected to answer a single-select multiple-choice questionnaire answering this study's research question: What is your first preferred teaching channel in answering your religious queries: Muslim Scholars or Islamic Websites? Results showed that (41%) of the participants preferred to check Islamic Websites to answer their religious questions, whereas (45%) chose to contact an Imām. We recommend that Muslims should question the authenticity and reliability of the information they read on Islamic Websites before adopting it, by comparing it with other authentic resources; by asking Muslim Scholars/Imams, or by reading authentic Islamic books.

Keywords Conventional teaching methods · Islamic websites · UOS students

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1 Introduction

Allah The Al-Mighty created mankind to worship Him and to populate this earth, He said in the Holy Qur'an: "I did not create jinn and mankind unless to worship Me" [al-Dhāriyāt: 56].

Since He created humans, Allah honored mankind with knowledge by teaching them what they did not know (Ibn Kathīr, 1999, pp. 8/437). He sent his messengers to people to define to them the proper path that will lead to Him. He sent His last messenger Prophet Muhammad (PBUH) and revealed to him the Holy Qur'an and the Sunnah and ordered him to convey it to people. He said: "That You may make clear to the people what was revealed to them" [Al-Nahl:44]. Thus, He (PBUH) conveyed to people what Allah imposed on them and taught them the proper way to worship Him, i.e., what actions they should do or refrain from in their quest for heaven (Ibn Taymīyah, 1995, pp. 19/95).

Many Verses in the Holy Qur'an highlight the virtue of learning and building one's religious knowledge Allah said: "And say, 'My Lord, increase me in knowledge'" [Taha: 114]. "It was said that Allah did not command His Messenger to seek addition in anything except in the pursuit of knowledge" (Al-Zamakhsharī, 1407 A.H., pp. 3/90).

Simultaneously, the Sunnah emphasized the benefits of pursuing religious knowledge, including: "Whoever Allah wants good for; He will make him understand the religion" (Al-Bukhārī, 1422 A.H., 71), pp. 1/25). It means: Whoever does not learn the rules of Islam and its related matters of what is permissible and what is forbidden, he/she is deprived of goodness (Ibn Hajar al-'Asqalānī, 1379, A.H., pp. 1/165), for knowing and understanding the religion leads to piety (al-Taqwā) (Al-Nawawī, 1392, A.H., pp. 7/128).

Prophet Muhammad (PBUH) said: "The quest for religious knowledge is the duty of each Muslim, male or female" (Al-Ṭabarānī, n.d. (no: 9), pp. 1/7). "Every sane adult Muslim male or female is obliged to seek religious knowledge, and those who do not know are not excused for their ignorance because they are obliged to ask about all Sharī'ah teachings' that they ignore so that they will worship Allah in the correct way" (Al-Ghazālī, n.d., pp. 1/9). Muslims must know about what is permitted (Ḥalāl) and what is forbidden (Ḥarām), what actions are obligatory and what are not, what does Allah recommend and like, and what He prohibits and dislikes, and they are also requested to know what promotes virtue and prevents vice (Al-Ghazālī, n.d., pp. 1/14, & Ibn Taymīyah, 1995, pp. 9/19).

Abiding by the Prophet Mohammad's (PBUH) sayings, Muslims usually endeavor to teach their children the provisions and teachings of Sharī'ah and show them the proper way of practicing them since early childhood. Religious teaching used the conventional face-to-face, direct two-way communication channel between the student and his teacher, at homes, schools, or any specialized religious center.

But since the introduction of the Internet, world-wide Web, and other innovative technological devices, Islamic religious teaching methods witnessed a dramatic change (Levitt, 1983, pp. 1). "Muslim scholars started creating and using Islamic

Websites to convey Islamic knowledge, beliefs, practices, ideas, viewpoints, answering questions and make Da'wa aiming to spread Islam Internationally” (Scholz et al., 2008, pp. 460). “Quite a huge number of Muslims –namely the youth- welcomed this change and started using these Islamic Websites to answer their religious questions and to build their religious knowledge instead of the known traditional face-to-face teaching method” (Maḥmūd et al., 2012, pp. 2). “However, due to the vastness and anonymous nature of the data released on the Internet, researchers reported a lack of reliability and authenticity of Islamic Websites’ content” (Ishak et al., 2011, p. 8–9). Other research reported that some Islamic Websites offer misleading and incorrect information to their users (Maḥmūd et al., 2012, p. 2). This rings a bell, for Muslims who adopt the unauthentic unreliable Islamic religious teachings offered by these Islamic Websites run the risk of practicing Islam away from Allah’s commands, and far from the correct teachings of the Holy Qur’an, true Sunnah, and authentic Sharī’ah principles. In other words, the upcoming Muslim generation will eventually end up practicing erroneous Islamic beliefs and practices which will distort the core principles of the Islamic religion, an important issue that should not be ignored and deserves extensive scientific research, underscoring the importance of this study, which addresses the following:

1.1 Significance of the Study

Muslims in general and the youth in particular, mainly those who embraced the use of Islamic Websites to build their religious knowledge and to answer all their religious queries, are at high risk of getting confusing, misleading, or incorrect religious information, which will be translated into erroneous beliefs and incorrect religious practices, consequently, worshipping Allah distant from the correct teachings of the Holy Qur’an and the true Sunnah.

1.2 Research Question

As an undergraduate female student at the University Of Sharjah (UOS); what is your first preferred teaching channel in answering your religious queries: Muslim Scholars or Islamic Websites?

1.3 Research Objective

The objective of this study is to assess the first preferred religious teaching channel among undergraduate female students at the University of Sharjah, whether it is contacting a Muslim scholar or searching Islamic Websites.

1.4 *Research Methodology*

Using the quantitative research method, a convenient sample of 100 undergraduate female students at UOS were randomly selected to answer eight-question single-select multiple-choice questionnaire answering this study's research question. The study employs descriptive analysis to examine specific factors that affect the participants' choice in selecting their first preferred religious teaching channel whether through conventional face-to-face teaching methods or visiting Islamic Websites.

2 *Literature Review*

2.1 *Conventional Islamic Teaching Methods*

2.1.1 *Initial Islamic Teaching Methods*

“It was narrated that the Prophet's companions used to sit around the Prophet (PBUH) in circles while having a lesson” (Al-Haythamī, 1994, (553), pp. 1/132). Abū Hurayrah (MABPWH) described this teaching process stating: “If you sit with the teacher or sit in gatherings of knowledge, come close together and sit behind one another, and do not sit apart as the people of pre-Islamic times used to do” (Al-Daylamī, 1986, (1051), pp. 1/271). Highlighting the importance of receiving religious information face-to-face and directly from an authentic teacher.

Before the establishment of schools, Muslim Intellectuals used to have regular meetings with their students at one of three places: The Mosque (al-Masjid) which is the most popular place to spread Islamic knowledge, at specific centers, or at the house of the teacher/Intellect. (Ibn al-Hajj, n.d., pp. 1/85). Muslim believers used to hurry to the Masjid or to the house of a known Muslim scholar every time they have any religious question. It was a common sight to see men gathering around the Imām in the Masjid at the end of each prayer, waiting to ask him any religious question they may have. People used to query the Sheik/Imām face-to-face and were keen to hear the answer directly from him, trying to avoid any misunderstanding or misinterpretation, for when it comes to Islam and religion, all Muslims are committed to pursuing nothing but accurate, correct, and credible information, because they want to practice their Islam correctly and as per the teachings of the Holy Qur'an and the Sunnah as Allah requested (Ibn al-Hajj, n.d., pp. 1/87). This was the case in almost all Muslim countries, until the establishment of the first school in Nishapur after the fifth century A.H. Later, other people in different countries followed (Al-Maqrizi, 1418. A.H., pp. 4/199–201).

2.1.2 Islamic Teaching Methods After the Establishment of Schools

After the establishment of schools, one can say that the teaching process itself did not change much - in the sense that - teachers explained to their students, while students listened, read, wrote, and asked their teachers directly for any unclear matters, thus reducing the chance of getting any wrong information aiming to worship Allah exactly as He asked us to do. On the other hand, some Muslim countries assigned specialized religious committees to review the content of Islamic books to be taught at schools and universities, for they desire to spread Islam among students correctly by teaching them reliable and authentic Islamic religious information (Al-Kitānī, n.d., pp. 1/151–152). As such, learning religious matters should be limited to authentic, reliable sources. Several Muslim scholars set few guidelines for those who desire to sit for Fatwa and answer Muslim religious queries, which will be discussed in the following paragraph.

2.2 General Guidelines for Fatwá in Islam

Muslim Scholars set certain guidelines for the Fatwá in Islam. Imām Al-Nawawī described some important measures that the Muftī has to embrace should he sit for Fatwá, from which we choose the following: “The Muftī should be an accountable Muslim, trustworthy, free from the causes of immorality and breaches of morality, jurist, with a sound mind, sober in thought, correct in conduct and reasoning, and alert when dealing with free men, slaves, females, blind, mute, or the handicapped” (Al-Nawawī, 1988, p. 19). “He who sits for Fatwá and whoever responds to people’s queries and is not fit to do so had committed a great sin” (Al-Nawawī, 1988, p. 31). “The Muftī is required to explain the answer in a way that removes any ambiguity, some Muftīs limit themselves to answer verbally not in writing since some questioners might misunderstand what they read. The Muftī should ask the questioner about any ambiguous word in his question that he did not understand, and he should listen to the question carefully. He should always check his answers for mistakes” (Al-Nawawī, 1988, pp. 44–48).

Thus, according to what Imām al-Nawawī previously mentioned, it is evident that not anybody can sit for Fatwá or answer Muslims’ religious questions. He who does so without being completely fit is sinful, for it is a highly complicated process bearing unlimited risks of answering erroneously. Regarding Islamic Websites, the issue is double-folded. Muslims who prefer to get their religious information by only reading Islamic Websites’ pages, without discussing their query directly with the Imām, run a high risk of getting unsatisfactory results. They might misunderstand what is written, or adopt what they read, thinking that it is authentic and correct when it is not. This raises an important issue, i.e., studying the effect of the Internet on Islamic teaching methods.

2.3 Islamic Teaching Methods After the Internet

Shortly after the introduction of Satellite Media, YouTube, Facebook, Twitter, Blogs, and Video Blogs, Muslim Scholars, academic Professors, Imāms, and Dua'āt started using the Internet through various Websites to spread Islam internationally. They seized the opportunity to spread Islamic knowledge and research-based literature among their students and followers and to build communication channels with others mainly non-Muslims all over the world (Scholz et al., 2008, pp. 459–461; Soukup, 2012, p. 24). Some scholars were pioneers in this domain creating their own Islamic Websites. Some limited their services to one domain like Ḥadīth, Jurisprudence, Theology, or Interpretation of the Holy Qur'an, online teaching of the Holy Qur'an, while others chose to offer online Fatwá, answering questions, problem solving programs, or community development programs (Aliyu et al. 2013a, b, p. 37).

Equally, public society instantly adopted Internet usage. Millions of Muslims checked Islamic Websites on the Internet, extolling its merits as a primary source of Islamic education and dissemination (Aliyu et al., 2014, p. 2). Consequently, people started giving up the old conventional ways of getting religious advice face-to-face from their Imāms in worship places. Young Muslim females who are concerned with building their Islamic religious knowledge were no exception, for they deem the Web as an ideal replacement. Searching the Web will save them the trouble of getting their religious advice from one single Imām, teaching at a specific mosque/center at some fixed time, for they can simply, with one click, check an unlimited number of Islamic Websites to answer their religious questions (Scholz et al., 2008, pp. 462–463). But one might ask: What are the pros and cons of getting religious information solely from Islamic Websites? How will Islamic Websites affect the future of the Islamic culture? Do all Islamic Websites offer authentic and reliable Islamic Information? A significant issue to discuss hereafter.

2.4 Islamic Websites

2.4.1 The Bright Side of Islamic Websites and Other Internet Social Platforms

“Previous Research stressed that the increasing global reliance on Islamic Websites as a source of Islamic information has grown exponentially over the years. Some researchers defined an Islamic Website as a genre website that accentuates Islamic ideologies, norms, and values. Others defined an Islamic Website as an Internet-based site created for and devoted to the service of Islam as a religion and Islamic way of life. It refers to a website whose main objective is to portray the commandments of Allah (SWT) per the teachings of the Prophet (PBUH)” (Aliyu, Maḥmūd, & Tap, 2013, p. 35). “Today, millions of Muslims rely on Islamic content online to

learn about the true teachings and practices of Islam. The content includes Qur'anic text, audio, and video recitations; authentic books of Ḥadīths, Islamic theology; scholars' Fatwá; preaching, personal Q&A; discussion forums; lectures from scholars, as well as research articles. There is no doubt that Islamic Websites have helped in educating many Muslim online users as well as non-Muslims, removing various misunderstandings and misconceptions about Islam" (Aliyu et al., 2014, p. 2).

"Likewise, some researchers claim that Islamic Websites assisted in creating an Islamic Identity and in Muslim users' information and knowledge about Islam. It provided them with convenient space to discuss Islamic teachings and practices with other Muslims and scholars from different parts of the world and different schools of thought" (Aliyu et al., 2012, p. 657).

Others argue that frequent use of Islamic Websites over a long time can increase users' religious knowledge and improve their religious practice. Islamic Websites helped them increase Iman (faith), bringing them closer to Allah, making them better Muslims, and influencing them to do good actions and avoid bad actions (Maḥmūd et al., 2012, p. 2).

Bahrine (2014) argues that Islamic Websites together with other digital social platforms have opened the opportunity for young Muslims especially those in the Western countries to engage with their co-believers. Where once the Ummah was a spiritual notion with Muslim communities separated by language and geography, satellite media has broken down barriers and enabled young Muslims to connect irrespective of where they are. It provides the means for reuniting the Ummah in a form of eUmmah (Ibahrine, 2014, pp. 739). One might anticipate the vast effect of Islamic Websites on future Islamic culture.

2.4.2 Effect of Islamic Websites on Future Islamic Culture

Research concludes that the wide availability of online religious sources has gradually changed the practice of Islam from a face-to-face community-based religious practice to a personal devotion, with individuals choosing which preachers to follow rather than simply going to the neighborhood mosque (Sisler, 2011, p. 1136). "It has become an ideal platform, the new Mosque or Madrasa, for the dissemination of the Islamic beliefs" (Ibahrine, 2014, p. 737).

"Likewise, Mishra and Semaan (2010) found that South Asian Muslims in the United States also turned to online sources to satisfy religious needs. The relative anonymity of the Internet allowed them to seek out religious advice on more personal questions" (Mishra & Semaan, 2010, p. 87). "In this instance online- religious counseling substituted for face-to-face interaction with a local teacher" (Aliyu et al. 2013a, b, p. 1). These were the pros of using Islamic Websites, but what about their cons? An imperative topic to be discussed in the coming paragraph.

2.4.3 The Credibility of Islamic Websites Content in Question!

“The usefulness and effectiveness of finding information and knowledge online is debated by many researchers. Despite the increasing number of Islamic Websites and the increasing participation by its online users, there appears to be a lack of confidence in using them. This lack of confidence might be due to lack of trust in the legitimacy of the Website’s content, -for it lacks accuracy, credibility, and authority”- (Maḥmūd et al., 2012, p. 659), “or it might be due to its online scholars, or perhaps due to the Islamic features portrayed” (Aliyu et al., 2013a, pp. 34–35).

Others argued that Muslim societies have lack of trust and confidence in the religious information available on Islamic Websites, for they do not cite the sources of their information such as respected scholars and reputable reference (Nassr et al., 2015, p. 17714).

Also, similar studies suggested that “Muslim users of Islamic Websites are opposed to seeking knowledge from these Websites because they might feel uncomfortable seeking Islamic knowledge online from unfamiliar scholars -whom they are unsure if they can fully trust-, especially those scholars not popularly recognized/ accepted and those from other schools of Islamic thought” (Maḥmūd et al., 2012, p. 2).

“As for the evaluation of Islamic Websites’ specialists claim that the Internet is an open platform for anyone to publish and share information without being subjected to the authenticity of information. For Muslims, religious information crucially should be reliable. Unfortunately, assessing the reliability of the information provided by the Internet is complex. Due to the vastness and anonymous nature of the Internet, the huge amounts of data available, and lack of religious knowledge among Muslims, users are unable to recognize the existences of unreliable religious information” (Nassr et al., 2015, p. 17713). An issue that necessitates further investigation.

3 Research Methodology

3.1 Sampling

Due to its economic feasibility and ease of application, the convenience sampling technique was employed to select volunteer participants from a convenient population. Undergraduate female students studying at the University of Sharjah (UOS) were randomly selected for this purpose. The sample size consists of 100 undergraduate female students (N = 100). Every participant has a similar and equal probability of participating in this study. Sharīah and Islamic Studies students and graduate students were excluded.

3.2 Research Questionnaire

The quantitative research method was employed to examine this study's research problem. An eight-question, single-select, multiple-choice questionnaire was prepared to assess the participants' first preferred teaching channel for answering their religious queries: conventional teaching methods vs. Islamic Websites. The questionnaire also assessed the participants' opinions about the efficiency of these two methods in meeting their needs and answering their religious questions (Fig. 1).

3.3 Data Collection Procedure

The eight-question questionnaire was written in English. It was handed to participants face-to-face on the UOS campus as a hard copy (A4 paper). Each questionnaire was passed on to participants and collected immediately. Participants took around 7–10 min to answer the eight questions. Questionnaires were distributed during the first week of July 2023. Filled questionnaires were screened for any missing data or invalid responses.

4 Research Results

4.1 Participants' Demographic Data

Participants are female undergraduate students studying different majors at UOS. Their age ranged from 17 to 23 years old. Students' majors included: Engineering and its related sciences like Architecture and Interior Design. Medicine and its related sciences, like: Dentistry, Nursing, Pharmacy, Physiotherapy, Biotechnology, Medical Lab, Chemistry, and Physics. Arts included: Fine Arts, English Literature, Advertisement, Business, Business Management, Early Childhood, Journalism, and Communication (Tables 1, 2, and 3).

4.2 Descriptive Data Analysis

This study empirically examines the first preferred religious teaching channel among undergraduate female students at the University of Sharjah, i.e., using the known conventional teaching methods (asking an Imām/Sheik) versus searching Islamic Websites. Using descriptive analysis, previous data showed the following results:

Research Questionnaire

Please choose the best answer from the following:

Q1:	In case you have any religious questions; you usually: 1- Do a web search to answer your religious question. 2- Ask somebody who knows about it. 3- Read about it (books, articles, pamphlets, etc.).
Q2:	In case you searched the web; you usually: 1- Choose to read in a specific Islamic Website that you trust. 2- Choose any web site and read from it.
Q3:	In case you asked somebody about your religious query; you usually: 1- Ask somebody specialized in the field (Imām, Sheik, teacher in religion) 2- Ask any family member about it. 3- Ask your friend about it. 4- Ask anybody you think he/she knows about it.
Q4:	You believe that in religious queries, one should: 1- Get the best answer from trustworthy people specialized in the field. 2- Any answer from anybody is fine.
Q5:	You believe that in religious queries, one should: 1- Get the best answer from trustworthy Websites only. 2- Answers from any Website are fine.
Q6:	You believe that Islamic Websites: 1- Sometimes give misleading and incorrect religious information. 2- Always give reliable & correct religious information.
Q7:	You believe that: 1- Islamic Websites can replace Imāms in giving correct religious Information. 2- Islamic Websites can't replace Imāms in giving correct religious Information.
Q8:	When you read in Islamic Websites, You, usually: 1- Understand totally everything written including Islamic terminology. 2- Sometimes I don't understand what is written, especially Islamic terminology. 3- Most often I find it hard to understand what is written. 4- I usually don't understand anything written on the site.

Fig. 1 Research questionnaire

Table 1 Participants' age group

Age group	Total number	Age group	Total number
17 years	2	21 years	20
18 years	15	22 years	2
19 years	27	23 years	7
20 years	27		

Table 2 Participants' majors

Major	Total Number
Engineering and related sciences	39
Medicine and related sciences	36
Arts	25

First: Answers to question 1: Results showed that (45%) of the participants first prefer to ask somebody who knows about their religious inquiries. Answers to question 3: Results showed that 41% prefer to ask a specialized person in Sharī'ah, and (39%) prefer to ask a family member. As for answers to question 4: 99% believe that when it comes to religious teachings one should get the best answer from trustworthy people.

Second: Answers to question 1: Results showed that (41%) of the participants prefer firstly to do a web search to answer their religious inquiries. Answers to question 2: Results showed that (88%) of the participants prefer to check a specific Islamic Website whom they know. As for answers to question 5: (90%) believe that when it comes to religious teachings, one should get the best answer from authentic Islamic Websites.

Third: As for answers to questions 6: Results showed that 87% of the participants agreed that Islamic Websites sometimes give misleading and incorrect religious information.

Fourth: Answers to question 7: Results showed that 84% agreed that checking Islamic Websites cannot replace Imāms in giving all religious Information.

Fifth: Results of question 8 showed that: 11% of the participants understood everything they read on Islamic Websites, while 41% of the participants stated that they sometimes Do Not understand what they read, 36% often find it hard to understand what is written, and 12% usually do not understand anything written on Islamic Websites (Table 3).

When comparing the groups by major, results showed that Arts students were divided into two equal groups. They come first among other majors to ask an Imām (48%) and come first in checking the web (48%). Same for medicine and its related sciences students, they come last with equal results of 41.6% in each. As for Engineering and its related sciences' students, results showed that 47% of the participants prefer to ask the Imām/Sheik about their religious questions, Vs 34% who chose to check the web. This result proposes that a good number of engineering students are not comfortable with Islamic Websites (Table 4).

Table 3 Descriptive results

Questions	Choose the best answer				Total
Q1: In case you have any religious question; you usually:	1- Do a web search to answer your religious question	2- Ask somebody who knows about it	3- Read about it	Total	
Results	41%	45%	14%	100%	
Q2: In case you searched the web; you usually:	1- choose to read in a specific Islamic web site that you trust	2- choose any web site and read from it	Total		
Results	80%	20%	100%		
Q3: In case you asked somebody about your religious query; you usually:	1- ask somebody specialized in the field (Imām)	2- ask any family member about it	3- ask a friend	4-ask anybody you think he/ she knows about it	Total
Results	41%	39%	3%	17%	100%
Q4: You believe that in religious queries, one should:	1-get the best answer from trustworthy people specialized in the field	2- any answer from anybody is fine	Total		
Results	99%	1%	100%		
Q5: You believe that in religious queries, one should:	1-get the best answer from trustworthy websites only	2- answers from any website are fine	Total		
Results	91%	9%	100%		
Q6: You believe that Islamic websites:	1- sometimes give misleading and incorrect religious information	2- always give reliable and correct religious information	Total		
Results	87%	13%	100%		
Q7: You believe that:	1-Islamic websites can replace Imāms in giving correct religious information	2- Islamic websites can't replace Imāms in giving correct religious information	Total		
Results	84%	16%	100%		
Q8: When you read in Islamic websites, you usually:	1-understand totally everything written including Islamic terminology	2- sometimes I don't understand what is written, especially Islamic terminology	3- Most often I find it hard to understand what is written	4- I usually don't understand anything written on the site	Total
Results	11%	41%	36%	12%	100%

Table 4 Comparing participants by major

Major	Total number	Ask Imām	Check the Web	Read	Total
Engineering and its related sciences	39	46.5%	33.5%	20%	100%
Medicine and its related sciences	36	41.6%	41.6%	16.6%	100%
Arts	25	48%	48%	4%	100%

Table 5 Comparing participants by age

Age group	Total number	Ask Imām	Check Islamic Web	Read	Total
17–20 years	71	43.6%	42.25%	14%	100%
21–23 years	29	55%	31%	14%	100%

When comparing participants by age, 43.6% of participants from age group 17–20 years, chose to ask an Imām about their religious questions Vs 42.25% who chose to check the web showing almost similar results. While for students from the age group 21–23 years, results were not similar: 55% of the participants chose to ask an Imām/Sheik about their religious inquiries Vs 33% who chose to check the Web. These results propose that students when they grow older and become more mature, they are more likely to seek the best answer to their religious inquiry directly from trusted people and not from web pages.

4.3 Discussion

According to the pre-mentioned results, (45%) of the participants when having any religious inquiry, prefer to get their answers from knowledgeable people whom they trust or from specialized Imāms, for they are determined to practice Islam in the best way according to the teachings of the Holy Qur'an and the true Sunnah as Allah ordered us.

On the other side, the remaining (41%) participants chose to get answers to their religious questions from specific Islamic Websites that they know or trust. This might be a promising result if we can guarantee that these specific Islamic Websites—that the participants usually check—are continuously committed to releasing credible and reliable religious information to their users, an issue that is so hard to achieve, as previous research proposed. This fact was reinforced by the results of question 7, when 87% of the participants agreed that Islamic Websites sometimes give misleading and incorrect religious information. This problem is double-folded when 89% of the participants confirmed they have difficulty understanding what they read on Islamic Websites.

Considering the anonymous nature of the data available on these Websites and the fact that these female students don't know the correct answer to their religious inquiries because they are not specialized in Islamic studies, all these factors contribute to their incapability to differentiate between authentic, reliable religious

information and unreliable knowledge written on these Websites. Hence, they run the risk of adopting incorrect misleading information, which will end up with practicing Islam incorrectly.

To sum up, research results propose that young female students who will represent the future Islamic Ummah are divided—equally—into two groups. The first group is still attached to the traditional teaching methods by seeking Islamic information directly from trustworthy people or Imāms. In contrast, the second half chose to replace this conventional teaching channel with an easier innovative one, i.e., by getting religious information from Islamic Websites. These results might hide a hidden threat for the following reasons:

First: The total percentage of the second group is vulnerable to increase soon, knowing that using the Internet has become the norm in satisfying religious and spiritual needs.

Second: The number of Islamic websites is increasing tremendously, hence, anyone can create a website or post any information online, whether authentic or not.

Third: Anyone can claim that he is a Muslim Intellect and give himself the right to sit for Fatwá answering Muslims' questions even if he is not fit.

Fourth: "Nobody can verify the true faith of the Website' owner; Does he believe in the oneness of Allah? Does he use authentic Hadīth for his teachings? Does he follow the teachings of any of the four Sunni schools of thought?" (Aliyu et al., 2013a). Since none of these is guaranteed thus, disseminating falsified Islamic thoughts and teachings is quite popular on these Websites' pages.

Fifth: Being nonexperts in Islamic Studies, most Islamic Website users can hardly distinguish reliable and authentic religious information from misleading ones; thus, they fall into the trap of adopting false religious practices.

Sixth: Not all people master all Islamic terminology that Muslim scholars write on their website pages, so the chances of misunderstanding the written data are quite high. Even during face-to-face conversation, misinterpretation between the Muftī and the asker might occur simply because not all people have equal Intellectual capabilities. Also, some cannot understand the exact meaning of what they read or hear from the first time.

Seventh: "Religious authorities in some Islamic countries issued Fatwás against the use of social media like Twitter, arguing its incompatibility with Sharī'ah because of promoting lies. In a similar line, Sheik 'Abd al-'Azīz Āl Shaykh, Grand Muftī in Saudi Arabia, describes the use of the new digital media as incompatible with Islamic practices. He advances a critical stance towards social media platforms such as Facebook and Twitter because, as he says, they disseminate lies and may destroy established relationships and Muslim families in the offline real world" (Ibahrine, 2014, p. 737).

As a result, young people who prefer using Islamic Websites to satisfy their religious requirements could be easily trapped by such Websites, ending up adopting false beliefs and incorrect practices. As time goes by, quite a huge number of the Islamic Ummah will be practicing erroneous Islamic teachings.

In other words, these Muslims will be adopting what they assume to be true Islamic principles when they are unaware that they are practicing the wrong ones.

They are not aware that they have adopted falsified principles that have deviated far away from the original ones that our Prophet Muhammad (PBUH) taught us. This problem is of supreme importance. It might distort the core concepts of Islam as a religion, thus threatening the whole Islamic Ummah.

4.4 Limitations and Threats

Studying only undergraduate female students at one university with a small sample size can limit the generalization of our research findings. Further studies are invited to examine both sexes at different universities in UAE and/or other Muslim countries, with a larger sample size to assess the scalability of the results.

The expected high costs and the availability of a specialized research team interested in similar studies in various Muslim countries pose real threats to the fulfillment of such studies.

5 Recommendations

We propose the following:

1. Muslims in general and undergraduate students in particular—especially those who did not have the chance to fully build their Islamic knowledge, and who cannot discern the right answer to their religious inquiries—should not sacrifice the credibility, authenticity, reliability, and the accuracy of their religious information by making Islamic Websites their first and sole source of Islamic religious knowledge.
2. Muslim Internet users are requested to quest the reliability and the authenticity of any information they read on Islamic Websites' pages before adopting its teachings.
3. Muslim Internet users are strongly advised and invited to verify and compare religious Islamic information that they read on Islamic Websites with other authentic sources; either by directly asking a trustworthy Muslim Intellect, or by reading authentic books, thus avoiding practicing Islam in the wrong way.
4. Certified Muslim Scholars and Imāms/Sheiks are requested to make themselves more reachable to the public by introducing hot-lines to directly answer their religious questions.
5. Further Research is required to examine, monitor, and evaluate the content of Islamic Websites data written to identify fabricated and misleading information.
6. Owners of Islamic Websites are highly requested to write only authentic and reliable Islamic religious information, knowing that a good number of Muslims are visiting their sites.

7. Students awareness campaigns regarding this problem are highly advocated, through digital social platforms, Mass Media, or via various schools/universities activities.
8. All Islamic Governments are invited to set strict rules and standards for those willing to create Islamic Websites.
9. People sitting for Islamic fatwā should be certified by local authorities.

6 Conclusion

Using descriptive analysis, the results of this paper showed that (41%) of undergraduate female students at the University of Sharjah prefer to get answers to their religious inquiries from Islamic Websites Vs. 45% prefer to get it from Muslim Intellectuals. Eighty-seven percentage of the participants agreed that Islamic Websites sometimes give misleading and incorrect Islamic Information, and 89% stated that they have difficulty understanding what is written on Islamic Websites' pages, which will unfortunately lead to practicing Islam away from the correct teachings of Islamic Sharī'ah. Study findings are confirmed by research mentioned earlier in this paper, where many researchers questioned the authenticity and the reliability of Islamic information released by Islamic Websites.

According to this paper's research results, the Islamic Ummah will be facing a hidden threat since participants in this study—undergraduate female university students—are the future mothers, the teachers of the upcoming generation, and they represent an essential section of the workforce, so when they build their religious beliefs and practices on incorrect Islamic knowledge then; their children, their students, their close family members, and their peers will follow to finish with a new Ummah worshipping Allah away from the correct path He set for us, thus losing this life and the life after, may Allah forbid.

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Greta Thunberg's Activism to Mobilize Youth for Climate Change Awareness



Syed Ali Hussain, Shahbaz Aslam, and Thouraya Snoussi

Abstract Greta Thunberg's Activism, and Resistance to Mobilize Youth for Climate Change Awareness: The study explores Greta Thunberg's climate change movement with specific emphasis on mobilizing youth to engage in environmental communication while facing criticism and resistance from influential figures like Donald Trump. The study is important to understand the youth involvement in climate awareness and sustainability efforts. *Method:* The study objectives are to understand the media portrayal of Greta's climate change movement with specific emphasis on her unique communication style, impact of health condition (autism), and response to anti-climate change narrative. *Qualitative analysis of Reviews, Editorials, and Opinions* from news sources ($n = 557$) between January 2018 and December 2020 were conducted. *Findings:* The results comprise three prominent themes: (1) Opposition to Greta's social movement from climate deniers including Donald Trump, (2) Greta's impact on youth and climate policy at world institutions such as United Nations, and (3) Greta's candid and open communication style in mobilizing change specifically among youth. *Conclusion:* The study informs climate policy by introducing a unique perspective and experiences of Greta's autism and its influence on Generation Z. The results also address the challenges and criticism faced by Greta and the youth worldwide, particularly from prominent climate change doubters, resonating with audiences worldwide and galvanizing global action on climate change.

Keywords Greta Thunberg · Climate change · Autism · Activism · Communication

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1 Introduction

Greta Thunberg is a young activist from Stockholm, Sweden, famously known for her movement called School Strike for Climate Change. She started campaigning at the age of 15 when she protested for the first time in front of the Swedish parliament in August 2018. Later she skipped school every Friday to continue the protest. Her initiative has gained significant attention from young people around the world making this a truly global campaign also called “Fridays for Future” social movement. The movement quickly spread globally, and students in various countries began organizing their own strikes to demand climate action from their governments.

Greta’s speeches and actions have attracted positive and negative responses. Her speeches to world leaders at numerous international events are often characterized by their straightforward and powerful messages, holding world leaders accountable to take firm actions to address the climate crisis. She has criticized political inaction, challenged governments and corporations to increase their commitments to reduce greenhouse gas emissions, and emphasized the need for urgent and science-based action (Fonseca & Castro, 2022). While many people admire her dedication and passion, she has faced criticism from individuals and political figures who question her knowledge of climate science, young age, and communication style (Bergmann & Ossewaarde, 2020).

Specifically, from a media and communication point of view, this study presents a qualitative content analysis of editorials and opinion articles published about Greta in prominent global newspapers. The study fills a critical gap of understanding the role of youth in climate change movements. The study is important because Greta is not a conventional climate activist and her youth-led movement intersects with a complex range of factors such as her health condition (autism), assertive communication style, empowering youth, influencing climate policy, strategic use of social media in the face of intense opposition from climate deniers.

2 Introduction of Greta to the Climate Change Movement

Greta emerged from the billions of users on Facebook, Instagram, and Twitter starting with a simple white sign; *School Strike for Climate* to draw attention to the “life-threatening” circumstances of the climate crisis. In an interview, she claimed that the symbolism of skipping school for the strike was to demonstrate how little policy makers care about the future generations. “*Since you adults don’t give a damn about my future, I won’t either*” (CNN, 2020). Greta could not understand why elected public officials are not addressing climate change in an earnest manner. She worried about “tipping points,” i.e., science-backed milestones of climate change that would result in points of no return, “start[ing] a chain reaction beyond our control” (Baker, 2022). One month after her first solo school strike and protest, Greta had galvanized a group of students, teachers, and parents to join her and

officially kicked off her movement with the regular strike effort of Fridays for Future, inviting students in other schools to stage walkouts in protest of climate change inaction. By November 2018, over 17,000 students in 24 countries were taking part in school walkouts and the media catapulted Greta into the international limelight (BBC, 2019).

2.1 Greta's Communication Style

Greta's *communication style* is a crucial factor in her ability to mobilize and inspire the youth and adults. Greta's speeches and social media posts present climate change as a moral issue that needs to be addressed on ethical grounds to preserve the future for the next generation (Chen et al., 2023). Her communication strategy on platforms like Instagram has been analyzed, revealing her use of moral, hopeful, and motivational framing to mobilize her audience. Greta's ability to communicate the urgency and severity of the climate crisis has struck a chord with youth resulting in widespread engagement and activism (Bergmann & Ossewaarde, 2020). She uses this skill to make the climate crisis an issue that people can understand in their own life, rather than just a set of statistical numbers. Instead, she uses analogies and imagery. For example, in her TED talk she said "*The year 2078, I will celebrate my 75th birthday. If I have children or Grandchildren maybe they will spend the day with me...maybe they will ask why you didn't do anything while there was still time to act. What we do will affect my entire life and the lives of my children and grandchildren*" (Greta Thunberg, 2019).

2.2 Role of Greta's Autism in the Climate Change Movement

Greta Thunberg's health condition, Asperger's syndrome, plays a significant role in her social movement on climate change. Asperger's syndrome is clinically known to involve difficulty with social interactions and restricted interests (Hosseini & Molla, 2020). Climate change was an issue that she deemed necessary and important, which allowed her to be vocal on the issue. However, her Asperger's syndrome also offers positive to aid her climate change movement such as focus and persistence, aptitude for recognizing patterns, and attention to detail. These features help her comprehend and focus the issue on a deeper level. For instance, many people would read concerningly about CO2 emissions but forget the severity a few days later, whereas Greta's mind would persist in learning more. In addition, her communication skills are comparable to others on the autism spectrum such as professional tone of voice when speaking, direct remarks, and lack of cognitive empathy for those she speaks with.

2.3 Impact of Greta's Activism on Youth Engagement

Greta's activism is instrumental in mobilizing youth for climate change awareness (Han & Ahn, 2020). Her rise to global prominence as a young climate activist has inspired and empowered young people around the world. The *Fridays for Future* movement, in which Greta is a prominent figure, has mobilized young people to demand action on climate change and has demonstrated the strong environmental awareness of young people today (Bergmann & Ossewaarde, 2020). The spread of the movement from the sidewalk to the main cities of the world happened in the span of a few months. While not every teen wants to be politically involved, thousands gather every Friday to strike for the climate. Overall, Greta's efforts have framed climate change from the standpoint of climate justice and protection of the rights of youth.

Youth-led climate solutions have emerged as grassroots movements worldwide, with young representatives campaigning for immediate action on climate change and highlighting the importance of sustainable practices (Bonell et al., 2022). These initiatives have forced climate change onto the global agenda, emphasizing the need for urgent and collective action to address environmental challenges. Additionally, youth participation in climate workshops and political arenas has been recognized as a means of promoting intergenerational justice and empowering young people to become key stakeholders in climate politics and action (Ursin et al., 2021).

2.4 Examination of the Opposition from Climate Change Deniers

Greta has faced opposition from climate-deniers particularly from Donald Trump. Trump has publicly criticized Greta, dismissing her as a "very happy young girl" indicating her need for temper management (Murphy, 2021). Trump withdrew the United States from the Paris agreement and is famously known for his anti-climate stand and policies. His policies during his presidency often favored the expansion of fossil fuel industries, which diverged from Greta's calls for urgent action to address climate change. On various occasions, Trump has made dismissive remarks about Greta and climate change activism in general. For example, in January 2020 at World Economic Forum, he stated, "We must reject the perennial prophets of doom and their predictions of the apocalypse." Although he didn't mention Greta by name, his remarks were seen as indirectly targeting her and other young climate activists. Baiardi and Morana (2021) found a significant impact of Trump's denial campaigns and Greta's environmental activism on environmental concern. They associated the drop in environmental concern in 2017 with Trump's denial campaigns and the

subsequent increase in 2019 with Greta's activism. The study suggests that Greta's positive effect may have prevailed over Trump's negative effect. Greta's impact and influence has continued to grow when she was awarded Person of the Year title by Time magazine in 2019 (Jung et al., 2020). Trump took to Twitter to express his disagreement with the decision, suggesting that Greta should "go to a good old-fashioned movie with a friend." In response, Greta edited her Twitter bio to "teenager working on her anger management problem." This opposition highlights the challenges faced by youth activists like Greta, who are often met with skepticism and resistance from those in power.

3 Research Objectives and Questions

Overall, Greta Thunberg and her social movement presents a unique case to study climate change communication due to several factors discussed above. This study examines the global media portrayal of Greta's social movement. We conducted a content analysis of editorials and opinion pieces to identify key themes, tones, and arguments presented in these editorials to analyze the portrayal of Greta in the global media and the subsequent shaping of public opinion. The study seeks to address a broad research question:

How Greta Thunberg is portrayed in global news media in context with her autism, activism, and opposition received from anti-climate change activists?

4 Method

4.1 Study Design

A purposive sampling approach was used to select news articles and editorials related to Greta's climate change movement. To systematically study the media portrayal of Greta, we generated the sample of newspaper articles using LexisNexis Academic, a database consisting of full-text articles from reputable and widely circulated news sources. We searched for English-language articles from January 1, 2018, to December 31, 2020, to ensure a manageable dataset. We used the keyword "Greta Thunberg." At the filtering stage we narrowed down to two article types: Reviews, Editorials, and Opinions. Our reason to include these article types was to capture the rich and in-depth discussion and analysis of Greta's movement which would not have been available in the routine descriptive news coverage articles. Next, we filtered the articles based on the people mentioned, i.e., Greta Thunberg ($N = 465$) and Donald Trump ($N = 160$). This filtering resulted in 625 articles. On

further review of articles and removing duplicates, our final sample size comprised 557 articles. This included both US national and international articles to capture a diverse range of perspectives. Only editorials that specifically discuss or mention Greta Thunberg as the focus of the article were included in the sample. Editorials that mention her in passing or provide brief references were excluded.

4.2 Data Analysis and Coding

Our sampling unit is individual articles. The articles were analyzed according to thematic analysis (Clarke & Braun, 2013). Inductive thematic analysis was performed to identify themes and patterns from the data. Emerging themes and key arguments were analyzed to gain deeper insights into the portrayal of Greta Thunberg. The first step comprised open coding to identify meaningful units in each article. Each paragraph of the article was treated as a meaningful unit. The coding was done as per the following process. First, the authors together coded 10% of the articles. This process resulted in identifying main codes and sub-codes. Next, the second author coded the remaining articles. The authors held weekly research meetings to discuss the findings and revisions to meet inter-coder reliability. Inter-coder reliability checks were conducted to maintain consistency in the coding process. Any disagreements or uncertainties were discussed among the coding team to reach a consensus.

Next step of the analysis comprised generating categories and sorting categories into themes. As a result, three themes emerged: (1) opposition to Greta's strike for climate deniers, (2) Greta's impact on youth and climate policy, and (3) Greta's communication style. Examples for each theme are presented in Table 1. This approach is used before to analyze media portrayal of environmental communication topics (Chen et al., 2023). The qualitative nature of the study allowed for an in-depth exploration of the media discourse surrounding Greta's climate change movement.

Table 1 Themes, codes, and example statements from the data

Meaningful units	Condensed units	Codes/categories	Themes
"I have not received any money or any promise of future payments in any form at all"	Greta has not received any funding	No specific funder. Greta funds herself	Greta's activism/ communication strategy
"It's disturbing to know that today's teenagers can find no such optimism"	Today's teenagers are unhappy	Lack of foresight by youth. Attacking the youth	Greta's impact on youth and climate policy
"Trump took to twitter to attack a 16-year-old girl with Asperger's syndrome and tell her to 'work on her anger management problem'"	Trump attacks Greta's autism and health condition	Greta's autism, social media movement, resistance from climate deniers	Opposition to Greta from climate deniers

5 Results

From the analysis of different opinion pieces and editorial articles, three distinct themes emerged: (1) opposition to Greta's movement, (2) Greta's communication strategy, and (3) impact of the social movement on youth and climate policy, presented next.

5.1 *Opposition to Greta's Movement by Anti-climate Change Activists*

Donald Trump's Public Statements About Greta Thunberg President Trump gave little attention to the climate crisis, but a lot of attention to the face behind the activism. Trump attacked the Climate Strike movement and continued to belittle Greta on social media. Trump has a very loyal fan base and as with most strong leaders, his supporters tend to believe what he says whether it is fact or fabrication. Trump has always had an infatuation with Time magazines "Person of the Year" and when Greta Thunberg won the title, it hit a nerve.

Time covers are something of a fixation for this president. Back when he was a reality-TV star, he decorated the walls of at least five of his golf clubs with fake ones featuring his own face (The most depressing thing about Trump's attack on Greta Thunberg, 13 Dec, 2019).

Some say Trump is jealous, while others agreed with him that she did not deserve the award. When Greta received Time of the year award, Trump tweeted about her method of communication and temperament.

"So ridiculous. Greta must work on her Anger Management problem, then go to a good old-fashioned movie with a friend! Chill Greta, Chill! (Why do Trump and his ilk have it out for Greta Thunberg?" (14 Dec, 2019)

This is not the first time that the president has taken his emotions to Twitter. The notable thing about Greta, however, is that she is 17-years-old and has Asperger's syndrome. Most people would not go after her, but Trump had no issue putting a target on her back. Despite the outpour from the left and the praise from the right, Greta seemed unfazed by the attacks.

"She has been attacked so often, including by our own President Trump, but keeps fighting for what she believes in" (Letter: Greta Thunberg is more adult than some in Congress, 17 Dec, 2019).

While she did not seem too fazed, she also did not allow the comment to slide under the radar. She changed her bio.

"A teenager working on her anger management problem. Currently chilling and watching a good old-fashioned movie with a friend" (The most depressing thing about Trump's attack on Greta Thunberg, 13 Dec, 2019).

Her sarcastic response showed no weakness and exemplified her maturity. This response gained Greta praise from her loyal base, liberal leaders, and Trump haters; however, it touched another nerve in Trump's loyal fan base. One conclusion drawn from the mini-Twitter war between Trump and Greta was that both have an unswingable fan base.

"Trudeau and Notley may dearly covet the approval of the Greta Thunberg crowd, but they both know they have to get pipelines built for the sake of the economy, jobs and government revenue. Unfortunately, Canadian Conservatives have not figured out how to appeal to the hearts and minds across the aisle yet, but I think Trump has" (7 Feb, 2020)

His fanbase loves him, just like Greta's followers love her. So, while the tweet secured anti-Greta enthusiasts on the side of Trump, it also brought more attention to her mission and strengthened support from her followers.

Disapproval of Greta's Young Age The most factually rooted attack on Greta is that she is very young and that it is a youth-led movement. Aside from ageism and generational stereotypes, law also discourages youth from political involvement. The United States only allows citizens over the age of 18 to vote in both state and federal elections. Greta's movement is unconventional because instead of rallying and encouraging their own members to vote, the movement strives to encourage older people to vote for climate. The movement received criticism for this reason.

"We need to mentally equate Abraham Lincoln's rhetoric of "a house divided cannot stand" with Swedish activist Greta Thunberg's message, "Our house is on fire" (Young people must make climate action a political priority, 3 Feb, 2020)

Even if some of the movement's participants could vote, would they? The doubt stems from the previously reported statistics about young voters.

"It won't work if you don't vote as well. Only 43 percent of 18- to 24-year-olds voted in the last general election, against around 80 per cent of over 60s" (If you want to change the world, get involved, 24 April, 2019)

This is not to say that 18–24-year-olds are not passionate about policy changes, they are just less likely to fill out a physical ballot. The lack of physical representation in politics contributes to the stigma held against youth activism.

Skepticism About Funding Greta's Movement For many, it is hard to believe that Greta could achieve so much influence without financial backing from a political party, organization, or company. Her claim to be self-funded sparks controversy in the political realm. She does not accept money outside of her own family, and any money handed to her is regifted to an organization she believes is making milestones in the fight for climate. Still skeptics believe otherwise.

"Indeed, there have been false stories about her and her financial situation" (21 Oct, 2019)

Notably, public figures are known for representing a bigger organization, policy, or party. Greta, however, is not involved in the politics. She is distinctly clear that there is no person or organization funding her activism.

"I have not received any money or any promise of future payments in any form at all."

Her public statement of transparency shows that she is dedicated to the cause for personal reasons rather than financial gains. She explains that her travel cost is paid by parents. Her mother works as an opera singer and her father used to be an actor. However, the family is struggling with finding ways to afford the costs of running the campaign. In addition to the high ideals of transparency, Greta also admits that she is not a climate expert. This is a notable act of honesty for the poster child of the climate crisis.

People have their own speculations about Thunberg's campaign, and the Internet is a breeding ground for creative allegations. Some call her the "Mother Theresa" of the climate movement, while others hold a more skeptical opinion. To defuse the allegations, Greta trademarked the name Greta Thunberg, "*Fridays for Future*" and "*School Strike for Climate*" to dissociate from companies and organizations claiming that they work with or through her. Prior to launching her trademark, the misperception of Greta acting as a puppeteer led to a counterattack by the big-oil companies through the introduction of a rival youth, Naomi Seibt.

Opposition from Naomi Seibt Introduced as the *anti-Greta* of the climate strike, Naomi Seibt is a self-defined "climate realist" who started making videos on YouTube to battle claims made by Greta Thunberg. Greta is not serving the likes of any big corporations through funding; however, Seibt was quickly funded by Heartland Institute, a self-proclaimed conservative publication.

"Seibt is in the pay of the Heartland Institute, a think tank closely allied with the White House that denies established science showing humans are heating the planet with dangerous consequences" (25 Feb, 2020).

Seibt's backing by a conservative, anti-climate organization is tell-tale that the Fridays for Future movement hit a nerve with right-leaning ideologists. The action of bringing another teen woman's voice to the surface creates an equal playing field between Greta and Seibt. Since Greta is not funded by any outside organization, she has the freedom to say or act as she pleases. Seibt, on the other hand, is subject to reflect the same values of her financial backer. Seibt does not deny the scientific evidence provided in support of climate change; however, she denies the severity of this issue. Due to this, her image has grown a conservative base of individuals. She works as an effective attack on the *School Strike for Climate* because she is also a member of Generation Z and she can relate to people who are not fond of Greta's message. However, Greta's supporters view Heartland's elevation of Seibt as a weakness.

"If imitation is the highest form of flattery, Heartland's tactics amount to an acknowledgment that Greta has touched a nerve, especially among teens and young adults" (25 Feb, 2020)

Anti-Greta companies saw the impact that the 17-year-old made and therefore wanted to front their own activist to combat the claims. Seibt's following is nowhere near to the masses of Greta, but she is another prominent figure working against the youth-led climate movement.

5.2 *Greta's Communication Style in Conveying the Climate Message*

Transparency Greta is unique in her upfront and transparent way of communicating in the corridors of power about climate change. She is also conversational with her fan base about her financial situation, scientific expertise levels, and mental struggles.

"Thunberg is not claiming to be a climate expert or an adept policymaker ... As an activist, her role is simply to encourage everyone, from other teenagers to the most powerful leaders in the world, to listen to the facts and take action" (29 Nov, 2019).

She redirects speculations about the science of climate change back to the scientists. While she memorizes certain facts and figures, her main role is to inspire others. Greta is unapologetically herself, openly discussing her experiences with Asperger's syndrome and using her unique perspective to advocate for climate action. When Greta faces aversion for her expertise on climate change, she is not afraid to admit that she does not have all the answers. Such transparency lets people know her true intentions and builds trust.

Candid Responses Greta does not *sugarcoat* the situation. In fact, she emphasizes the negatives to instill a factor of urgency and risk. She bluntly talks to and confronts world leaders about their lack of action.

"Greta Thunberg bluntly tells business and political world leaders to act immediately to halt all activities that aggravate the climate change crisis ... Start treating this as a humanitarian crisis instead of protecting the businesses that create the ongoing crisis" (3 Feb, 2020)

She does not mince words when it comes to addressing the urgent need for climate action, often using strong language to convey the severity of the climate crisis. She does not hesitate to call them out for their bad intentions. Greta's speeches are devoid of traditional rhetorical techniques or flowery language. Instead, she relies on hard-hitting facts, scientific evidence, and straightforward logic to make her points.

Inspiring the Youth Greta's communication is focused on inspiring action. She consistently urges politicians, business leaders, and the public to take urgent and ambitious steps to address the climate crisis. Her communication is moving because it inspires young people by pinning them against the adults. Similar to how teens rebel against their parents; politicians ask for one thing and Greta's climate strikers do the opposite. In a sense, it pins the young against the old and inspires youth by promising a brighter future.

"Today, the world's children say: enough. You adults - you politicians, businesspeople, media - have not listened. While you fret about issues that don't matter to our future, you ignore the biggest problem - climate change. It dwarfs all other issues for our generation, and it is your fault. Your problem to fix" (Back the spirit of youth over climate change 20 Sept, 2019).

Greta's speeches are delivered with genuine passion and emotion. Her concern for the environment and future generations is evident in her voice and body language, which helps to connect with her audience on a personal level. She makes public appearances in different parts of the world on a frequent basis to be involved with the strike.

"The strikes spread throughout the fall and winter and spilled over to 2019 ... with a mass mobilization, on the heels of Australia, Switzerland, Germany, Japan, and many other countries around the world. They skipped school because they felt there was no point to school without a future, and their resistance took their grievances around generational injustice directly to elected officials" (A year of resistance: How youth protests shaped the discussion on climate change, December 26, 2019)

Greta is a clear voice within Generation Z, and many find her empowering because the concepts she preaches are desirable to similar others of her age. She travels all across the globe to speak to students and motivate them to join her fight. Students have reported experiencing intense feelings while listening to her speak.

"I started crying. I just found it powerful and empowering, said Juliana Rubiano, 16. "She represents a lot of people, and that's us, that's the youth" (Global climate strike, 21 Sep, 2019).

It's possible that such emotions are expressed because of the desperation in Greta's voice as she demands action. It was seen at the UN when Thunberg delivered a famous speech "How Dare You," and it is seen now at high schools, protests, and climate strikes around the globe.

"The teenage climate activist has a way of enraging people in ways her contemporaries - adult scientists and activists - could only dream about" (Why do Trump and his ilk have it out for Greta Thunberg?, 14 Dec, 2019)

Overall, Greta's communication is rooted in inspiration specifically for youth. As a young activist, Greta brings a fresh and unique perspective to the climate movement. According to Greta, the young people are most impacted by the crisis; therefore, they are more inclined to act. While scientists have a better understanding of the implications and solutions, their audience was too broad to make an impact.

Response to Hate Speech Greta promotes non-violent civil disobedience as a means of raising awareness and driving change. She encourages peaceful protests and strikes as a way for young people to make their voices heard. However, she has come under harsh criticism from those who do not believe in climate change. Greta is diagnosed with Asperger's syndrome on the autism spectrum which means that she does not necessarily understand all social cues or process her emotions very well. This could be a helpful tool in her communication. She only speaks when she feels it necessary. She had faced attacks based on her mental illness, but she responds to them all the same.

"When haters go after your looks and differences, it means they have nowhere left to go. And then you know you're winning!" (3 Feb, 2020).

She encourages her followers that the attacks do not impact their movement. A movement doesn't catch momentum until people are opposed to it. Her lack of acknowledgment of these remarks gets under people's skin and provokes even more targeted replies. Being a world icon, Greta is invited to events and conferences around the world. She gets the opportunity to communicate with many renowned politicians; however, she does not allow their words to persuade her.

"Thunberg elicited laughter when she described all the politicians, she had met who asked for selfies and "tell us they really, really admire what we do" yet have done nothing to address the climate crisis" (Global climate strike, 21 Sep, 2019).

Greta places a strong emphasis on scientific evidence and the consensus of climate scientists. She often cites specific data and reports to support her arguments and to urge leaders to take immediate action based on the best available science. Politicians view her as a celebrity instead of a serious threat. Her ability to address this problem and laugh it off is a strength in her communication because not many people would be able to look the other way to a surplus of hate.

Third theme relates to the impact of Greta's movement in informing youth as well as influencing policy reforms about climate change.

5.3 Impact of Greta's Movement on Climate Policy

Respect for Generation Z Greta's social movement has increased the involvement of Generation Z. This category of impact may not be completely without dispute. There are two sides of the argument; those who believe Greta has given a voice to her generation, and those who view the movement as an unwarranted annoyance. However, it is indisputable that Greta brought attention to the views and feelings of young people. Her humble beginnings may be the best indicator of how this global transformation began to develop.

"She started at age 15 by sitting alone in front of the Swedish Parliament for weeks with a handmade banner School Strike for Climate, demanding the government reduce carbon emissions" (3 Feb, 2020).

Her movement started small and caught fire over a fairly short period of time, demonstrating the critical nature of the issue. If generation Z did not share similar concerns, her strike would have stayed a lonely effort. Through social media and coverage by the local press, the word of School Strikes spread around the globe. This exemplifies the ability of Generation Z to advocate on a global scale through social media, expand the message, and rally masses to join the movement. This is probably the first time that the world has united in the fight against climate change communication movement; however, the information is not new. As discussed previously, Greta was able to relate to people better than scientists. Due to this, she is difficult for certain people to accept.

“An explanation, besides sheer meanness and ignorance, is that adults are embarrassed that a kid managed to do what they couldn’t” (Why do Trump and his ilk have it out for Greta Thunberg?, 14 Dec, 2019).

Adults may find it difficult to understand how Greta could get through to people while scientists merely stand by. For many, it is hard to accept the idea is being led by a kid and for good reason. She picked a target audience and stuck to them. This is a key to her success. Many of the kids around the world protesting are too young to vote, take Canada for example:

“Many of those marchers, like the climate strike’s founder Greta Thunberg, are too young to vote and are too young to be surveyed about voting intentions in Canada’s upcoming federal election” (Focus on main issues in election campaign, 14 Dec, 2019).

The young protest even though they don’t have the power to change the problem. This shows their commitment to bring a change. Their message is consistent and unwavering. Greta highlights this in one of her speeches:

“Young people showed that we are united and that we are unstoppable” (3 Feb, 2020).

To sum, by speaking directly to world leaders and mobilizing millions of young activists worldwide, Greta has effectively amplified the urgency of the climate crisis and catalyzed a global movement for change.

Creating a Sense of Urgency Scientists have said for years that the current state of the world requires immediate attention to rehabilitate; however, Greta may be the only *youngest* person who practically established it as a climate crisis. This adds urgency to the issue, importance to the movement, and prominence to the politicians. With so many pressing issues in the world, climate change has long been pushed to the back of the list in terms of urgency.

“We cannot solve a crisis without treating it as an emergency. If the system cannot find a solution, change the system” (Greta Thunberg lends youth a loud, clear voice, 3 Feb, 2020).

The political system has long struggled to keep up with the constant demand of the climate crisis in contrast with the demands of the economy, and Greta has explained this error to the governments around the globe.

“We are adaptable; we can still fix this if we treat it like a house on fire! But the opportunity to do so will not last. We must start today. Because giving up can never ever be an option” (3 Feb, 2020).

Greta’s movement shows that for the world to pay attention, it has to be treated as an emergency. People react strongly to danger, and she utilized this tactic to help her movement make a bigger impact.

Increased Attention from Adults Adults are not impacted by the climate crisis as much as the younger generation. This is the reason why warnings of climate change never fully resonated with them. As Greta’s movement gained momentum, it was noticed by several big organizations.

“Workers from Microsoft, Google, Amazon, Facebook, and Twitter staged walkouts in what may be the largest coordinated worker action in the history of the tech industry” (Global climate strike, 21, Sep 2019).

The tech industry is not alone in making strides toward climate change movement. The University of California is among many colleges contributing to the struggle.

“The University of California pledged to divest over \$80bn in endowment and pension funds from fossil fuel companies, citing the ‘financial risk’ posed by the industry, compared to renewable energy” (Global climate strike, 21 Sep 2019).

The involvement from adults creates an even bigger impact on the *Friday’s for Future* movement because adults can vote. They have the power to influence policy. Youth can advocate with their voice, but a ballot is what makes the decision. However, not all adults are accepting Greta’s climate strike. For many, the economy takes precedence. To make the changes that Greta suggests in her protest, the economy would take a significant hit. It would require commitment from most of the population, and sacrifices that not many are willing to make. Some find this threatening.

“The reality of meeting our climate change target requires a great degree of public will, which will be sorely tested when the costs and lifestyle changes required of us all are crystallized. There will also come a point when the public begins to stop accepting rushed decisions and proposals from climate alarmists” (Greta Thunberg - how do MPs see her views? 9 Oct, 2019)

A misconception about Greta’s campaign is the thought that she is attempting to destroy capitalism. To commit to the environmentally green way of life, people would have to find a new line of work, invest in green energy, and be able to make it affordable for everyone. As the mayor of Alberta said on Greta’s visit to Canada:

“If you believe that the entire industrial modern economy should be shut down tomorrow, that the airplanes should stop flying, the cars should all stop driving, that millions of people should be put into unemployment, because we need to turn off the consumption of all hydro-carbon energy tomorrow, if that’s what you believe, then you’re probably not going to be a supporter of what we’re doing in Alberta” (17 Oct, 2019)

These viewpoints are more prominent now than ever due to Greta’s momentous movement. The problem is lack of consensus, particularly in the United States. It is why Americans vote for offices, policy changes, and laws. American government tries to focus on the issues most currently relevant to the citizens. Those issues are often economy, jobs, human rights, immigration, and gun laws. Climate change is an ongoing problem; however, many other things have bigger temporary importance.

“In poll after poll, climate change consistently ranks at or near the bottom on the public’s list of concerns” (22 Oct, 2019).

These results point toward a shift that started with the introduction of *Friday’s for Future* and *School Strike for Climate*. However, it is too soon to assess whether it will change the way people vote for change. Although there is lack of concrete evidence about the impact of Greta on slowing climate change, the success lies in

more awareness. Adults are now more aware of the issue; after all, their kids are the ones protesting.

6 Discussion

This study examines the media portrayal of Greta Thunberg's climate change movement in context with her autism, activism, and opposition from climate deniers. Greta's movement to combat climate change has received both praise and scorn. Youth-led climate campaigns significantly impact environmental awareness and action. For instance, Lorenzini et al. (2021) found that it has successfully raised public awareness and encouraged collective action toward mitigating climate change. Greta has drawn attention to young people's unique perspectives, concerns, and responses to the environmental crisis.

Greta's ability to rally support and mobilize people, especially the younger generation, largely attributed to her straightforward and no non-sense communication style. Her public lectures and speeches, known for their directness and unwavering honesty, have struck a deep chord with audiences growing more worried about the world's climate. Greta skillfully bridges the gap between scientists and public due to her ability to make complex scientific material understandable, and relevant especially for the youth. For this, Greta has received both praise and criticism for her directness and simplicity. While some believe her honesty to be a strategy for cutting through complacency, others think it alienates some listeners.

Concerns have been raised regarding how the campaign is funded. While there may be valid worries about financial transparency in any movement, these doubts are not specific to Greta's involvement. It also emphasizes how environmental movements' financing sources are frequently questioned that diminishes their credibility. Research on climate change denial and conspiracy theories by Cook (2017) emphasizes the existence of opposing viewpoints and their influence on public dialogue. These studies highlight the polarization of the climate change discussion and how competing perspectives, like Seibt's, shape the conversation about climate activism.

Despite the criticism, Greta has endured and her influence on the debate over climate change is established. She has increased the urgency of the environmental catastrophe and forced adults to pay more attention via her tenacious and straight forward communication. The climate emergency has risen to the top of political agendas and policy conversations due to her capacity to question global leaders and hold them responsible for their inaction.

Trump remains to be a prominent critic of Greta's social movement. His remarks against Greta and public denial of climate change indicate a more significant political dispute over climate policy. For example, Hornsey et al. (2016) examined how political ideology affects people's views on climate change. According to the study, political conservatives like Trump tend to be less convinced about climate change, which may lead to criticism and hostility toward campaigners like Greta.

Greta is also outspoken about the necessity for transparency in climate change and urged authorities to give truthful accounts of their policies and accept accountability for their deeds. Credibility is enhanced, and informed decision-making by the public and decision-makers is made possible by transparent communication. The impact of inspiration in inspiring people to participate in communal endeavors is highlighted by research on collective action and social transformation (Van Zomeren et al., 2008). Many people have been inspired by Greta's enthusiasm and dedication to the cause further increasing the urgency and desire for change.

Greta's statement also stresses the existential threat of environmental degradation and the requirement for prompt action. Mildenberger and Leiserowitz (2017) emphasizes the part played by well-known individuals, such as Greta, in portraying climate change as an urgent and imminent issue, motivating both political and public reactions. Following Greta's involvement, the data shows a change in public perception and interest in climate change problems. Due to her speeches and direct challenges to global leaders, people are paying attention to the climate crisis and examine their actions and responsibilities. Greta's lectures positively affected public opinion and raising awareness of adults as well (Van der Linden et al., 2015). The broader public debate and the impetus for climate action have benefited from Greta's ability to hold the interest of older generations.

Greta's action has also spurred essential discussions about the precarious balance between the economy and combating climate change. She has forced people to face the need for sustainable economic practices that prioritize the long-term welfare of planet earth over short-term gains by highlighting the potential financial costs and trade-offs involved with climate action. This has changed how we view and approach sustainability by fostering more excellent knowledge of the connections between economic systems and environment. For example, Stern (2006) emphasizes the importance of moving toward low-carbon economy while keeping in balance the economic needs. Greta's influence in this area comes from her efforts to encourage sustainable economic methods and a reevaluation of objectives.

To sum, Greta Thunberg has strongly advocated climate change and defied obstacles, sparking a worldwide movement. Although her communication method has drawn criticism, it has successfully motivated people of all ages to accept responsibility and work toward a sustainable future.

Greta's unwavering dedication serves as a reminder that teamwork and tenacity are crucial in addressing one of climate change's most critical problems as the world struggles to cope with its effects. Overall, Greta's work has sparked a global movement for climate action and influenced policy conversations at different levels of public awareness. Her dedication is a potent reminder of the need for teamwork and perseverance in addressing a critical issue of current times.

7 Conclusion

The study on Greta Thunberg's activism, autism, and its impact on mobilizing youth for climate change awareness highlights several key aspects. Thunberg's unique communication style, driven by her straightforward and candid approach, has significantly influenced global climate policy discussions. Her condition, Asperger's syndrome, has been both a strength and a point of contention, providing her with a focused and persistent drive while also attracting criticism from climate change deniers.

Three main themes emerged from the analysis of media portrayals: opposition from climate deniers including notable figures like Donald Trump, the impact of Greta's activism on youth and climate policy, and her communication style. The study found that despite intense opposition, Thunberg's ability to communicate the urgency of the climate crisis has galvanized a global youth movement, inspiring widespread engagement and activism.

Her activism has also faced skepticism regarding funding and transparency, yet her unwavering honesty about her financial situation and motives has helped maintain credibility. The influence of her movement is evident in the increased attention to climate issues and the involvement of both youth and adults in demanding urgent action.

Overall, Thunberg's activism has played a crucial role in raising climate change awareness and mobilizing a global movement, emphasizing the need for immediate and science-based action to address the environmental crisis.

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News in the Holy Quran: An Analytical Study of the News Information Interpretation in Surah An-Naml



Nassir Bouali and Syed Ali Hussain

Abstract This chapter analyzes the media interpretation of “Surah Al-Naml” (The Ants) to elaborate on the media disparity that exists in traditional and new media platforms, especially at the level of news production, news reporting, visuals, comments, and videos. The study provides solutions to the accumulated media problems in the context of prominent media and communication theories. If we suppose that the Prophet Suleiman (Solomon) is the director of a media channel, we can consider him as a Gate Keeper who is very skilled in applying important media principles in his governance. This includes principles of objectivity, integrity, timeliness, honesty, credibility, investigation, and accuracy among others. In addition, considering the Hoopoe as a journalist who transmits news, we can consider him as a media source that relates the events and delivers it truthfully, credibly, certainty (sure/tiding) and objectively as well as answering the six questions known to academics in media sciences: Who? What? Where? Why? When? How? We see him accompanying the news and separate opinion from facts. The media interpretation of some Quranic verses from Surah Al-Naml provides evidence that can help media professionals as a reference and vision for the study of news media writing and reporting. Overall, the study builds on cognitive integration of the science of the Holy Quran with mass media and communication.

Keywords News · Misinformation · Certainty · Surah Al Naml · Quranic media interpretation · Prophet Solomon and Hoopoe

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1 Introduction

The world is experiencing many overlapping events in terms of political, economic, and sociological progress. The world events are widely circulated through radio, TV, and newspapers in addition to the new media and social networking sites. As a result, the users (i.e., readers, listeners, and viewers) are confused due to the large number of events, facts, and fiction. The user receives deferent pieces of information in the form of news reporting, investigative journalism, and reportage. The problem is that an examination of these forms, or media templates does not help the user to acquire knowledge, receive information, and form a correct idea of what is happening and going on in their apparent reality.

With regard to this *problem*, Farooq Abu Zaid said, “We need a realistic story that narrates the event as seen with the naked eye, and we do not need news that is true or false! This contains a subjective interpretation that does not correspond to the truth...” (Abu Zaid, 2000, p. 98). In addition, Muhammad Hassanein Heikal also said, in an interview with the Kuwaiti magazine *Al-Arabi*: “How can I live as a user of opinions alone without knowing what happened?” (Hassanein, 2006, p. 34). This sentence illustrates the apparent confusion of many media sources between information and politics, between news and commentary, and between the truth and opinion. The media “chaos” that many of the so-called news channels are experiencing, now numbering more than 60 specialized news channels broadcasting their news throughout the Arab and Islamic world, prompts us to reflect on the media treatments in these channels and reduce the negative impact these channels have on news dissemination (Arab Media Forum, 2013). In addition, they affect the way users process the news through poor media coverage that does not serve the truth. We firmly believe that the solution this time is not from translated books in Arabic or limited media writing theories but in the following values and characteristics: strangeness and oddity, timeliness, impact, controversy, prominence, emotion, speed, scoop, and news interest rather than importance. These characteristics may not mean much, in the situation we are experiencing. Certainty, as a news value, is related to other characteristics such as objectivity, proximity, currency, usefulness, honesty, and credibility. The intended meaning of the certainty significance is the clear and unambiguous information (clarity), as opposed to the presumptive indication in which there is some invisibility and is addressed by possibility and ambiguity.

This chapter examines the news media development and dissemination in today’s world based on the most important source of Islamic legislation, i.e., the Holy Quran.

2 Objectives of Research

The *objectives* of this research are summarized as follows:

1. Rooting media studies of the Holy Quran.
2. Attempting to address phenomena, events, and media facts by returning to the Arab-Islamic heritage and through the most important sources of legislation, i.e., the Holy Quran.

3. Understanding the “Quranic news story” and deducting rules to write the news story.
4. Clarifying the scales of the media in the Holy Quran, like the scales of politics, economics, sociology, and education, which has come a long way in terms of research and investigation, except in the media studies.
5. Introducing researchers in the media and communication sciences toward this subject and contribute to it by bringing about the required knowledge accumulation.

3 Research Question

As such the study asks a broad research question: Is Certainty (Al-Yakiniya) the most significant characteristic value that positions the Holy Quran as a solution to the media challenges in various media outlets across the Arab and Islamic world?

The question seeks to explore whether certainty, referred to as “Al-Yakiniya” in Arabic, is the most crucial attribute that positions the Holy Quran as a potential solution to the challenges faced by numerous media outlets in the Arab and Islamic world. The Quranic term “Al-Yakinia” refers to certainty or conviction. In Islamic theology and Quranic context, it signifies a state of absolute assurance or firm belief in the truth of something. It is derived from the Arabic root word “yaqeen,” which conveys the concept of certainty, confidence, or surety. In the Holy Quran, the term “Alyakinia” is often associated with matters of faith, belief in God, and the afterlife. It represents a level of conviction that transcends mere belief or speculation. It implies a profound and unwavering confidence in the existence of God, the truth of His message, and the certainty of the Hereafter. “Alyakinia” in the Holy Quran refers to the highest level of certainty or conviction in matters of faith and belief, emphasizing unwavering trust in the truth of God’s message and the ultimate reality of the divine (Shalabi, 1988, p. 54).

The *importance* of this topic lies in the element of *media interpretation* which will achieve the *methodology normative* of this research, as they will define and separate the “original” from the “non-original” in media thought and practice. The *importance* of this topic also lies in presenting a media interpretation within the limits of scientific knowledge to discover how the media treatment was in Surah Al-Naml through the relationship of Prophet Suleiman (Solomon) with the (Hoodhood) hoopoe, to guide and set a good example for the professional type of journalism.

The normative methodology approach, often used in fields such as philosophy, ethics, law, and media, focuses on prescribing how things should be rather than describing how they are. It is concerned with establishing norms, principles, or standards that guide human behavior or decision-making in a particular context. The specific techniques or tools used in the study for interpretation and appropriate for the research question are as follows:

1. The Value Judgments that normative methodologies often involve making value judgments about what is morally right, just, or desirable. These judgments are

based on philosophical, religious, cultural, or societal beliefs about the nature of good and bad, right, and wrong.

2. Reasoning and Justification that normative claims are typically supported through reasoned arguments and justifications rather than empirical evidence alone. This may involve logical deduction, ethical reasoning, appeal to moral intuitions, or consideration of hypothetical scenarios to support normative conclusions.
3. Critique and Revision that normative methodologies are subject to critique and revision as societal values, ethical beliefs, or theoretical insights evolve over time. They are open to debate and reinterpretation based on changing circumstances or new philosophical insights (Omolola, 2020, p. 45).

4 Definition of News

4.1 *The Concept of News in the Traditional Media Theories*

Linguistically speaking, the concept of news is “what is conveyed and spoken by word or writing” (Intermediate Dictionary, 2007, p. 896). The news and the gathering of news are what comes to you regarding whom you are asking. This means that news is an “order” that is, it reports what is happening. People pass it on through their conversations or through written texts, or it is information about “cases that have taken place” and we are interested in knowing them so we will ask about them. News becomes “what news has come to you regarding whom you are asking.” Based on this, it can be said that humanity has contributed to the creation and transmission of news since God Almighty created them on earth (Ibn-Mandhour, 2001, p. 783). News is also a report of recent events or unknown information, reported in a newspaper, magazine, or broadcast, an event that is interesting enough to be reported.

Definitions of news and its conceptualization varied among various political, sociological, and professional journalism fields, depending on the objectives of each, the systems they represent, and their interpretation of the role of media in society. This diversity in defining news naturally results from the perspectives of theorists in these fields and what they seek to achieve with their audience, whether it be readers of journal, radio listeners, TV viewers internet users, or users of social networking sites.

Our primary focus in this chapter is the concept of news as mentioned in the Holy Quran, and we place less emphasis on the concept of news in different media theories. According to Authoritarian theory, news closely resembles propaganda, where the dissemination of objective facts takes a back seat. In this context, the selection of news becomes a tool to serve the interests of the ruling authority, rather than enlightening citizens and assisting them in making informed decisions (Sibert and Schramm, 1965, p. 43). Under this theory, news is primarily information chosen by decision-makers to support specific strategy (William et al., 1971, p. 77). The

authoritarian approach has been the most pervasive method both historically and geographically. It was almost universally adopted by most countries when society and technology advanced enough to create what we now call the “mass media” of communication. It furnishes the basis for the press systems in many modern societies; even where it has been abandoned, it has continued to influence the practices of several governments, which theoretically adhere to libertarian principles (William et al., 1971, p. 45). In contrast, the libertarian theory defines news on a set of principles, including freedom, media competition, and giving full opportunity for all opinions and ideas to be expressed, regardless of the degree of error and rightness in them, with little control over what is published. The media is governed by an economic factor that is to make profits, which guarantees its continuity and independence, and this will only be achieved by a larger distribution to a larger audience that tempts the advertiser to publish in a popular medium (William et al., 1971, p. 38). Like other theories addressing the role and function of the mass media in society, the libertarian doctrine derives from the philosophical principles that underpin social and political structure. Liberalism, as a social and political system, establishes a framework for the institutions, including the press, which is influenced by the principles inherent in the society it serves.

Today, when newspaper publishers speak about their calling, such phrases as “the public’s right to know” and “the public responsibility of the press” are likely to creep into their talk. Such ideas and the press performance resulting from them represent an important modification of traditional libertarian theory, for nothing in libertarian theory establishes the public’s right to information or required the publisher to assume moral responsibilities. On rare occasions when the American and Soviet journalists convene to discuss mass communication, the conversation can be both amusing and frustrating. Within the first few minutes, it becomes evident that their frames of reference are incompatible. The Americans appreciate their free press and may sympathize with their Soviet counterparts who contend with state ownership, censorship, and propaganda. In conclusion, we touch upon the theory of social responsibility that is closest to an objective and moderate proposition, as it acknowledges the relationship between freedom and responsibility when crafting news stories, a concept evident in the theory of social harmony (Markham, 2009, p. 38).

4.2 The Concept of News as Mentioned in the Holy Quran

Turning our attention to the concept of news within Islamic tradition, the Holy Quran references news in several verses. These verses convey meanings, situations, and events from which we can derive an integrated theory of media news. The development of such a theory, aligned with the rules, foundations, ethics, and principles outlined in the Holy Quran, serves several objectives the nation seeks to attain. This has already been achieved considering this great media chaos witnessed by some television news channels as well as the new media models represented in social networking.

Researcher Karam Chalabi in his book, *The News from an Islamic Point of View*, identifies a set of goals that media professionals and journalists should consider when covering events and facts. These goals include (Shallabi, 1988, p.48):

1. Establishing a specific definition of the news based on the teachings of the Islamic religion and its media ethics.
2. Identifying the foundational principles and rules based on which the news is evaluated and presented across various media platforms.
3. Establishing and defining the values, considerations, and rules that guide the editing and commentary on news stories.
4. Protecting and fortifying the audience (the public) in our Arab and Islamic societies as well as abroad against the daily inundation of information. This includes employing and directing the news received from various media sources, especially with the growth of specialized news channels and the increase in social networks, including what came to be known as “the new media.” New media encompasses various forms of content such as opinion, information, news, experiences, images, and video scenes disseminated electronically by individuals who operate independently, free from political or value-based constraints, adhering solely to their personal beliefs and principles, subject to their self-censorship. Among the new media tools are social networking sites on internet, such as Facebook, Twitter, Myspace, YouTube, Messenger, WhatsApp, Instagram, and other virtual social networking applications.

Based on these considerations, it is now possible to formulate a specific definition of the news and its characteristics, importance, and qualities. This serves as the initial step toward establishing a theory of news work in the alignment with the principles of the Holy Quran.

The term “news” is mentioned in numerous verses of the Holy Quran. Many sources have unanimously agreed that “the news” (Al Khabar) is synonymous with “the great news” (Al Nabaa), and they refer to the same concept. In essence, “a man’s news is some news: he tells him, and he informs him of the news, and by news: he tells him” (Intermediate Dictionary 2007, p. 896).

Some argue that the news (Nabaa) carries significant implications that lead to knowledge or a preponderance of suspicion. The news is not originally called news (Al Nabaa) until it includes the following three things. This means that the news is the news (Al Nabaa) if it has three conditions (Mourtadha, 1965, p. 443):

1. The great benefit: for a category. This indicates importance.
2. Knowledge: complete information about a specific thing that happened.
3. Predominance of suspicion: information that is part of the truth or reality until the matter is clear upon examining the noble verses of Quran that mentions news a clearer and more precise definition of the concept of emerges. The Quran itself, specifically Surah An-Naba (News), revolves around the critical news of the Resurrection, addressing the disbelief of polytheists (Al-Mushrikoon) who had long denied this belief. The opening verses inquire about “the great news,” signifying Islamic Monotheism, the Quran brought by Prophet Muhammad, and the impending Day of Resurrection (An-Naba, 1 & 2).

Karam Chalabi says that the word “An-Naba” in Surah An-Naba indicates important news: Either it is important or of great significance. It refers to an important, perilous, and great event, and thus the important news conveys a significant event one that is so momentous that its exact timing is known only to God Almighty (Shallabi, 1988, p. 48).

While some interpretations suggest that “the great news” in this verse refers to “the Quran,” the consensus leans toward interpreting it as “the Resurrection.” “The Quran is an important matter as well as great news, that is, tell them, O Muhammad: This Quran that I brought to you is important news and a matter of great importance. And in another interpretation that God Almighty commands His Messenger to say to them (skeptics) (Say, it is great news). It means a great news and an eloquent affair, and it is God Almighty’s sending me to you”.

Nevertheless, the common thread in these verses is that “news” refers to a highly significant event or a matter of great importance. The Quran itself and the mission of Prophet Muhammad both constitute matters of paramount significance, categorically described as “events” and “news” of great importance (Sherif, 2000, p. 32).

We find in the subsequent verses a clear definition of what the news is as it used in the Holy Quran. It signifies the “important event” or “significant news”; then we find in it also the two most important elements of the news, which are “Magnitude” and “Relevance” which means the number of those who are influenced by the news and are concerned about it and are coming to it are, In Surah An-Naba, this encompasses all of humanity, as the concept resurrection includes all people (Sherif, 2000, p. 33).

The definition that we can derive from the preceding discussion is that news is “an important event that will occur and all people should know it.” In concise term, it is synonymous with the concept of the Resurrection (Shallabi, 1988, p. 32). However, what about the events that have already occurred or that have occurred in the past? How can an event be considered news if it has taken place without prior knowledge? Why would it merit publication in the media?

The God Almighty addresses this issue in Surah Al-Ahzab: “They hold that the clans have not retired (for good), and if the clans should advance (again), they would fain be in the desert with the wandering Arabs, asking for the news of you, and if they were among you, they would not give battle, save a little” (Surah Al-Ahzab, 20).

This verse mentions “news” in the context of those who inquire about it, specifically referring to the hypocrites. So, what is the thing they are asking about? The honorable verse gives us the answer to this question indicating that these hypocrites wish to be in the desert with the Bedouins rather in the city with the Prophet. In addition, there they seek information about the events and circumstances concerning the Prophet that they did not witness or hear about before. This is the news (Nabaa); then, as indicated by this noble Quranic verse: it is the information about a fact or an event that occurred and it is important for a group of people to know.

The two elements encompassed within this definition of the news (Nabaa) are as follows:

1. Something that has happened and that has already occurred.
2. The importance of this event to a particular group.

5 Literature Review

Approximately 70 years ago, the publication of Abdul Latif Hamza's book titled *Media in the Lead (Beginning) of Islam* marked the inception of a novel and distinct field of study: "Explanation and Interpretation of Islamic History through the Media." Prior to Abdul Latif Hamza, no researcher or thinker had explored this subject to search for the manifestations and phenomena of the media and some of its skills in the events and history of Islam. Abdul Latif Hamza's book, *The Media in the Lead (Beginning) of Islam*, despite the shortcomings that were noted about it at the time, was the beginning, the pioneer, the starting signal, or the safety sign that many researchers and media professionals interested in this unique subject. Following the publication of Abdul Latif Hamza's book, subsequent works began to emerge, expanding the discourse on Islamic media. Ibrahim Imam released his first book, *The Fundamentals of Islamic Media*, followed by his second book, *Islamic Media in the Oral Stage*. In addition, Abdul Qadir Hatim authored a book on *Media in the Holy Qur'an*, providing a comprehensive interpretation of numerous Quranic verses from a media perspective, Muhammad Galosh, also contributed to this body of literature with his book bearing the same title as the previous book, *Media in the Holy Quran*, Muhammad Galosh means by the media here, "Dawah" (term "Islamic") as a term synonymous with the media. The Dawah is derived from the verb to propagate in the sense of urging, requesting, calling, wishing, and conveying, and the media here intersects with the notion of propaganda.

Subsequently, the school of Islamic media emerged in the late 1980s, characterized by a group of pioneers and researchers who effectively linked media with Islamic heritage in their writings. Some notable figures in this movement include Abdul Qadir Tash who authored *Media and Issues of Contemporary Islamic Society* and *Why Islamic Media?*. In addition, Mohieddin Abdel Halim contributed works such as *Public Opinion in Islam* and *Islamic Media and Its Practical Applications*. Karam Shallabi explored this field through his book *The News and its Islamic Regulations*. These movements also included Muhammad Sadati Al-Shanqity, who wrote *The Islamic Media Method* and *Islamic Media Objectives*, as well as Muhammad Sayed Muhammad, who authored *Media Responsibility in Islam*. Muhammad Farid Muhammad Izzat published two books, *Research in Islamic Media* and *Studies in the Art of Press Editing in the Light of Quranic Landmarks*. In addition, Abderrahmane Azzi's study, titled *Islamic Media: The Stumbling of the Message in the Information Age*.

Perhaps this important effort is what eventually resulted in the establishment of specialized departments dedicated to the study of Islamic media in some Arab universities, colleges, departments, and institutes. It paved the way for further research and the development of a comprehensive framework and theory for this field, drawing inspiration from the Holy Quran and the Sunnah of Prophet Muhammad.

After accumulating this wealth of knowledge, it is worth contemplating the emergence of a new approach in media studies known as the media interpretation approach. Media interpretation as a method, differs from content analysis, in that it seeks to ascribe the media meaning to the Islamic religious texts. In other words, it

explains the meanings in the Quranic verse through their media connotations. Media interpretation is not an isolated method from other methods of interpretation, instead it falls under the concept of “the cognitive integration of sciences.” In this academic field, scholars have drawn from Islamic references in interpretation, including the interpretation of Ibn Kathir’s *The Beginning and the End in History*, Al-Alusi’s *The Spirit of Meanings in the Interpretation of the Great Quran*, Al-Suyuti’s *Tafasir of Al-Jalalayn*, Al-Qurtubi’s *A Collector of the Rulings of the Quran*, Al-Nawawi’s *Riyadh Al-Salihin*, and Muhammad Ali Al-Sabouny’s *Safwat Al-Tafseer*. Others have also found inspiration in the writings of Abu Hamid al-Ghazali and Muhammad Deraz. For instance, the recent contributions by Abderrahmane Azzi on the theory of “moral duty” in media practice (Azzi, 2016) exemplify this approach. These sources serve as reference points, foundational texts, and central visions when interpreting the Quranic phenomenon through a media lens.

As of the author’s last update in January 2023, specific studies focusing exclusively on news in the Holy Quran were not prevalent in academic literature. However, scholars have explored various themes related to communication, information dissemination, and social dynamics, which can indirectly relate to the concept of news within the Quranic context. Here are some recent approaches and themes in Quranic studies that may intersect with the concept of news: communication and revelation, prophetic narratives, social justice and advocacy, truthfulness and integrity, audience engagement and response, historical context and contemporary relevance, media ethics and responsibility. These approaches demonstrate the diverse ways in which scholars engage with Quranic teachings and narratives in relation to communication, information dissemination, and societal dynamics, which may indirectly intersect with the concept of news within the Quranic context (Christians, 2019, p. 191).

If we look at the Western studies related to the relationship of the Holy Quran to the media in very brief, we find that scholars and researchers have approached the study of media in the Quran from various perspectives, often influenced by the cultural, academic, and religious contexts of these regions. For example, the way digital media and online discourses have increased accessibility to Quranic texts, interpretations, and discussions. Scholars may study how digital media technologies shape the dissemination, reception, and interpretation of the Quran in Western contexts, including the role of social media, websites, blogs, and online forums (see Table 1 in the Appendix, some Western studies related to the subject).

The story of Prophet Suleiman (Solomon) and his interaction with the hoopoe hold valuable lesson for understanding the correct media ethics and laws that should serve as a standard for others. It embodies the sublime meaning of “certainty” mentioned by the hoopoe in Surah Al-Naml. Our contemporary media challenges are not merely about characteristics: objectivity, impartiality, honesty, strangeness, geographical proximity. Instead, “certainty “combines all these words in one crucible. Certainty refers to the correct and definite information. In contrast, “conjecture” refers to the relative opinion. It is said in the media, “The news is sacred, and the opinion is relative,” and “The news is presenting as much information as possible in the least number of words.” What our world truly needs now is correct information

free from speculation and tainted with subjective opinions. There is a plethora of political analysts who extract take the truth from its natural context, the “event” and place it in the field of “unintentional” subjective opinion.

6 Discussion

6.1 The News Between Reality and Fiction

The word itself holds paramount significance in the media, embodying the truth and certainty. Whether conveyed through newspapers, magazines, radio, or television, it serves as a vessel for conveying either facts or mere rumors and propaganda. One of the most pressing issues plaguing modern media practices today is the lack of a clear demarcation between truth and opinion, news and commentary, reality and imagination, and freedom and evasion. A significant dichotomy persists within the media—that between negativity and positivity, amateurism and professionalism, importance, and interest, and what benefits the nation versus what does not.

Regrettably, careful observation suggests that Arab and Islamic media, in general, tend to lean toward rumors and propaganda while prioritizing opinion over truth and fiction over reality. There are, of course, exceptions, and one should refrain from generalizing this. A renowned German media professional once wisely stated, “Provide a person with accurate information, the opportunity to understand and be aware of the truth will remain with them forever. Conversely, furnish them with misinformation, and as a journalist, you risk dismantling their cognitive faculties. In doing so, you reduce them from the level of a thinking human to that of an animal.”

We aspire to write on this subject based on the lessons of media ethics that forms the basis for the relationship between the Prophet Solomon and the hoopoe, which the Holy Quran expresses in a way that we have not seen before in the literature and skills of media writing. My words here represent just a simple interpretive media reading far from the analytical interpretation or objective analysis of the religious text as it is known in Sharia sciences and Islamic studies. The aim of this media news reading is to derive lessons from one of the most significant sources available in the Arab and Islamic world: the Holy Quran.

6.2 The Importance of Media Management in Media Drafting

If we consider that Prophet Solomon, as a director of a media channel, he undoubtedly qualifies as a skilled media professional who is skilled in applying the important communicative standards represented in media management, such as the censorship, staff management and other disciplinary matters which forms the bedrock of success, this serves as a valuable lesson not only for the media authorities but for academics, professors specializing in communication and media sciences.

Truthful and certain news, far from conjecture and speculation, forms the cornerstone of accurate media, and this underscores the importance of media. When the hoopoe arrived before Solomon, serving as a media gatekeeper, he did not merely state, “I have news from the Saba (Sheba) region (identifying the place and its importance in the media),” and he then remained silent. Instead, he declared, as mentioned in the verse: “I bring you certain news.” This choice of words denotes accuracy, importance, and a complete absence of ambiguity. “Certainty” conveys honesty and reliability in the hoopoe’s words, mirroring the media’s requirement for news to be trustworthy. In contemporary media literature, terms like “objectivity” and “credibility” are often used, but “certainty” comprehensively encompasses these. If we consider the hoopoe as a “reporter journalist” who investigates events and conveys news, then he can be considered as a source of news. The hoopoe’s choice of words and the context where he presented Solomon with this information refute any doubts and rumors circulating about the Queen of Sheba “The Lady Bilqis.” The hoopoe arrived bearing news of an event that piqued public interest, indicating that people were curious about these individuals, their way of life, and their beliefs. Therefore, the hoopoe brought news of absolute certainty to extinguish the flames of speculation and malicious propaganda. The Arab and Islamic media require this elevated form of media coverage, especially in regions where current events and conflicts are hotly debated. This becomes clear in the following verses: “Indeed, I found [there] a woman ruling them, and she has been given of all things, and she has a great throne. I found her and her people prostrating to the sun instead of Allah, and Satan has made their deeds pleasing to them and averted them from [His] way, so they are not guided” (Al Naml, 23-24).

The hoopoe’s presentation to Prophet Solomon represents an information report containing a wealth of information presented in a concise manner, akin to the modern media concept of the “inverted pyramid.” Thus, the “most important” aspect of the news is introduced at the beginning—the Queen of Sheba, Belkis—followed by the “important” detail of her people worshipping the sun instead of God, and finally, the “less important” factor that Satan misled them from the right path. This technique adheres to the principles of effective news reporting.

When examining the six fundamental questions along with the quantum question, we find that the hoopoe provides information, whose internal structure is formed by these fundamental “WH” questions: Who? What? Where? Why? When? and How? Each of these questions provides crucial elements within the information, as follows:

1. *Who?* Refers to the individuals who are involved in the event.
2. *Where?* Indicates the location of the event.
3. *Why?* Explores the causes and factors contributing to the event.
4. *When?* Specifies the timing of the event.
5. *How?* Describes the way the event transpired.
6. *What?* Reveals the key details and facts surrounding the event, as witnessed firsthand.

In response to the question “Who?,” the hoopoe identifies Queen Belkis, a woman who rules over an entire nation. For “What?,” we learn about a people who prostrate to the sun and do not prostrate to God. “Where?” places the event in the Sheba region, near Yemen (in the past). “When?” takes us back to the ancient times, during the era of Prophet Solomon. Here, the immediacy of the event is included as a characteristic of the news or as a news value. “Why?” uncovers that these people were tempted by Satan with worldly desires, leading them away from their religion and resulting in their lack of guidance. “How?” Here, we find the hoopoe, as a reporter-journalist, who embarks on a quest for the scoop, even if it requires traveling as a media correspondent. One of the essential criteria for publishing the news is “novelty and innovation” which is found in God’s verse: But the hoopoe stayed not long: he (came up and) said: “I have grasped (the knowledge of a thing) which you have not grasped, and I have come to you from Sheba with true news)” (Al-Naml, 22). In today’s media language, this constitutes an exclusive press or Scoop. (See Table 2 in Appendix.)

The hoopoe narrates to Prophet Solomon what he saw with his eyes following the “News story” method, which is the most effective way to convey news. It involves recounting something one has witnessed or learned to inform others about it. The Holy Quran also provides a warning in the verse: “O you who believe! If a FASIQ (liar—evil person) comes to you with any news, verify it, lest you should harm people in ignorance, and afterward you become regretful for what you have done” (Al-Hujurat, 6).

The Holy Quran refers to those who “receive” the deviant media in the verse: “And this is an order) that the hearts of those who disbelieve in the Hereafter may incline to such (deceit) and that they may remain pleased with it, and that they may commit what they are committing” (Al Anaam, 113); “There are some who would have listened to them...” (Al Tawba, 47). The Holy Quran also warns against immoral media and accusing the innocent in the Verse: “Verily, those who like that (the crime of) illegal sexual intercourse should be propagated among those who believe, they will have a painful torment in this world and in the Hereafter. And (Allah) God knows and you know not” (Al-Noor, 19).

Furthermore, the Holy Quran warns against misleading media: “And of human-kind is he who purchases idle talks to mislead (men) from the path of God without knowledge and takes it by way of mockery. For such there will be a humiliating torment” (Luqman, 6).

The term “certainty” mentioned in the Quranic text resolves all matters. With certainty, there is no room for distorted, misguided, or misleading media, rumors, propaganda, or other factors that cause confusion in society.

6.3 The Important Lesson in Separating Opinion from Event

The crucial lesson in separating opinion from an event is often overlooked by many journalists. It is essential to distinguish between reporting news as it is, without bias or opinion, and providing space for independent and well-established commentary

without mixing the two. News is entirely distinct from opinion. News is a factual account of a current event, providing information about something that has recently occurred or will happen soon, as previously mentioned. This is precisely what the reporter, the Hoopoe, practiced when reporting the news by saying: “Lo! I found a woman ruling over them... to God Almighty saying so that they go not aright.” He conveyed the event with complete “certainty” without altering or interjecting personal opinions or derogatory judgments about Queen Belkis (respect privacy). This serves as a valuable lesson in practical media ethics, emphasizing the importance of respecting the individual’s personal dignity and refraining from intruding into their privacy, whether physical, mental, or psychological. Subsequently, he provided a commentary without violating her privacy, as seen in his statement: “So they do not prostrate to Allah, who bringeth forth what is hidden within the heavens and the earth and knows what you conceal and what you declare Allah—there is no deity except Him, Lord of the Great Throne” (Al Naml, 25-26).

Is it possible to suggest that the hoopoe applied the well-known media rule: that “the news is sacred, and the commentary is free”? It is worth noting that this was an opinion based on a specific or reference conviction, implying that the Hoopoe had a contextual grounding in its time. In other words, it had a reference point that formed the core of its perspective on events. The opinion follows the news, coming after addressing the WH questions, and may serve as raw material for an opinion, comment, or standpoint. This aligns with the wisdom of the pioneering Arab journalist, Hassanein Haykel, who once commented on the state of the contemporary Arab press which leans heavily on commentary in the absence of substantial information. However, the Hoopoe provides a valuable lesson to all Arab and international media regarding the proper separation of opinion from the event. It presents the news based on firsthand observations and subsequently offers commentary using its faith-based reference or standpoint. Nevertheless, the News Monitoring Department, led by the editor-in-chief Solomon, is cautious about accepting the news without verification or suspicion as evident, in the verses: [Solomon] said, “We will see whether you were truthful or were of the liars. Take this letter of mine and deliver it to them. Then leave them and see what [answer] they will return” (Al Naml, 27-28).

Furthermore, observers can recognize the importance of rhetoric, the power of expression, the impact of words, and brevity in these preceding verses. These qualities align with the characteristics of contemporary media. Table 3 of Appendix illustrates these details of Solomon’s media management in his interaction with the hoopoe as a journalist.

6.4 The Importance of News Impact and Feedback

The discussion on news and ethics would be incomplete without addressing the effect, or feedback, which is essentially the result of the news that Hoopoe delivered to Prophet Solomon. Media effect refers to how certain stories in the news can influence or magnify trends in a particular asset class, sector, or overall market. If this theory holds true, readers or investors tend to be influenced by headlines and quickly

respond to news articles. While new information is undoubtedly important, the true significance lies in its impact and feedback—the fifth element in the communication process, according to Harold Laswell’s theory. Effective media, contributing to societal development, is the kind that produces positive changes. One of the most important conclusions drawn from the Hoopoe’s news is Solomon’s belief in it, the certainty of this people’s reality, and the consequences of Solomon’s behavior following this news, such as the Islam embraced by Queen Belkis and her people. This is evident in God’s words: “It was said unto: Enter the hall. And when she saw it, she deemed it a pool and bared her legs. (Solomon) said: Lo! It is a hall, made smooth, of glass. She said: My lord! I have wrong with Solomon unto Allah, the Lord of the Worlds” (Al-Naml, 44).

6.5 Diversity of Communication to Strengthen the Impact and Effectiveness of the Media Message

The multitude and variety of media channels play a pivotal role in highlighting the transition from one stage to another, from disbelief to faith, and from sun worship to worship of God in the dialogue exchange between Prophet Solomon and Queen Belkis. Throughout this dialogue, Solomon employed three types of communication. He began with an oral dialogue between Himself and the Hoopoe. Then He utilized a written tool, the message, underscoring the enduring significance of writing as the earliest communication revolution dating back to Solomon’s time. Belkis responded to Solomon’s message with the gift, the Almighty said: “But indeed, I will send to them a gift and see with what [reply] the messengers will return” (Al Naml, 35); this in contemporary terms would be classified under the umbrella of public relations, a crucial aspect of communication and media sciences. Then the Almighty said: Solomon said, “O assembly [of jinn], which of you will bring me her throne before they come to me in submission?” (Al Naml, 38). Solomon chose the most effective way to convey his message within the context of a civilized dialogue between a kingdom worshipping nature and a kingdom that worshipping the Creator of nature. In this story, we notice that a wide range of communication tools was employed, encompassing various forms of communication known to us today. These tools include writing, verbal communication, and audio-visual means—particularly the sense of sight, which is central in communication technology according to Canadian Marshall McLuhan’s theory. Communication initially relied on the senses of hearing, speech, and sight, and has now evolved into modern communication technologies, including newspapers, radio, television, and the internet, serving as extensions of human senses.

The diversity and multiplicity of communication tools usually lead to strengthen the impact and effectiveness of media and communication content. Richness and diversity in the tools had a great impact on the goal, which is recognized as “persuasive communication,” which may be achieved only by the multiplicity and diversity of tools. The verses also show us that the Prophet Solomon was interested in the refining (Tajweed) of the message and the availability of elements related to the

content and form in it. He said, “Disguise her throne for her that we may see whether she will go aright [to truth] or be of those not rightly guided” (Al-Naml, 41).

The story summarizes deep meanings in relation to the Quranic vision of dealing with tools in general and communication tools, in a path of research that inevitably opens us to exploring the features of technological philosophy generated by the activation of the Quranic content in Islamic environments through the prosperous periods of Islamic civilization and the sterility that the process of Import the results and ideas of Western technology. (See Table 4 in Appendix.)

7 Conclusion and Recommendations

7.1 The Necessities of Media Training and Value and Ethical Dimension

The purpose of this modest scientific media reading in Surah Al-Naml through the story of the Prophet Solomon, with the hoopoe, is to guide the correct media rules after errors have become in the form and content intolerable in the media, especially those that carry out the news function or whose priority is to provide news. First, these new media institutions need training courses in the field of media skills to control the news’s form, structure, sources, types, language, templates, characteristics, values, the issue of separating opinion from the event, the difference between “news” and “news reporting”—the last, which requires the presence of the journalist in the place of the event as a reporter (like the presence of the hoopoe in the “Sheba” region)—the difference between “News” and “investigation News” that investigates in depth the events, the television interview and how to manage it, the conditions for managing the dialogue, and everything related to the elements of quality content, rationalizing journalists, and clarifying the exact meaning of media freedom linked to freedom of knowledge and freedom of access to information sources.

The most important thing is to train media professionals about the purposes and goals of media writing. The media professionalism may not differ between a Russian, American, Arab, or Chinese journalist, and the steps that a Russian journalist follows to carry out an “investigation news” are the same as the steps that an American journalist follows and the same way we shoot a documentary film. However, we say that the main, basic, and important disagreement is the content of the media message that is presented, the goal that this content serves and seeks to achieve, and then what is allowed and what is not allowed according to value controls that have become known, whether in terms of form, content or the way in which implementation is carried out.

In the end, we believe that Surah Al-Naml does not establish a new value media. Rather, it is possible, to quote from it some ethical premises, as it may—in my opinion—constitute a theory of news in media legislation and ethics, especially in issues related to the investigation of honesty, reporting the news and separating opinion

from the event as watched and shared by the hoopoe. On the other hand, it is not possible to compare an animal with a human being, as the hoopoe is a bird that does not possess ideological backgrounds and premises, nor does it possess the mechanism of understanding and interpretation nor its rules, and it does not play the “media game” according to what politics and commerce dictate. Contemporary media in terms of knowledge and technology is far ahead of what it was in the past. Terrible progress, but the problem lies in the absence of the media’s ethical and professional commitment.

7.2 Important Recommendations

Below we present recommendations, based on our findings for journalists to make media messages more accurate and balanced:

Fact-Checking: Always verify information from multiple reliable sources before publishing. Cross-referencing facts helps to ensure accuracy and minimize errors.

Seek Multiple Perspectives: Present different viewpoints on a given topic to provide readers with a well-rounded understanding of the issue. This includes seeking out diverse sources and expert opinions.

Avoid Bias: Strive to maintain objectivity in reporting by separating personal opinions from information. Be aware of any potential biases, whether political, cultural, or personal, and aim to present information in a fair and neutral manner.

Provide Context: Offer background information and context to help readers fully comprehend the significance and implications of the news. This can include historical context, relevant statistics, and explanations of complex topics.

Transparency: Be transparent about sources, methodologies, and any conflicts of interest that may influence reporting. Disclose any affiliations or financial relationships that could affect the objectivity of the story.

Fact-Based Headlines: Craft headlines that accurately reflect the content of the article and avoid sensationalism or clickbait tactics that may mislead readers.

Check for Accuracy in Images and Multimedia: Ensure that images, videos, and other multimedia elements used in reporting accurately represent the events or topics being discussed. Avoid the manipulation or selective editing of visuals that could distort the truth.

Corrections and Updates: Promptly correct any errors or inaccuracies that are discovered after publication. Provide updates as new information becomes available to keep readers informed and maintain credibility.

Ethical Considerations: Adhere to ethical guidelines and standards of journalism, including principles of honesty, integrity, and accountability. Respect the privacy and dignity of individuals involved in news stories, especially in sensitive or controversial situations.

Feedback Mechanisms: Encourage feedback from readers and stakeholders to address any concerns or criticisms about the accuracy and balance of reporting. Engage in constructive dialogue to improve journalistic practices and enhance trust with the audience.

By incorporating these recommendations—based on our findings—into their reporting practices, journalists can strive to create media messages that are more accurate, balanced, and trustworthy. A potential area for future research is to further explore the integration of Islamic principles with media and communication studies.

Appendix

Table 1 Research that studied the Quranic phenomenon in the media (This table accurately provides a comprehensive overview of the most prominent contributors in the Islamic world to the study of the Quranic phenomenon from a media perspective)

No.	Researchers	Title of research	Country
1	Abdullatif Hamza	<i>Media in the Beginning of Islam</i> Arab Thought House Publishing, Cairo, 1970	Egypt
2	Ibrahim Imam	<i>The Origins of Islamic media</i> Arab Thought House publishing, Cairo, 1985	Egypt
3	Ibrahim Imam	<i>Islamic Media in the Oral Stage</i> The Anglo-Egyptian Library, Cairo, 1980	Egypt
4	Abdul-Kader Hatim	<i>Media in the Holy Quran</i> The Family Library, Cairo, 2000	Egypt
5	Muhammad Ghelooch	<i>Media in the Holy Quran</i> The Family Library, Cairo, 2005	Saudi Arabia
6	Abdelkader Tash	<i>Media and Issues of Contemporary Islamic Society</i> Al-abican Library, Jeddah, 1995	Saudi Arabia
7	Abdelkader Tash	<i>Why Islamic Media?</i> Green Undulous Publishing, Jeddah, 1995	Saudi Arabia
8	Mahy-Eddine Abdel Halim	<i>Public Opinion in Islam</i> The Anglo-Egyptian Library, Cairo, 2000	Egypt
9	Mahy-Eddine Abdel Halim	<i>Islamic Media and Its Practical Applications</i> Al-Khanji Library for printing, publishing, and distribution, Cairo, 1984	Egypt
10	Karam Shallabi	<i>The News and Its Islamic Legislation</i> Dar Al-Shorouq, Jeddah, 1988	Jordan
11	Mohammad Sadati Al-Shankity	<i>Islamic Media Methodology</i> Dar Al-Hadarah for publication and distribution, 2008	Saudi Arabia
12	Mohammad Sadati Al-Shankity	<i>Media Reflections on Quranic Texts</i> Dar Al-Hadarah for publication and distribution, al Madinah Munawara, 2008	Saudi Arabia
13	Mohammad Sadati Al-Shankity	<i>News Function in Surat Al-Anam</i> Word Books Publishing, al Madinah Munawara, 1990	Saudi Arabia
13	Mohammad Sayed Mohammad	<i>Islamic Media Responsibility</i> Enag. Algiers, 1986 (Algerian Edition)	Algeria
14	Abdelaziz Sharaf	<i>Islamic Media and the Technology Challenge</i> Egyptian General Book Authority, Cairo, 1980	Egypt

(continued)

Table 1 (continued)

No.	Researchers	Title of research	Country
15	Mohammad Farid Mahmood Izzat	<i>Islamic Media Research</i> Al-Hilal Bookshop, Dar Al-Shorouk for publication and distribution, Cairo, 2008	Egypt
16	Mohammad Farid Mahmood Izzat	<i>Studies in the Media Skills Writing in the Light of Quranic Landmarks</i> Al-Hilal Bookshop, Dar Al-Shorouk for publication and distribution, 2010	Egypt
17	Abdul-Rahman Azzi	<i>Islamic Media, Message in the Age of Technology</i> Annals of the Algiers University, 1989, 12(4):55–71	Algeria
18	Mohammad Lagab	<i>Modern Islamic Media in Algeria</i> Al Ouma (Nation) Publishing, Algeria, 1995	Algeria
19	Maray Madhkoor	<i>Interpreting Media in "Surat An-Noor"</i> Al Shorouk Publishing, Al Azhar University, Cairo, 2004	Egypt
20	Taha Ahmed Al-Zidi	<i>Media Miracles in the Holy Qur'an</i> Al Fadjar Publishing, Islam Abad, 2018	Pakistan
21	Samir Bin-Jameel Rady	<i>Islamic Media Message and Objective</i> Journal of the Muslim Word League, Makkah, (172):12–22	Saudi Arabia
22	Nassir Bouali	<i>Media and Its Civilization Dimensions</i> Al Fadjar Publishing, Constantine, 2007	Algeria
23	Nassir Bouali	<i>Religious Discourse in the Modern Media: A critical Normative Approach to Structure & Function</i> Algerian Communication Journal, 2021, 2(18):179–198	Algeria
24	Mahmood Mustapha	<i>Media in the Holy Quran</i> Dar Al Fikr Al Arabi, Cairo, Egypt, 2021	Egypt
25	Haddadi Walida	<i>New Media and the Learning of the Holy Quran</i> Al Miayar Journal, University of EAK, Constantine, 2021, 1(34):680–711	Algeria
26	Yasmin Mol	<i>The Idea of Islamic Media: The Quran and the Decolonization of Mass Communication</i> International Journal of Middle east studies, October 2020, 4(52):623–642	Cambridge University England
27	Hina Nawaz and Syed Abdul Siraj	<i>Framing of Islamophobia in the Western Press: A Critical Analysis</i> Pakistan Journal of Law, 2023, 2(2):75–85	Islamabad Pakistan
28	Abdullah Al Mamun and Ibrahim Khalil Bhuiyan	<i>Social Media in the light of Quran and Hadith: An Analytical Study</i> International Conference of on Tradition and Religious Studies, 2023, 1(2):463–475	Bangladesh Pakistan
29	Rosemary Pennington	<i>On Islam: Muslim and the Media</i> Indiana University Press, 2018	USA
30	Saif Uddin Ahmed and Jorg Matthews	<i>Media Representation of Muslims and Islam from 2000 to 2015: A Meta-Analysis</i> International Communication Gazette, 2016, 3(79)	USA

Table 2 The seven “WH” questions of the news according to the news story of the hoopoe

Information questions	Nature of the event	Elements of a news story
Who?	Persons who in relation to the event	Queen Belkis, a woman at the head of an entire nation
Where?	The location of the event	In the Saba (Sheba) region, near Yemen
When?	The time of the event	Prophet Solomon’s time
How do?	How did the event happen?	A people in whom rumors and gossip abounded, and they became not guided
What?	The event itself	A people who prostrates to the sun or of the worshipers of the planets; this is the Scoop in the News Story
Why?	The factors	Factors near and far that led to the occurrence of the event
How much?	Event size	The biggest news that Solomon did not know about

Table 3 Issue of separating opinion from the event within the media management

Event sequence	Quran verses	Facts and events	Information types
1	In addition, he sought among the birds and said: How is it that I see not the hoopoe, or is he among the absent? (Al-Naml, 20)	Communication and socializing, (knowing the conditions of the employees...)	Media management
2	But he was not long in coming, and he said: I have found out (a thing) that thou apprehendest not, and I come unto thee from Sheba with sure tidings (Al-Naml, 22)	Realism and objectivity	Reporting news or investigative news
3	I have found out (a thing) that thou apprehendest not (Al-Naml, 22)	Exclusivity, modernity, currently...	The scoop
4	Lo! I found a woman ruling over them, and she hath been given (abundance) of all things, and hers is a mighty throne (Al-Naml, 23)	Information about WH questions’ answer	The News or the WH questions
5	So, they do not prostrate to Allah, who bringeth forth what is hidden within the heavens and the earth and knows what you conceal and what you declare Allah (Al-Naml, 25)	Comment, opinion, position...	Opinion or point of view
6	Solomon said: we shall see whether thou speak the truth or whether thou art of the liars (Al-Naml, 27)	Media ethics	Censorship

Table 4 Tools and methods of persuasive communication in the era of Solomon

Tools communication	Quranic verses of Al-Naml Surah	Media signification
Verbal dialogue	And he sought among the birds and said: How is it that I see not the hoopoe (Hoodhood), or is he among the absent? (20) But he was not long in coming, and he said: I have found out (a thing) that thou apprehend not, and I come unto thee from Sheba with sure tidings (News). (22)	Work etiquette and discipline
Message	Take this letter of mine and deliver it to them. Then leave them and see what [answer] they will return. (28) (The queen of Sheba) said: (When she received the letter): O chieftains! Lo! There hath been thrown unto me a noble letter. (29)	Impact and persuasion
Gift	But indeed, I will send to them a gift and see with what [reply] the messengers will return. (35)	Public relations
Debate (dissertation)	So, when she arrived, it was said [to her], "Is your throne like this?" She said, "[It is] as though it was it." [Solomon said], "And we were given knowledge before her, and we have been Muslims [in submission to Allah]. (42) She was told, "Enter the palace." But when she saw it, she thought it was a body of water and uncovered her shins [to wade through]. He said, "Indeed, it is a palace [whose floor is] made smooth with glass." She said, "My Lord, indeed I have wronged myself, and I submit with Solomon to Allah, Lord of the worlds." (44)	Religious dialogue

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Learning Styles Prevalent Among a Sample of Gifted Students with Learning Disabilities in Jordan



Mustafa Nuri Al-Qamash

Abstract This chapter aimed to identify the prevailing learning styles among a sample of gifted students with learning disabilities in Jordan. The study sample included 112 male and female students distributed to different schools and educational centers for gifted students, and they were chosen in an intentional manner. To achieve the objectives of the study, the researcher used the VARK (visual, auditory, read, and kinesthetic) scale for learning styles, which were rationed on the Jordanian environment and had acceptable degrees of validity and reliability. The results of the study showed that the prevailing learning styles among gifted students with learning disabilities in Jordan were as follows: the visual style came in the first place, while the auditory style came in the second place, followed by the reading-writing style, which came in the third place, while the practical style came in ranked last. Finally, the results showed that there are differences due to the effect of the gender of the gifted student with learning disabilities in learning styles related to the auditory style, where the differences came in favor of males, and in the reading-writing style, where the differences came in favor of females. Based on these results, the study came up with a set of recommendations, the most important of which was to conduct a comparative study between gifted students with learning disabilities and normal students in learning styles.

Keywords Learning styles · Gifted students with learning disabilities

1 Introduction

This theoretical study addresses a relatively recent topic that has not been extensively explored by educators and has not received sufficient attention in terms of research and study. Even to this day, the topic of “gifted students with learning

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disabilities” remains controversial among some researchers, interested individuals, and academics. One may wonder about perplexing and diverse questions: Are learning disabilities among gifted students real? Is there no solution for gifted students with learning disabilities? Schools are filled with many students from various categories, including gifted students with disabilities, yet we do not know who they are and under which category they fall. Due to the lack of specialists in public schools to identify them early on, recognizing this group of students requires extensive knowledge. This group of students with special needs requires more attention so that educators and parents become aware that some gifted students may have learning disabilities that impede their academic progress. On the other hand, some students with learning disabilities may possess talents that go unnoticed, resulting in an educational loss that requires strategies to harness the intellectual potential and abilities of this student population.

Research and studies indicate that gifted students with learning disabilities are individuals with high intelligence, but at the same time, they are unable to perform academic skills at the expected levels. These students possess a remarkable talent or exceptional ability that qualifies them for high achievement. However, they also experience learning disabilities that make one or more aspects of academic achievement challenging for them (Qamash, 2017).

The concept of learning styles emerged from the idea that all students differ in their intelligence, personalities, thinking processes, and learning patterns. Understanding these differences helps educators acknowledge individual variations among students, enabling them to create a climate and experiences that encourage individuals to maximize their capabilities and achieve the highest level of effective learning. The theories on learning styles vary in their approach to students’ preferred learning styles. Some theories focus on learners’ personal characteristics, while others concentrate on learners’ reception, processing, and organization of experiences. Meanwhile, other theories emphasize the sensory-perceptual mediator through which learners prefer to receive, process, and deal with educational experiences. Despite the diversity in theories’ treatment of learning styles, learning styles remain cognitive, affective, motivational, psychological, and mood indicators that reflect how learners utilize and process experiences, as well as how they interact with them positively (Ziyat, 2004). Thus, this chapter aimed to identify the prevalent learning styles among a sample of gifted students with learning disabilities in Jordan.

Theoretical Literature and Previous Studies

Learning Styles: Learning styles are cognitive, affective, and physiological behaviors exhibited by learners. They serve as relatively stable indicators of how individuals perceive and interact with their educational environment and respond to it. They also encompass the methods, techniques, and procedures learners autonomously follow to acquire new experiences. Researchers have been able to identify a significant number of dimensions of learning styles (Jaber & Qoran, 2004).

Learning styles have garnered widespread interest from numerous researchers, and they have been defined in various ways, including:

- Honey and Mumford (2000) define learning styles as a term used to describe the activities, behaviors, and tendencies that individuals prefer in learning.
- Fleming and Bonwell (2001) define learning styles as the way learners receive knowledge, information, and experiences, how they organize and structure this information, how they record, encode, and integrate it into their cognitive storage, and how they retrieve and express that information.

Furthermore, in addition to the aforementioned, the researcher views learning styles as a set of personal characteristics and traits that influence how each learner focuses on and comprehends new information, whether it is difficult or easy. Most individuals possess a specific learning style, and it can also be said that learning styles are the methods individuals use to process the situations, stimuli, and educational experiences they encounter, with their educational environment. They also refer to the methods, techniques, and procedures learners employ to acquire new experiences. Researchers have identified various dimensions of learning styles (Jaber & Gharan, 2004).

Learning styles have received significant attention from researchers and have been defined in different ways.

In addition, learning styles can be seen as a set of personal characteristics and traits that influence how each learner focuses on and comprehends new information, whether it is difficult or easy. Most individuals possess a specific learning style, and it can be said that learning styles are the methods individuals use to process the situations, stimuli, and educational experiences they encounter.

Theories of Learning Styles

The theoretical literature has indicated that the preferred learning styles of students are based on several assumptions that educators need to take into consideration. These assumptions include:

1. Each learner has their own distinct learning style, which is reflected in their preference for one or more sensory-perceptual modalities in receiving, processing, and comprehending information more effectively and easily.
2. Learning is more efficient, effective, easy, and sustainable when the presentation or delivery of educational experiences is aligned with the learner's preferred learning style.
3. Students differ in their reception of educational experiences, ranging from relying on direct sensory experiences to abstract conceptualization.
4. Any curriculum can be adapted to accommodate the preferred learning style of students through the presentation of educational experiences and the implementation of processing strategies. Adapting the curriculum or course to match students' preferred learning styles makes learning easier, more effective, less burdensome, more enjoyable, and leads to better retention (Fleming & Bonwell, 2002).

Classification of Learning Styles: The classification of individuals according to their preferred learning styles based on sensory perception includes three

categories: auditory learners, visual learners, and kinesthetic learners (Jaber & Qura'an, 2004).

1. **Auditory Learners:** Auditory learners are individuals who remember at least 75% of what is discussed or heard during a period of 40–45 min. Younger children are less likely to become auditory learners. They enjoy noise, make sounds, and engage in conversations. They tend to remember names of things and people more than faces. They can recall and repeat what they have heard in previous discussions or lectures. Auditory learners store words in their minds similar to a recorder and can retrieve them when they focus or intend to do so. The ability for this performance is a physiological gift that can be developed with training and effort (Abiator, 2001; Black, 2004).

Key indicators of auditory learners include:

- Relying on the sense of hearing in the learning process.
 - Preferring listening to the teacher's explanations over reading information on the board.
 - Enjoying silent reading or listening to classmates' reading in the classroom.
 - Being affected by noise frequently.
 - Actively participating in classroom discussions.
2. **Visual Learners:** This category of learners prefers learning through observation. They watch and see what others do, enjoy pictures and shapes, and differentiate words by their visual appearance. They have vivid mental images, daydreams, and imaginative abilities with many details. Visual learners can remember faces more than names (Abiator, 2001). Visual learning involves thinking about things visually through mental imagery and having the ability to modify this visual representation in the mind before translating it into reality (Sloon, 2004).

Key indicators of visual learners include:

- Learning through the sense of sight.
 - Easily comprehending written instructions compared to verbal or auditory instructions.
 - Preferring silent reading and taking notes to reinforce their ideas.
 - Remembering what they have seen more easily than what they have heard.
 - Expressing events through description or drawing.
 - Enjoying studying through tables, maps, charts, and diagrams (Petraakis, 2003).
3. **Kinesthetic Learners:** It appears that the cognitive abilities of kinesthetic learners mature at a slower pace compared to other individuals. They often have difficulty remembering a significant amount of what they learn and require frequent reminders. However, they can learn more easily when combining tactile and kinesthetic experiences. They are often active and express their emotions physically, which can lead to issues with others, as they tend to approach and touch them. Kinesthetic learners focus on movement, action, and touch, and they learn

well through practical methods. They actively explore the physical world around them and may find it challenging to sit for long periods (Abiator, 2001).

Key indicators of kinesthetic learners include:

- Possessing high motor skills.
- Using drawing or writing as a means to remember information.
- Preferring learning through movement and action.
- Enjoying disassembling and assembling things.
- Expressing their ideas through facial expressions, hand gestures, and body movements.
- Excelling in role-playing, imitation, and mimicry.

Gifted Individuals with Learning Disabilities

The concept of talented individuals with learning disabilities emerged prominently during a conference held at Johns Hopkins University in the United States in 1981. The participants in the conference concluded the existence of this group, characterized by distinct qualitative characteristics, unique special needs, and individualized diagnostic methods and programs. In the past, and until recently, it was believed that it is difficult for talent to coexist with learning disabilities, and for both to be present simultaneously in a group of students (Qamash, 2017).

According to educators Schnur and Stefanich, as mentioned by Qamash (2017), talented individuals with learning disabilities are individuals who:

- Have exceptional abilities and untapped potential.
- Are capable of high achievement and success.
- Achieve at an acceptable level compared to their peers.
- Have talent that is not apparent due to the learning disabilities they experience.

Patterns of Gifted Individuals with Learning Disabilities

The psychological literature in this field suggests that there are three patterns of talented individuals with learning disabilities (Mitchem & Richards, 2003; Baum, 1997):

1. Gifted individuals with mild learning disabilities:

These students are often identified as gifted due to their high IQ scores and the attention they draw from their parents and teachers because of their high abilities. They perform well in primary school, participate in gifted programs, but in academic work, they fall within the range of unexpected students with learning disabilities. Their spelling, reading, writing, and handwriting may be weak, and they are rarely recognized as having learning disabilities.

2. Students with learning disabilities who are also gifted:

These students have severe learning disabilities to the extent that it is easy to classify them as having these disabilities. This makes it difficult to identify their exceptional intellectual abilities. Focusing on their weaknesses without recognizing their strengths may lead to neglecting their talents and abilities, resulting

in their repeated academic failure. They are rarely classified or recognized as gifted.

3. Gifted individuals with learning disabilities who have not been identified:

This group is difficult to identify and recognize as either gifted or having learning disabilities. They often use their intelligence and talents to hide or disguise their disabilities, which obscures both their giftedness and learning disabilities. Neither aspect can be expressed through various forms of expression. These students have hidden disabilities that conceal their talents and display them falsely. They perform at an average or above-average level academically, and they are not referred for educational assessment. The contradiction between their IQ test scores and their academic performance is not significant, as they perform at the grade level in most academic tasks. However, they have hidden disabilities that prevent the recognition of their exceptional performance. They are often placed in regular classrooms and, therefore, cannot benefit from the services provided to gifted students or the services offered to their peers with learning disabilities.

Previous Studies

The topic of learning styles has attracted the attention of many researchers and scholars in both the Arab and foreign contexts. The researcher has observed, to the best of their knowledge, a scarcity of studies that have addressed learning styles among gifted students in general, and a lack of studies that have examined learning styles among gifted students with learning disabilities in particular. Therefore, the researcher has reviewed relevant studies on learning styles among regular students in general and gifted students in particular, according to their chronological order from oldest to newest.

Hassan (1998) conducted a study aimed at examining the influence of gender and academic specialization on students' preferred learning styles at different educational stages. The study also aimed to identify the nature of those learning styles and their relationship with students' academic achievement. The study sample consisted of 1,200 male and female students. Four scales were applied to measure students' preferred learning styles, which included several stimuli. The study results revealed significant statistical differences between male and female students in some preferred learning styles at different stages, depending on gender and academic specialization. There was also a significant correlation between academic achievement and elements of preferred learning styles at different stages.

Similarly, Al Harbi et al. (2021) conducted a study aimed at uncovering differences in learning styles and thinking patterns associated with brain hemisphericity among gifted and non-gifted students in primary schools in Riyadh. The study aimed to identify the nature of differences between gifted and non-gifted students in learning and thinking styles. The study sample consisted of 60 Saudi gifted students from the fifth and sixth grades of primary school. The researcher used student nomination forms, Torrance's Test of Creative Thinking (Figural), and a test of mental abilities. The study results showed differences between gifted and non-gifted students in the left hemisphere pattern, favoring non-gifted students, and no differences were found in the right hemisphere pattern between the two groups.

Van Zwanenberg et al. (2000) conducted a study aiming to compare the learning style inventory based on Felder and Silverman's model with the Honey and Mumford learning styles questionnaire. The study also aimed to explore the predictability of academic achievement based on learning styles. The study sample consisted of 284 male and female students from a British university. The results of the study showed no significant effect of gender (males, females) on learning styles (active, reflective, sensing-intuitive, sequential-global). However, statistically significant differences were found between males and females in learning style preferences (visual, verbal), with males being more visual learners and females being more verbal learners. The study also found the possibility of predicting academic achievement based on learning styles.

Al-Busaidi (2002) conducted a study aiming to identify the preferred learning styles among a sample of third-year secondary school students in Muscat Governorate and their relationship with students' gender, academic specialization, and academic achievement level. The study sample consisted of 866 male and female students selected from government schools in Muscat Governorate for the academic year 98/99. A scientific and literary stream was randomly selected from each school. The results indicated that the competitive style was the most preferred learning style, followed by the cooperative style, and finally the individual style. There were statistically significant differences between males and females in their preferences for the three styles, favoring females. Significant differences were also found attributed to the difference in academic specialization, as students in the literary specialization preferred the individual style, and students with higher academic achievement preferred the competitive style. There was no interaction effect between the students' gender, academic specialization, and academic achievement level in their preferences for the three styles.

Abbas (2005) conducted a study aimed at investigating the preferred learning styles of students and the extent to which teachers perceive and consider them in teaching methods in Hailiyat (a region in Jordan). The sample consisted of 8 mathematics teachers from upper elementary schools and 200 students from these schools, selected from four different locations in Jordan. The researcher used the VARK (visual, auditory, read, and kinesthetic) questionnaire from 2002, as well as interviews, document analysis, official records, and observation. The study revealed that students had preferences for both complex learning styles, such as the auditory and practical style, and the read/write and practical style. It also showed that the teachers' perception of the students' preferred learning styles, both complex and simple, was below the required level in the four study locations. However, after guidance and awareness sessions that included information about complex and simple learning styles, the teachers utilized effective teaching strategies that aligned with the students' preferred learning styles.

As for Al-Abuweeni's study (2008), it aimed to identify the preferred learning styles, leadership behavior, and social adaptation among gifted students in Jordan. The sample consisted of all gifted students in Jubilee School, totaling 240 students. The researcher used a scale to measure learning styles, another scale to measure leadership behavior, and a scale to measure social adaptation among gifted students.

The results indicated that gifted students highly used the visual learning style, which ranked first among their preferences. There were statistically significant differences in the degree of visual learning style preference based on gender, favoring females. The kinesthetic learning style ranked second with a high degree of preference, while the auditory style ranked last with a moderate degree of preference. The study also found that the practice of leadership behavior among gifted students was at a high level. Regarding social adaptation, the overall degree was moderate. There were no statistically significant differences in the degrees of leadership behavior and social adaptation among gifted students based on gender.

In addition, Hurani (2011) conducted a study aimed at determining the preferred learning styles and locus of control among gifted male and female students in secondary school. The study also aimed to investigate the relationship between learning styles and locus of control among gifted students. The sample consisted of 120 gifted students from the ninth and tenth grades at Jubilee School in Jordan, including 76 males and 44 females. To achieve the study's objectives, the researcher developed two tools, one to measure learning styles and the other to identify the locus of control among gifted students.

The results of the study showed that gifted students at Jubilee School highly preferred the kinesthetic learning style, which ranked first among their preferences. The results also indicated that 58.3% of the students followed the kinesthetic style more than the visual and auditory styles, while 31.7% of the students followed the visual style, and only 10% of the students followed the auditory style more than the visual and kinesthetic styles. Regarding the locus of control, the results showed that gifted students at Jubilee School exhibited a high level of internal locus of control, which ranked first among their preferences. Finally, the results indicated that overall performance in the three learning styles favored females.

The study conducted by Saray and Çetinkaya (2024) aimed to explore the behavioral characteristics and their relationship with learning styles among gifted students in Kuwait. The study included a sample of 201 male and female students. The results of the study revealed that the highest-ranked behavioral characteristic was based on the dimension of productive thinking ability, followed by communication skills in the second rank, and decision-making ability in the third rank, all with high levels. Academic talent ranked fourth with a moderate level, while predictive talent ranked last with a moderate practice level. As for the dominant learning styles among gifted students, the visual style ranked first, followed by the auditory style in the second rank. The reading-writing style came in the third rank, while the kinesthetic style ranked last. Regarding the nature of the relationship between behavioral characteristics and learning styles, the results showed a positive relationship between academic talent and both the visual and auditory styles.

Similarly, Zahrani (2020) conducted a study aimed at identifying the preferred learning styles among gifted students and their relationship with scientific research skills in the Baha region. The study sample consisted of 217 gifted students, and a descriptive correlational approach was followed. The results of the study showed that the active learning style was the most common among gifted students, followed by the reflective learning style in the second rank. The visual learning style ranked

third, followed by the utilitarian style in the fourth rank. The scientific research skills of the gifted students were found to be at a moderate level. The results also indicated a statistically significant positive correlation between learning styles and scientific research skills.

A Comment on the Previous Studies

The previous studies reviewed indicate that all studies related to learning styles did not address gifted students with learning disabilities. Instead, they focused on gifted and regular students. For example, Al Harbi et al. (2021) study aimed to identify the differences in learning and thinking styles between gifted and non-gifted elementary school students. It compared the learning styles from Felder and Silverman's model and the learning styles questionnaire based on Honey and Mumford's model, as well as the possibility of predicting academic achievement based on learning styles. This study differed from the current study in not addressing gifted students with learning disabilities. Similarly, Van Zwanenberg et al. (2000) study aimed to compare the list of learning styles based on the Felder and Silverman model with the learning styles questionnaire based on the Honey and Mumford model, and the possibility of predicting academic achievement through learning styles. It also did not investigate the learning styles of gifted students with learning disabilities. Likewise, Al-Abowieni's (2008) study aimed to identify the learning styles, leadership behavior, and social adjustment of gifted students in Jordan. In addition, Al-Hurani's (2011) study aimed to determine the preferred learning styles and dominant locus of control among gifted male and female students in secondary school, as well as the relationship between learning styles and locus of control among gifted students. These studies also did not examine the learning styles of gifted students with learning disabilities. Therefore, the current study stands out for its originality and significance, focusing on this specific target group.

1.1 Statement of the Problem

As learning styles are important for regular students, they are even more crucial for gifted students in general and gifted students with learning disabilities in particular. Researchers believe that learning styles can serve as a reference framework for identifying gifted students with learning disabilities. Therefore, they have designed measures and tools that can be used by the gifted student or those close to them who have a good understanding of them. This allows their assessment of the predominant learning style to be somewhat objective and accurate (Qamash, 2017).

Furthermore, learning styles play a significant role in selecting appropriate educational and guidance programs based on the needs of gifted students with learning disabilities. These programs are built upon knowledge of their specific learning styles, thus contributing to considering the individual differences among them in order to create an environment and experiences that encourage individuals to maximize their abilities.

1.2 Questions of the Study

1.3 This study addresses the following questions

1. What are the predominant learning styles among a sample of gifted students with learning disabilities in Jordan?
2. Are there statistically significant differences at a significance level ($\alpha = 0.05$) in the mean scores of learning styles among gifted students with learning disabilities based on the variable of the student's gender?

1.4 Objectives of the Study

1.5 The main objectives of this study are:

- To identify the predominant learning styles among a sample of gifted students with learning disabilities in Jordan.
- To understand the nature of differences in learning styles attributed to the variable of gender among gifted students with learning disabilities.

1.6 Significance of the Study

The significance of the study is derived from the importance of its topic, which aims to identify the predominant learning styles among a sample of gifted students with learning disabilities in Jordan. The significance can be highlighted through two important aspects:

Firstly, the theoretical aspect, which includes the following: Providing a theoretical and educational literature that can be referenced and accessed by researchers and scholars, thus contributing valuable knowledge and information related to learning styles specifically for gifted students with learning disabilities and adding to the Arabic library.

It is one of the few studies in the Arab world—to the researcher's knowledge—that addresses the topic of learning styles among gifted students with learning disabilities.

The significance of the age group addressed in this study is that the students involved are in the adolescent stage, where several developmental and growth changes occur.

Secondly: “The practical aspect” that involves providing a measurement tool for assessing the learning styles of gifted students with learning disabilities. This facilitates the field for educators, researchers, and students in the research field to delve into this field and reach important future results. In addition, educational authorities can benefit from the findings of this study to develop plans, programs, and strategies that contribute to improving the students’ level of study and academic achievement. Furthermore, it can be utilized by counselors and parents of gifted students in Jordan.

1.7 Key Terms of the Study

1.8 The key terms used in this study are:

- Learning styles: Fleming and Bonwell (2002) define learning styles as “the way an individual processes the situations, stimuli, and educational experiences presented to them.” Learning styles include visual, auditory, reading/writing, and kinesthetic styles. Operationally, learning styles are measured using the VARK (visual, auditory, read, and kinesthetic) learning styles inventory.
- Gifted students with learning disabilities: Mitchem and Richards (2003) proposed the following definition for gifted students with learning disabilities: “They are students who have a clear and outstanding talent in one or more domains of giftedness, but at the same time, they experience a specific learning difficulty that has a negative impact on their academic achievement.”

Operationally, in this study, gifted students with learning disabilities are defined as students officially classified and diagnosed by their schools as gifted but also experiencing learning disabilities according to the criteria established by their schools.

1.9 Limitations of the Study

Human limitations: This study was limited to gifted students who have been identified as experiencing learning disabilities, and it included both genders.

Spatial limitations: The study was conducted in schools that specifically cater to gifted students in the city of Amman, specifically.

Timeline: The study was conducted during the first semester of the academic year 2022–2023.

As for the constraints of the study, they are related to the tools used. Therefore, the validity and reliability of the results are determined by the validity and stability of these tools.

2 Methods

2.1 *Sample of the Study*

This study used a descriptive survey method, which focuses on describing the phenomenon as it is and describing the nature of the relationship between variables. This method was chosen to align with the study's objectives and research questions.

The participants of this study consisted of all gifted students with learning disabilities in schools and centers that provide services for gifted students in Jordan. The total number of participants was 112 students. All participants were purposively selected for the purposes of the study. Table 1 illustrates the distribution of study participants according to the variable of the gifted student's gender with learning disabilities.

2.2 *Tools of the Study*

Learning styles scale: The researcher used the VARK (visual, auditory, read, and kinesthetic) questionnaire developed by Fleming and Bonwell (2002) to assess students' preferred learning styles. The VARK model focuses on the sensory modalities preferred by students in the learning process. It consists of 13 items, where each item represents a life situation followed by four statements. Each statement reflects the individual's preferred style toward that situation, ultimately representing one of the four preferred learning styles. Each participant was asked to choose their preferred learning style from the given options.

2.3 *Reliability and Validity of the Scale in Related Studies*

The VARK questionnaire has demonstrated good validity and reliability in related studies. Abbas (2005) applied the questionnaire in the Jordanian context after translating and adapting it to the Arabic environment. The questionnaire was administered to a sample of 50 students from the upper elementary level who were selected outside the study sample. The validity of the instrument was established by

Table 1 Distribution of study participants by gender

Students gender		
Male	Female	Total
59	53	112

consulting experts in the field of psychology and psychometrics. Test-retest reliability was determined by re-administering the questionnaire to the same sample after 2 weeks, resulting in a Pearson correlation coefficient of 0.83, which indicates an acceptable level of correlation. These findings affirm the appropriateness of using the instrument in the current study.

2.4 Reliability and Validity of the Scale in This Study

Scale validity: To verify the validity of the scale for gifted students with learning disabilities in Jordan, the researcher presented the scale to ten experts in the field of educational psychology and psychological measurement in Jordanian universities. They were asked to assess the appropriateness of the scale items for measuring the intended trait and suggest any necessary modifications. Based on the opinions and suggestions of the reviewers, the required adjustments were made to the items, resulting in the final version of the scale.

Scale reliability: The researcher examined the reliability of the Learning Styles Scale using Cronbach's alpha coefficient. The overall reliability coefficient of the scale was found to be 0.87, indicating its suitability for measuring the intended construct. Table 2 illustrates this.

2.5 Correction to the Learning Styles Scale

The scale consists of 13 items representing a situational scenario followed by four alternatives. Each alternative represents a preferred learning style toward the given situation. Ultimately, the four preferred learning styles among students are visual, auditory, reading/writing, and kinesthetic. Each respondent is asked to select one preferred learning style. The alternatives corresponding to each learning style are indicated in Table 3.

Table 2 The internal consistency reliability coefficient (Cronbach's Alpha) for the dimensions of the learning styles scale as a whole

Number	Style	Reliability coefficient
1	Visual	0.89
2	Auditory	0.87
3	Read/write	0.86
4	Kinesthetic	0.83
Overall scale		0.86

Table 3 Correction key for (VARK) learning styles scale

Item	Visual style	Auditory style	Reading/writing style	Kinesthetic
1	1	2	3	4
2	2	3	1	4
3	3	1	2	4
4	1	4	2	3
5	2	4	3	1
6	4	1	2	3
7	1	3	2	4
8	2	1	4	3
9	4	3	2	1
10	1	2	3	4
11	3	1	2	4
12	3	1	2	4
13	2	4	1	3

2.6 Study Procedures

The researcher conducted the following procedures:

- The researcher identified the study participants and obtained official approvals to conduct the study.
- The validity and reliability of the study instrument were ensured using appropriate statistical methods.
- Agreement was reached with the officials at the application centers to schedule visits to administer the study instrument to the study participants (gifted students with learning disabilities).
- After administering the instrument, the researcher recorded and entered the students' responses and data into the computer, utilizing the SPSS software for data processing.
- The data was analyzed and discussed statistically, and the findings were extracted. Necessary recommendations were formulated based on the results.

2.7 Study Variables

The main variables of the study are as follows:

- Learning styles.
- Gender: It has two categories, namely male and female.

2.8 Statistical Analysis

The following statistical methods were used to answer the research questions:

- To answer the first question, means and standard deviations were used.
- To answer the second question, a *t*-test was used to detect statistically significant differences in the mean scores of learning styles based on the gender variable.

3 Results and Discussion

The results related to the first question, which asks about the predominant learning styles among a sample of gifted students with learning disabilities in Jordan, were obtained by calculating the means and standard deviations of the students' dominant learning styles. Table 4 illustrates this.

Table 4 shows that the arithmetic means ranged from 2.87 to 3.69. The visual style ranked first among gifted students with the highest mean of 3.69 and a standard deviation of 0.65. The auditory style ranked second with a mean of 3.45 and a standard deviation of 0.89. The reading/writing style came in third place with a mean of 3.21 and a standard deviation of 0.81. The kinesthetic style ranked last with a mean of 2.89 and a standard deviation of 0.79. The researcher believes that this can be attributed to the learner's tendency to rely on this learning style, which involves visual perception and visual memory. Individuals learn better through visualizing scientific material such as letters, drawings, shapes, diagrams, visual representations, and presentation devices.

The researcher believes that this may indicate that gifted students with learning disabilities are inclined to acquire information and knowledge through learning styles that involve their visual abilities. These styles require greater mental effort compared to other learning styles. The researcher also believes that visual learning styles provide opportunities for observation, monitoring, enjoying kinesthetic activities, engaging in exercises, exploration, and more. Other learning styles do not allow gifted students with learning disabilities to practice these skills, which are characteristic of this group of students.

The study's results show that gifted students with learning disabilities primarily adopt the visual and auditory styles, as their means are close to each other. On the

Table 4 The means and standard deviations of the predominant learning styles among gifted students are arranged in descending order

Rank	Number	Style	Arithmetic mean	Standard deviation
1	1	Visual style	3.69	0.65
2	2	Auditory style	3.45	0.89
3	3	Reading/writing style	3.21	0.81
4	4	Kinesthetic style	2.89	0.79

other hand, the kinesthetic style was the least utilized among these styles. These results may be attributed to the fact that the kinesthetic style involves practical and physical aspects. It includes physical activity, direct physical involvement in learning tasks, and the use of multiple senses simultaneously. This aspect is lacking in programs offered to gifted students with learning disabilities in Jordan, where there is more emphasis on the theoretical aspect than the practical aspect. The results of the study are consistent with the findings of Alqahtani and Alzoubi (2018), who indicated that gifted students, in general, have a high preference for the visual learning style, ranking it first. Furthermore, the results of this study differ from the findings of Abbas (2005), who revealed that the preferred learning styles among students are the reading/writing style followed by the kinesthetic style. The researcher believes that the difference between these studies is due to the characteristics of the researched community. Abbas's study targeted learning styles among regular students in the upper primary stage, while this research focused on gifted students. The results also differ from the study by Al-Fuqaha et al. (2015), which showed that the preferred learning style among students is the automatic realistic style. The difference between the results of these two studies may be attributed to Al-Fuqaha's exploration of different learning styles among students, specifically Kolb's learning styles, while this study focused on VARK learning styles among students.

The results related to the second question, which states "Are there statistically significant differences at a significance level of ($\alpha = 0.05$) between the mean scores of learning styles of gifted students with learning disabilities according to the variable of student gender?", were analyzed using an independent samples *t*-test. Table 5 presents the results of the *t*-test examining the significant differences in the distinctive learning styles of students attributed to the variable of student gender.

The following can be inferred from Table 5:

- There is a statistically significant difference in the mean scores of the auditory learning style, with a *t*-value of 4.92. The mean score for males was 4.23, while for females it was 3.91, indicating that males had a higher average score.

Table 5 Results of the *t*-test examining the differences in learning styles of gifted students with learning disabilities attributed to the variable of student gender

Learning style	Gender	Number	Average arithmetic	Standard deviation	<i>t</i> -test	Significance
Visual style	Male	59	3.70	0.42	0.21	0.817
	Female	53	3.68	0.53		
Auditory style	Male	59	4.23	0.37	4.92	0.00
	Female	53	3.91	0.57		
Reading/writing style	Male	59	4.08	0.39	-4.63	0.00
	Female	53	4.31	0.32		
Kinesthetic style	Male	59	3.01	0.67	1.07	0.280
	Female	53	2.85	0.68		

- There is a statistically significant difference in the mean scores of the reading/writing learning style, with a t -value of -4.6 . The mean score for females was 4.31 , while for males it was 4.08 , indicating that females had a higher average score.
- There is no statistically significant difference in the visual learning style, with a t -value of 0.21 . The mean score for males was 3.70 , while for females it was 3.68 .
- There is no statistically significant difference in the kinesthetic learning style, with a t -value of 1.07 . The mean score for males was 3.01 , while for females it was 2.85 .

The researcher believes that this may be attributed to the fact that female students find reading and writing as an opportunity to express themselves and their emotions due to their calm nature. It may also be due to their inability to express themselves verbally due to societal norms and traditions in Jordanian and Arab societies, or even through clear behavioral manifestations. This is in contrast to male students who are able to express themselves and their emotions in various ways, hence the higher score for females in the reading/writing learning style.

- There is no statistically significant difference in the visual learning style between males and females. The researcher believes that this may be because visual learning is essential for individuals with good vision, and they efficiently utilize their visual sense regardless of gender. These results differ from the study conducted by Al-Busaidi (2002), which showed statistically significant differences between males and females in their preferences for selected teaching methods, with females showing a preference for the visual learning style. They also differ from the study by Alqahtani and Alzoubi (2018), which indicated that female gifted students had a higher degree of using the visual domain.
- There is no statistically significant difference in the kinesthetic learning style between males and females.

This can be attributed to the diversity of modern technological tools, which allow individuals to explore different forms of kinesthetic learning styles and select the appropriate style regardless of their gender. These results are consistent with the study conducted by Van Zwanenberg et al. (2000), which found no gender-related differences in the use of all learning styles.

4 Recommendations

Based on the findings of this study, the following recommendations are suggested:

- Develop training programs for gifted students with learning disabilities to enhance all learning styles they possess.
- Conduct experimental studies to determine the impact of improving learning styles among gifted students with learning disabilities on their academic achievement.
- Investigate the influence of other variables, beyond those examined in this chapter, on learning styles, such as the student's grade level.
- Conduct a comparative study between gifted students with learning disabilities and regular students in terms of learning styles.

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Psychometric Properties of the Vanderbilt Scale for Detecting Students Who Suffer from Attention Deficit Hyperactivity Disorder in the Cycle One Schools in Al Batinah North Governorate in Oman Based on Rasch Rating Scale Model



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Abstract This chapter aimed at identifying the psychometric properties of Vanderbilt's scale for detecting people who suffer from attention deficit hyperactivity disorder (ADHD) in the cycle one schools in Al Batinah North Governorate in Oman based on the Rasch Rating Scale Model. The scale in its final version consisted of 43 items where items from 1 to 3 followed the quadruple Likert's scale while items 36 to 43 followed quintuple Likert scale. The scale was applied to a sample consisting of 513 students, including 211 students with attention deficit hyperactivity disorder while 302 normal students. The research used a descriptive analytical approach, and Winsteps software was used to analyze data obtained from Vanderbilt's scale and interpret them. The results showed that there is a match between the items of Vanderbilt's scale and the rating scale model and the one-dimensional assumption was also achieved. Moreover, the value of the reliability coefficient for the items reached 1, and the separation index for the items reached 19.16. Furthermore, the reliability coefficient for individuals was 0.96, and the separation index for individuals was 5.16. This indicates that the scale has high reliability. Besides, the findings of the item order revealed that the values of Vanderbilt's scale item difficulty estimates ranged from 2.22 logit to -2.68 . The standard error values ranged from 0.09 to 0.05 which could be considered to be very small. Such small values indicate the accuracy and reliability of the scale. The results of the efficiency of the response categories also showed that the categories are gradual in terms of difficulty and fit the Rasch Rating Scale Model. Based on the study's outcomes, it is recommended that Vanderbilt's scale be utilized to screen the children with ADHD.

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1 Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most important behavioral problems that children suffer from at an early and middle childhood. This behavioral problem might cause worries for parents and teachers who raise such children who have this disorder. Moreover, such disorder leads to a poor relationship between those children and their colleagues. In fact, it is considered among the neurodevelopmental disorders, as it occurs at early stages of human life and develops with time. It often appears at the age of 3 years, but it is not observed and diagnosed until the child enters school where its effects on behavior and academic achievement are clearly shown (Al-Almai, 2018; Hafez et al., 2018).

This disorder is distinguished by the following three main symptoms: attention deficit, impulsiveness, and hyperactivity where children who suffer from this disorder might waste their efforts and energies in many movements and thus their health conditions deteriorate apart from the psychological and social problems those children are exposed to (American Psychiatric Association, 2013).

The teacher is considered as a corner stone in the process of detecting children who have this disorder. In this connection, many studies have revealed that the teacher's assessment is one of the accurate and objective estimates (Al-Qara & Jarrah, 2016). Such teachers are essential as they can observe the student's behavior in the school environment during a long period of time. They can notice the degree of negative impact of behavioral symptoms on the children's academic performance, and on their social relationships with others (DuPaul et al., 2014). This might reflect the great importance of teachers in the sense that many benefits can be obtained from them in the process of assessment because students spend most of their time in the school environment and the only ones who can observe them largely are the school teachers.

The researcher, therefore, stresses the importance of providing a diagnostic scale to detect students who suffer from attention deficit hyperactivity disorder that has good psychometric properties. This is for the sake of helping students to be academically and socially developed. Moreover, such diagnostic scale is helpful to teachers in the sense that it might help them easily identify appropriate teaching strategies and methods for this category.

Moreover, Vanderbilt's scale is one of the rating scales that combine what is included in the assessment requirements which are based on the Fifth Diagnostic and Statistical Manual (DSM-5). This scale includes the diagnostic criteria for attention deficit hyperactivity disorder (ADHD) symptoms that are found in the diagnostic manual. In addition to that, it clarifies the symptoms associated with

attention deficit hyperactivity disorder, namely, opposition and defiance, conduct disorder, anxiety and depression (Al-Almai, 2018). The results of studies conducted on the Vanderbilt's scale indicated that it has good psychometric properties (Bussing et al., 2017; Wright & Masters, 1982).

Furthermore, the majority of the scales have been developed on non-Omani environments, which are completely different from this environment and were also developed on old versions of the Diagnostic and Statistical Manual. Because most of the scales, when developed and codified in the Arab environment, depended on the Classical scale theory, and had many defects and problems, the modern scale model (i.e., Rasch Rating Scale Model) has been developed so as to identify the most important psychometric properties that it achieves for a scale built in the light of the modern theory.

Therefore, this study is different from other studies, as it seeks to provide an objective rather than subjective measurement tool in the process of detection about attention deficit hyperactivity disorder according to the concepts of individual response theory (IRT). This is because inherent trait models have not received much attention in building psychological and educational scales at the local and Arabic level—based on the best knowledge of the researcher. Thus, the problem of the current research can be summarized as follows.

This chapter develops a scale to measure attention deficit hyperactivity disorder among children in the Cycle one school who have good psychometric properties according to the Rasch Rating Scale Model; this might, in turn, contribute to diagnosing attention deficit hyperactivity disorder in children from 6 to 10 years.

1.1 Questions of the Study

1.2 The chapter addresses the following questions:

- To what extent do the items of Vanderbilt's scale for attention deficit hyperactivity disorder match the assumptions of the Rasch Rating Scale Model?
- What is the estimation of the item difficulty in the Vanderbilt's scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?
- What are the estimates of the distinct threshold values for the item grading levels of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?
- What are the implications of the validity and reliability of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?

1.3 Objectives of the Study

The study aims to identify attention deficit hyperactivity disorder among children in the cycle one schools using a diagnostic tool that has psychometric characteristics according to the Rasch Rating Scale Model. The study aims to achieve the following:

- To examine the extent to which the items of the Vanderbilt scale for attention deficit hyperactivity disorder match the assumptions of the Rasch Rating Scale Model.
- To estimate the item difficulty of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model.
- To estimate the values of the distinct thresholds for the item grading levels of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model.
- To examine the validity and reliability of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model.

1.4 Significance of the Study

This study develops a scale with good psychometric properties according to the Rasch Rating Scale Model which might contribute to provide diagnostic clues for children with attention deficit hyperactivity disorder in the cycle one school.

2 Theoretical Framework

2.1 Attention Deficit Hyperactivity Disorder

Attention deficit hyperactivity disorder (ADHD) is considered as one of the most common behavioral problems among the children in the cycle one school. Such a disorder creates problems and anxiety for teachers, parents, and everyone who deals with the child who suffers from this disorder. These problems might appear at the academic, behavioral or social level, which requires therapeutic intervention as well as the provision of guidance and therapeutic programs for the school children who have this disorder (Hafez et al., 2018).

The diagnostic manual for the fifth mental and psychiatric disorders (American Psychiatric Association, 2013) is classified into three subpatterns, namely, the lack of attention, hyperactivity/impulsivity, and compound style: attention deficit and hyperactivity.

Most of the students with attention deficit and hyperactivity disorder suffer from academic difficulties and weak social relations with peers where children with a

different pattern also suffer a remarkable weakness in social relations. They find difficulty in the emotional organization in controlling anger and feel frustrated most of the time. As a result, their self-esteem decreases, and then in the future such symptoms may lead to depression and might force them to choose bad peers or use drugs (Karim El-Din & Gabriel, 2019).

2.2 Item Response Theory (IRT)

This modern theory has been developed to overcome the problems pertinent to classical measurement, and to achieve objectivity as it is in the physical sciences through the independence of the individual parameters from the group of examined individuals, as well as through the independence of estimating the ability of individuals from scale items. Both the individual measurement and scale items are involved in a fixed measurement unit on the variable so that the variable continuum is written in a linear manner and its units are equal (Al-Nuaimi, 2018).

The item response theory is an important way to modeling data, as it tries to model the relationship between unobserved (individual capacity) and the possibility of responding of the examinee to any item correctly (observed variable). The validity of the item response theory considerably depends on the data derived from the performance of the individual (Harwell, 1997).

This theory assumes the existence of a single latent trait that explicates the responses of individuals to the items of the test, and that the performance observed for individuals can be explained on a test of a trait or ability for these individuals (Crocker & Algina, 2017).

3 Population of the Study

The population of the study consists of students whose age ranges between 6 and 10 in the cycle one school in Al Batinah North Governorate with ADHD and ordinary students who do not have ADHD. The number of the population of the study is 50,612, according to the statistics of the Ministry of Education (Ministry of Education, 2019). The cycle one schools which have a psychological or social specialist were chosen so as to facilitate the selection of students who demonstrate some symptoms of ADHD (Table 1).

Table 1 Number of the population in the cycle one schools in Al Batinah North Governorate based on gender

Gender	Males	Females
No.	25,169	25,443
Total	50,612	

Table 2 Number of participants in the sample of the study

Students with the disorders (ADHD)		Normal students	
Sultan Qaboos University Hospital	20	Cycle one schools	302
Sohar Health Complex	30		
Cycle one Schools	161		
Total	211	302	
Sample size	513		
Percentage of ADHD and Normal Students in the sample	41%	58%	

4 Sample of the Study

The sample of the study consisted of two groups as follows:

1. Students with attention deficit and hyperactivity disorder
2. Normal students

The researcher did not find any official statistics on the total number of students with ADHD in Al Batinah North Governorate. Hence, an available sample consisting of 50 students with ADHD was selected at Sultan Qaboos University Hospital and Sohar Health Complex. Due to the small number of samples collected from the two health institutions, the researcher decided to complete the required number of students by selecting students from cycle one schools in Al Batinah North Governorate. Eventually, the collected sample consisted of 161 students who were diagnosed by school psychologists and social workers. This number is largely sufficient to examine the statistical indicators of the Rasch Rating Scale Model (Mahmoud, 2012).

As for the second category (Normal Students), an intentional sample was chosen from the students who have shown some symptoms of ADHD (less than 6 months), not lasted for 6 months or more, and were not visible in multiple environments, such as the home and the school. The sample of the normal students consisted of 302 participants from the cycle one schools in Al Batinah North Governorate, and any student with learning difficulties or any other disability was excluded.

It is clear from Table 2 that the total sample size (ADHD students and normal students) is 513, which is considered appropriate in the case of unknown population (Elayyan, 2024).

5 Instruments of the Study

5.1 Vanderbilt Scale

Vanderbilt scale is designed for personal assessment of attention deficit and hyperactivity disorder for the individuals whose age ranges between 6 and 12 years. It was built according to the DSM-5, which comes in two versions, one is a version for the teachers while the other is a version for the parents.

The scale has high psychometric characteristics in which the teachers' version consists of 43 items and includes some symptoms of mood, anxiety, depression, an evaluation of the students' performance in the semester, and the academic performance (Wolraich et al., 2013).

6 Results of the Study

6.1 Answer to the First Question

The first question is "To what extent do the items of Vanderbilt's scale for attention deficit hyperactivity disorder match the assumptions of the Rasch Rating Scale Model?"

To answer this question, data were entered into the Winsteps software and the Vanderbilt scale items were analyzed according to Rasch Rating Scale Model since this model fits scales that follow Likert Rating scale (Smith et al., 2008). Table 3 shows the results related to the first question.

The results in Table 3 reveal the following. The point-measure correlation coefficients of the items are positive ranging from 0.41 to 0.77. This means that all items work in the same direction to determine the scale's content.

The statistics of internal and external matching (infit and outfit mean-square statistics) of items show that most of the items (43) fall within the recommended range (0.5–1.5), which implies that they make a useful contribution to measuring the content of the scale except for the item 41 = 1.51 which is regarded outside the internal matching statistics (MNSQ). This is found to be close to the recommended indicator, which indicates the suitability of the Vanderbilt scale items. There are two items outside the external matching statistics (MNSQ) which are 16 = 1.81 and 31 = 1.51. It is noticed that these values are close to the recommended indicator (0.5–1.5). This increase is attributed to the unexpected responses.

These items have positive correlation coefficients which are higher than 0.3, and the mean of internal matching statistics (fit MNSQ) for scale items is equal to 1, which is within the specified range, with a standard deviation of (0.2). This means that the mean of the external matching statistics (Outfit MNSQ) of the scale is equal to 0.99 which falls within the specified range, with a standard deviation of (0.25). This indicates the suitability of the Vanderbilt scale items (1–43), where these items have not been deleted because they cover well all the components in the theoretical framework as revealed in the results of previous studies. So these items have been retained as they are.

As for the infit and outfit mean-square statistics of person, most of the individuals are within the recommended range (0.5–1.5), where 8 of them range between 1.51 and 1.54, 52 of them ≤ 1.55 , 52 of them are from those who have disorders, while 52 are normal participants. They represent a ratio of $52/513 \times 100 = 10.1\%$, and this percentage is considered more than the threshold of global suitability (5%). This increase is attributed to the fact that the sample consisted of 511 students, and it is divided into two groups (those who suffer from disorders and those who are

Table 3 Internal and external matching statistics of the items, the point-measure correlation coefficients, reliability and separation coefficients, and one-dimensionality for Vanderbilt with its four dimensions (attention deficit, hyperactivity, symptoms associated with attention deficit hyperactivity disorder, academic performance, and behavioral performance in class) for the items (1–43)

No	Item	Infit: Internal matching statistics		Outfit: External matching statistics		PT-measure CORR Correlation coefficients
		MNSQ	ZSTD	MNSQ	ZSTD	
27	S/He previously stole valuable things	1.37	3.5	1.04	0.3	0.41
30	Shy and easily embarrassed	1.33	4.1	1.47	4.2	0.42
33	S/He blames himself for the problems and always feels guilty.	1.18	2.2	1.36	3	0.44
16	S/He rushes to answer before the teacher completes the question	1.41	5.7	1.81	8.7	0.45
31	S/He is afraid of trying new things for fear of making mistakes	1.23	3.1	1.51	4.7	0.45
41	S/He disturbs the lesson	1.51	7.4	1.48	7	0.54
29	S/He feels frightened, upset, and anxious	1.11	1.6	1.22	2.5	0.54
34	S/He feels lonely, unwanted, or unloved and complains that “nobody likes him”	1.19	2.5	1.04	0.5	0.54
32	S/He feels worthless or inferior to others	1.1	1.5	1.15	1.7	0.56
35	S/He feels sad, unhappy, or frustrated	1.08	1.2	1.04	0.5	0.56
9	S/He forgets daily activities, such as bringing homework to school	1.01	0.1	0.97	−0.4	0.63
26	S/He is physically violent with others	1.03	0.5	1	0	0.64
22	S/He is catty and inclined to get revenge from others	0.97	−0.3	0.8	−2.2	0.64
25	S/He lies to get a reward or to avoid any punishment and defrauds others	0.89	−1.6	0.77	−2.7	0.64
21	S/He is always angry or upset	0.87	−2	0.81	−2.4	0.65
39	His/Her relationship with his peers	0.98	−0.2	0.98	−0.3	0.65
18	S/He interrupts other people’s conversations or intrudes on their activities	0.99	−0.2	1	0	0.66
8	He is easily distracted by external stimuli	1	0	1	0	0.67
28	S/He deliberately destroys the property of others	0.94	−0.8	0.83	−2.1	0.67

(continued)

Table 3 (continued)

No	Item	Infit: Internal matching statistics		Outfit: External matching statistics		PT-measure CORR Correlation coefficients
		MNSQ	ZSTD	MNSQ	ZSTD	
17	It is hard for him/her to wait for his/her turn	0.96	-0.6	1.05	0.8	0.67
15th	S/He talks a lot	1.05	0.8	1.04	0.7	0.67
23	S/He hardens, threatens, or frightens others	0.94	-0.8	0.81	-2.4	0.68
12	S/He runs or climbs a lot when required to take a seat	0.97	-0.4	0.88	-1.6	0.69
19	S/He loses his/her temper (S/He becomes nervous for trivial reasons)	0.85	-2.4	0.82	-2.6	0.7
37	Mathematics	1.23	3.6	1.23	3.5	0.7
7	S/He loses tools and objects needed to complete tasks or activities (such as homework, pens, or books)	0.87	-2.1	0.85	-2.2	0.7
38	Writing	1.31	4.7	1.3	4.6	0.71
11	S/He leaves his/her seat in class or wherever s/he is required to stay	0.95	-0.8	0.92	-1.2	0.71
10	S/He expresses boredom with his/her hands or feet, or moves a lot in a chair	0.85	-2.5	0.89	-1.7	0.71
36	Reading	1.3	4.6	1.3	4.6	0.71
6	S/He avoids, dislikes or does not want to start activities that require continuous mental focus like solving an arithmetic problem in class	0.89	-1.9	0.85	-2.3	0.71
14	S/He is constantly moving like a motor	0.95	-0.8	0.92	-1.1	0.71
5	S/He faces difficulty in arranging tasks and activities, such as arranging his seat in class	0.8	-3.3	0.84	-2.4	0.71
24	S/He begins physical altercations	0.82	-2.9	0.8	-2.9	0.71
13	He answers the question before it is completed	0.85	-2.4	0.83	-2.5	0.72
20	S/He refuses requests or laws of adults	0.8	-3.2	0.72	-4.1	0.72
2	S/He finds it difficult to stay focused on tasks and activities	0.78	-3.7	0.8	-3.1	0.73
3	He doesn't seem to listen when he is addressed directly	0.75	-4.2	0.76	-3.5	0.73
40	Following instructions	0.79	-3.7	0.8	-3.6	0.75
42	S/He gets tasks done	0.88	-2	0.88	-2	0.76

(continued)

Table 3 (continued)

No	Item	Infit: Internal matching statistics		Outfit: External matching statistics		PT-measure CORR Correlation coefficients
		MNSQ	ZSTD	MNSQ	ZSTD	
43	Organization skills	0.87	-2.2	0.87	-2.2	0.76
1	S/He does not pay attention to details and makes careless mistakes, such as homework	0.65	-6.4	0.69	-5.3	0.76
4	S/He does not follow instructions and fails to complete schoolwork, (not because of refusal or misunderstanding)	0.67	-5.9	0.63	-6	0.77
Means		1	-0.2	0.99	-0.4	
P.SD		0.2	3	0.25	3.2	
Item reliability		1				
Item separation		19.16				
Person reliability		0.96				
Person separation		5.16				
Raw variance explained by measures		66.1%				
Unexplained variance in first contrast		4.6%				

normal). The number of individuals who are in the wrong classification area was 26 individuals with attention deficit hyperactivity disorder (ADHD), and the misclassification is attributed to the inaccurate diagnosis by some examiners.

It is also found that the mean of the internal matching statistics (fit MNSQ) for individuals on the scale is equal to 0.97 which is within the specified range, with a standard deviation of 0.44. Moreover, the mean of the external matching statistics (outfit MNSQ) for the scale equals 0.99 which is within the specified range, with a standard deviation of 0.45, and the mean of the standard error of the ability estimates for the sample of the study is 0.21 which could be considered to be low. These findings indicate the accuracy of locating individuals on the trait continuum. Because the value of the reliability of individuals is high (0.96), and the individuals' separation indicator 5.16 exceeds 2, it can be concluded that the individuals of the study sample are suitable for the present study and thus, the researchers kept all members of the sample.

Table 3 also explains the unidimensionality results for the scale with its four dimensions:

- (A) The variance explained by the measures is 66.1%, and the percentage is considered to be congruent with the specified indicator, and it is greater than 40%, which is a strong indicator for the unidimensionality.
- (B) The percentage of variance explained by the second largest dimension must be less than 5% (Linacre, 2020). The variance reached 4.6%, which is congruent with the recommended indicator; this confirms the unidimensionality.

6.2 Answer to the Second Question

The second question is “What is the estimation of the item difficulty in the Vanderbilt’s scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?”

To answer this question, the item difficulty order was calculated in Vanderbilt scale as follows. As the level of item difficulty increases, it measures a much higher level of ADHD symptoms, where the mean of the ability of individuals 1.76 logit which is lower than the mean of item difficulty, which is usually set at 0.00 logit. This means that the level of attention deficit and hyperactivity disorder in the sample of the study is lower than the mean of the level of the attention deficit and hyperactivity disorder (ADHD) as indicated in the items. This is expected because the number of children with the disorder ($n = 211$) is lower than those without disorders ($n = 302$).

Table 4 shows item difficulty level arrangement, which is arranged from the highest to the lowest. The least responsive items are placed at the top of the table while the most responsive items are placed at the bottom.

From Table 4, the following can be noticed:

- The range of Vanderbilt item difficulty rating values ranges from 2.22 logit to -2.68 . The standard errors also range from 0.09 to 0.05, which are very small values that reveal the accuracy and reliability of the scale.
- Items 27, 33, 30, 34, 35, 22, 31, 25, 32, 28, 23, 21, 29, 26, 12, 20, 16, 19, 9, 3, 24, 13, 7, 4, 14, 5, and 17 are considered higher than the students’ ability level because their difficulty values are positive (in logit units).
- As for the items 17, 6, 18, 15, and 11, they are considered medium because their difficulty rating is close to zero logit.
- The items 10, 2, 1, 8, 39, 40, 41, 42, 43, 37, 36, and 38 are below the students’ ability level, as their difficulty ratings are negative (in logit units).
- It is possible to add a scale map that shows the difficulty of the items (items with numbers on the right side, and the abilities of individuals on the left side, expressed with the symbol (#) on one scale in the logit unit).

From Fig. 1 which shows a map of coefficients’ distribution of items’ difficulty and individuals’ abilities in the Vanderbilt’s scale, we observe the following:

1. Item distribution versus individual distribution.
2. Items overlap in terms of difficulty level, where the map indicates that there are a number of items of equal difficulty level, namely:
 - Items S22, S30, S34, S35, S25, S31, S21, S23, S28, S32, S12, S26, S29, S16, S19, S20, S3, S9, and S13, S14, S24, S4, S5 are higher than the students’ ability level because their difficulty values are positive (in logit).
 - Items S11, S15, S17, S18, and S6 are of medium difficulty as their values are close to zero logit.
 - Items S1, S10, S2, S41, S42, and S36, S37, S43 are lower than the students’ ability level because their difficulty values are negative (in logit).

Table 4 The item arrangement of the Vanderbilt scale with its four dimensions (attention deficit, hyperactivity, symptoms associated with attention deficit hyperactivity disorder, academic performance, and behavioral performance in class) for items (1–43) based on their difficulty

No	Item	Difficulty measures	S.E.
27	S/He stole valuable things	2.22	0.09
33	S/He blames himself for the problems and always feels guilty	1.44	0.07
30	S/He feels shy and easily embarrassed	1.21	0.07
34	S/He feels lonely, unwanted or unloved and complains that “nobody loves him/her”	1.2	0.07
35	S/He feels sad, unhappy, or frustrated	1.15	0.07
22	S/He is catty and inclined to revenge	1.11	0.07
31	S/He is afraid of trying new things for the fear of making mistakes	1.08	0.07
25	S/He lies to get a reward or to avoid any punishment and defrauds others	1	0.06
32	S/He feels worthless or inferior to others	0.86	0.06
28	S/He deliberately destroys the property of others	0.77	0.06
23	S/He hardens, threatens, or frightens others	0.75	0.06
21	S/He is always angry or upset	0.74	0.06
29	S/He feels frightened, upset, and anxious	0.7	0.06
26	S/He is physically violent with others	0.64	0.06
12	S/He runs or climbs a lot when required to take a seat	0.51	0.06
20	S/He refuses requests or laws of adults	0.49	0.06
16	S/He rushes to answer before the teacher completes the question	0.41	0.06
19	S/He loses his/her temper (S/He becomes nervous for trivial reasons)	0.41	0.06
9	S/He forgets daily activities, such as bringing homework to school	0.38	0.06
3	S/He does not seem to listen when s/he is addressed directly	0.31	0.06
24	S/He begin physical altercations	0.28	0.06
13	S/He has difficulty in participating in games that require calmness	0.25	0.06
7	S/He loses tools and objects needed to complete tasks or activities (such as homework, pens, or books)	0.22	0.06
4	S/He does not follow instructions and fails to complete schoolwork (not because of refusal or misunderstanding)	0.2	0.06
14	S/He constantly move like a motor	0.19	0.06
5	S/He has difficulty in arranging tasks and activities, such as arranging his/her seat in class	0.15	0.06
17	It is hard for him/her to wait his/her turn	0.09	0.06
6	S/He avoids, dislikes or does not want to start activities that require continuous mental focus like solving an arithmetic problem in class	0.05	0.06
18	S/He interrupts other people’s conversations or intrudes on their activities	0.04	0.06
15th	S/He talks a lot	−0.06	0.06

(continued)

Table 4 (continued)

No	Item	Difficulty measures	S.E.
11	S/He leaves his/her seat in class or wherever s/he is required to stay	-0.07	0.06
10	S/He expresses boredom with his/her hands or feet, or moves a lot in a chair	-0.12	0.05
2	S/He finds it difficult to stay focused on tasks and activities	-0.13	0.05
1	S/He does not pay attention to details and makes careless mistakes, such as homework	-0.14	0.05
8	S/He is easily distracted by external stimuli	-0.37	0.05
39	His/her relationship with his/her peers	-1.53	0.05
40	S/He follows instructions	-2.01	0.05
41	S/He disturbs the class	-2.19	0.05
42	S/He get tasks done	-2.26	0.05
43	Organization skills	-2.34	0.05
37	Mathematics	-2.46	0.05
36	Reading	-2.5	0.05
38	Writing	-2.68	0.05
Means		0	0.06
P.SD		1.19	0.01

3. There are gaps on the logarithm scale without items between items (27 and 33) and (8 and 39), where the difference between the estimate of the two items exceeds the sum of their standard error.

6.3 Answer to the Third Question

The third question states: “What are the estimates of the distinct threshold values for the item grading levels of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?”

To answer this question, the efficiency of response categories in the Vanderbilt’s scale were calculated as follows.

6.3.1 Efficiency of Response Categories in Vanderbilt’s Scale

A quadruple rating scale was utilized in Vanderbilt’ scale for items 1–35, which are never, sometimes, most of the time, and all the time. The scores of 0, 1, 2, and 3 were given, and a fifth rating scale was also used for items 36–43. This scale includes excellent, very good, average, suffers from some difficulty, and suffers from severe difficulty, and the scores of 1, 2, 3, 4, and 5 were given.

PERSON - MAP - ITEM

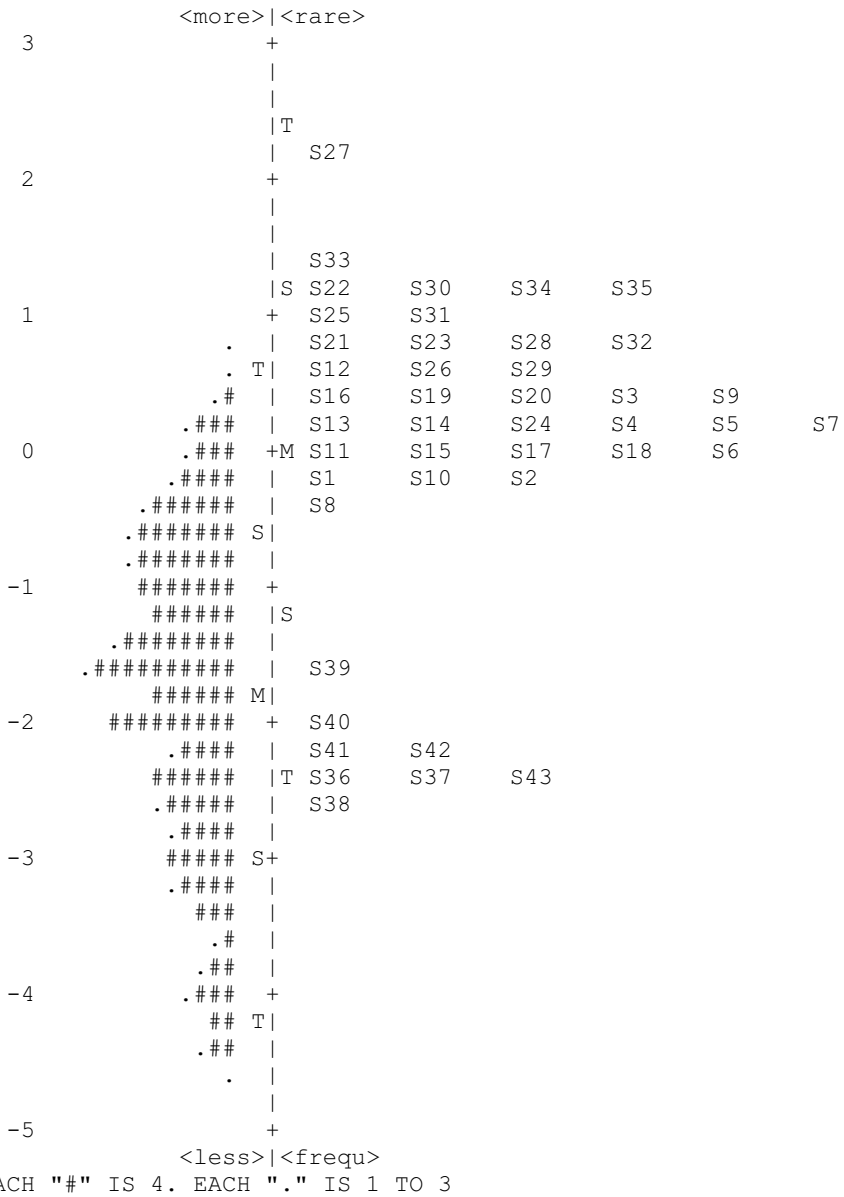


Fig. 1 A map of coefficients' distribution of items' difficulty and individuals' abilities in the Vanderbilt's scale

Vanderbelt 1-43

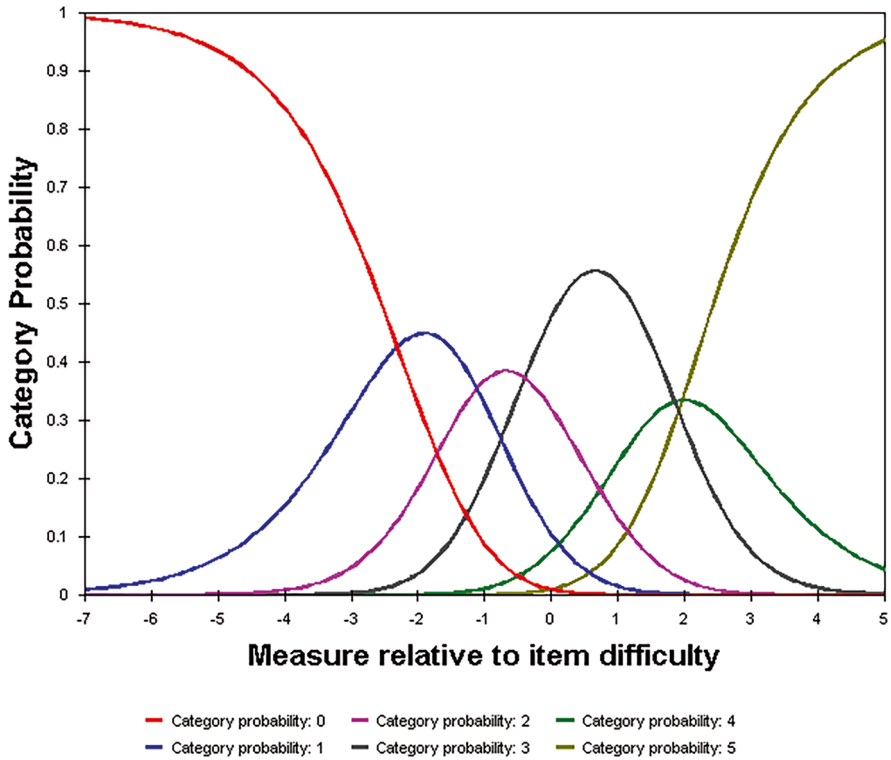


Fig. 2 Relationship between the difficulty levels for the six categories of Vanderbilt’s scale (1–43)

To test the efficiency of response categories in evaluating Vanderbilt’s scale in the sample of the study, a graph (Fig. 2) which shows the relationship between the levels of difficulty for the six categories and the probability of the correct response on the scale items using the program of Winsteps was developed.

Figure 2 reveals that the categories are clearly gradual in terms of difficulty and fit the Rasch Rating Scale Model based on the internal and external matching indicators. The researchers used the statistics of response categories provided by the Winsteps software to test the efficiency rating scale and the results are summarized in Table 5.

As revealed in Table 5 above, these results obtained are as follows:

- Percentage of categories appearance in the observed data is in descending order. It is also noticed that the percentage is lower in category nos. 4 and 5 compared to the other categories.
- As expected, the average of trait ratings in the six categories are arranged in ascending order according to category score and are well graded.

Table 5 Statistics of response categories in the Vanderbilt scale

Category		Observed count %	Observed sample		Infit and Outfit		Structure calibration (Rasch–Andreich thresholds)	Category measure
label	Score		Average	Expect	Infit MNSQ	Outfit MNSQ		
0	0	35	-3.19	-3.17	0.97	0.98	NONE	(-3.60)
1	1	27	-1.99	-2.01	1.05	0.98	-2.31	-1.9
2	2	18	-1.01	-1.07	1.01	1.04	-1.11	-0.67
3	3	15	-0.19	-0.07	1.05	1.07	-0.40	0.67
4	4	4	1.3	1.05	0.62	0.66	1.85	2
5	5	2	1.78	1.84	1.09	1.08	1.97	-3.46

- All response categories are statistically appropriate according to the Rasch Rating Scale Model, as it did not exceed the statistics of matching limits (0.6–1.4).
- That categories thresholds “calibration structure” are arranged in ascending order according to the degree of the category, as expected. This means that the assumption of the model has been fulfilled.

It is noticed that the fifth-category rating scale has an acceptable efficiency in Vanderbilt’s scale (1–43) among the sample members of the study.

6.4 Answer to the Fourth Question

The fourth question states, “What are the implications of the validity and reliability of the Vanderbilt scale for attention deficit hyperactivity disorder according to the Rasch Rating Scale Model?”

The validity of Vanderbilt’s scale for attention deficit hyperactivity disorder (ADHD) was examined based on the Rasch Rating Scale Model. The findings in Table 3 revealed that that the internal and external matching values for most of the items fall within the acceptable range (0.5–1.5). This indicates the matching of Vanderbilt’s scale items. The results of this study showed that the scale has unidimensionality assumption.

The results presented in Table 3 also showed that the reliability of the scale was examined by calculating the reliability coefficient for items and individuals. It was also found that there is an increase in the reliability coefficient of the items as it reached 1 with the separation coefficient among items whose value is 19.16, which is more than 2 (Wright & Masters, 1982). This is an indication that there is efficiency in the sample of individuals in separating the items, in distinguishing between the difficulty of the items, and in defining the continuum of the attribute that it measures, which is equivalent to the structural validity of the instrument (Linacre, 2020). The separation coefficient indicates the number of layers that make up the difficulty of the test items, so the items spread well on a logarithmic scale with high reliability.

The results also indicate that the reliability coefficient of individuals increased to 0.96 with the coefficient of separation between individuals as 5.16 which is greater

than 2. This means that there is efficiency in the scale items of attention deficit hyperactivity scale where there are 43 items in the separation between individuals. Further, there is also an efficiency in defining the continuum of the trait that these items measure and also in identifying their different levels of ability. This is confirmed by the increase in the reliability coefficient of individuals which means that the examinees are distributed appropriately on the power trait continuum in Vanderbilt's scale according to the Rasch Rating Scale Model. It is worth noting that the value of the reliability coefficient of individuals in the Rasch Rating Scale Model is equivalent to the reliability of the test in the traditional theory of Cronbach's alpha (α) (KR-20) (Linacre, 2020).

7 Discussion of the Findings

The results of the research indicate that the items of Vanderbilt's scale match the attention deficit hyperactivity disorder as most of the internal and external matching values (43) fall within the recommended range (0.5–1.5). This shows that they make a useful contribution to measure the structure of the scale, except for the item 41 = 1.51 as it is outside the internal matching statistics (MNSQ), which is close to the recommended indicator. There are two items outside the external matching statistics (MNSQ) which are 16 = 1.81 and 31 = 1.51. It is noticed that such values are close to the recommended indicator (0.5–1.5), which indicates the suitability of Vanderbilt's scale items to the rating scale model. This increase is attributed to the unexpected responses. The results indicated that the unidimensionality of the scale was validated.

The scale also has a high reliability as the value of the reliability coefficient for the items was 1, the separation coefficient for items was 19.16, the value of the reliability coefficient for individuals was 0.96, and the separation coefficient for individuals reached 5.16.

The results of the items order showed that the values of Vanderbilt's scale's item difficulty estimates range from 2.22 logit to -2.68 . The standard error values also ranged from 0.09 to 0.05, which are very small values, indicating the accuracy and reliability of the scale as well as the increase in the information function of the items. The results related to the efficiency of the response categories also revealed that the categories are clearly graded in difficulty and fit Rasch Rating Scale Model. It is also noticed that the reliability of item spacing reached 1, and this could be attributed more to the reliability of the differential thresholds of the items than to the reliability of the spacing of the items themselves. The items themselves are the same and the divergence is in the differential thresholds, which are achieved through the divergent values of the differential thresholds of the scale items. Therefore, it can be stated that the differential threshold values that are achieved for Vanderbilt's scale items grading levels have a good, identification ability to detect the existence of attention deficit hyperactivity disorder among students.

Based on what is discussed previously, it is clearly shown that Vanderbilt's scale for attention deficit hyperactivity disorder (ADHD) has acceptable psychometric

properties according to Rasch Rating Scale Model, which makes this scale applicable to children with disorders in the Arab world.

Based on what has been discussed before, the researcher concluded that Vanderbilt's scale for (ADHD) has acceptable psychometric properties according to the Rasch Rating Scale Model. A conclusion which renders this scale valid for application. This result is consistent with the outcomes of other studies (Bussing et al., 2017; Khambule, 2021; Wolraich et al., 2003, 2013).

8 Limitations of the Study

The results of the study are determined by the tool used in the study and the study sample, which includes students in the cycle one school whose age ranges between 6 and 10 years in Al Batinah North Governorate, Oman.

9 Implication of the Study

This study gains its importance in that it deals with one recent trend in educational measurement, which is the item response theory (Rasch Rating Scale Model). The research contributed to this area of knowledge by developing a scale that is able to detect students with ADHD in which the assumptions of the Rasch Rating Scale Model are fulfilled. Furthermore, the research provided specialists in the Omani and Arab environment with an appropriate tool to detect ADHD in accordance with the criteria contained in the Fifth Diagnostic and Statistical Manual (DSM-5), the Tenth International Classification of Diseases (ICD 10), and the International Classification of Diseases in its 11th form (ICD 11).

10 Recommendations

Based on the obtained findings, the following recommendations can be drawn:

- The study recommends that the current form of the scale should be used to identify children with attention deficit hyperactivity disorder so as to provide appropriate educational programs for them.
- The current form of the scale should be used to conduct a survey with the aim of identifying the prevalence percentage of attention deficit hyperactivity disorder in the Sultanate of Oman.
- The individual response models should be employed to develop and build psychological, mental, and educational tests and measurements due to the fact that they achieve linearity of gradation, uniformity of measurement, and independence.

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Learning-on-the-Go: The Impact of Mobile-Based Microlearning on Improving Functional Writing Skills and Soft Skills and Reducing Cognitive Load of Business Students



Ashraf Atta Mohamed Safein Salem

Abstract Microlearning is emerging as an efficacious pedagogical strategy, particularly in higher education, offering unique possibilities for both achievement and skills development. This research delves into the potential of mobile-based microlearning to enhance functional writing and soft skills—emphasizing communication and teamwork—alongside reducing cognitive load among business students. The study comprised an experimental group ($n = 44$) exposed to a mobile-based microlearning training and a control group ($n = 41$) adhering to traditional learning methodologies. Assessments were executed both pre- and post-interventions. The findings indicated a notable improvement in the performance of the experimental group in terms of functional writing skills, soft skills (namely, communication and teamwork skills), and reducing cognitive load. Independent samples t -test revealed that there are statistically significant differences between the mean scores of the experimental and control groups in the posttesting session of functional writing, soft skills, and cognitive load in favor of the experimental group. The analysis of covariance (ANCOVA) revealed the experimental group exhibited enhanced functional writing skills, superior communication and teamwork skills, and lower cognitive load compared to their counterparts. The effect size analysis underscored a considerable impact on functional writing skills, soft skills, and cognitive load, substantiating the effectiveness of mobile-based microlearning. Despite the study limitations, this study extends meaningful insights, suggesting that mobile-based online microlearning can serve as a pivotal tool for educators and institutions to refine instructional strategies in business education, particularly focusing on writing proficiency, soft skills, and decreasing cognitive load. Based on the research results, it can be concluded that this research contributes to the existing knowledge about microlearning in several ways: (1) it enhances retention and learning transfer; (2) it helps reducing cognitive load; (3) it also aligns with modern learner preferences; (4) it helps increasing students' engagement and interactivity; and (5) it supports continu-

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ous reinforcement for skill development. Therefore, this inquiry lays the groundwork for more extensive research and application, prompting further exploration and validation in diverse learning contexts and domains.

Keywords Mobile-based microlearning · Soft skills · Functional writing skills · Cognitive load · Business students

1 Introduction

Writing is a fundamental skill with significant importance as one of the fundamental abilities in the acquisition of language. The importance of writing is validated by extensive research (Yerukneh et al., 2023), which demonstrates its crucial role in the realm of both academia and professional settings. Writing functions as a pivotal medium that enables individuals to express their thoughts, ideas, and insights to others. It allows individuals to express themselves and explore their ideas for individuals to articulate their innermost emotions and reflections. The act of writing not only facilitates communication but also serves as a tool for introspection, allowing individuals to consolidate their thoughts and comprehend their experiences and knowledge. This process has the potential to empower individuals by bestowing them with a voice and enabling them to contribute their perspectives and understandings to a broader discourse, thereby enhancing communal knowledge and fostering intellectual diversity.

In educational settings, writing assumes special significance due to its predominant utilization as a means of evaluation, particularly in the Arab nations (Salem, 2008, 2013). Writing is heavily used to assess students' understanding, analytical abilities, and command of the English language. Within academic spheres, the capacity to write proficiently is frequently equated with academic achievement and intellectual aptitude, rendering it an essential skill for students to foster.

Writing is crucial in classroom activities as it reinforces grammatical rules and expands vocabulary. It allows students to communicate their thoughts and concepts without face-to-face interactions. Incorporating challenging writing tasks introduces diversity and promotes essential literacy skills. Enhancing English writing skills is most effective when instructional approaches are tailored to students' unique needs and objectives. Therefore, it can be concluded that Writing empowers individuals to express thoughts, shape ideas, and influence others effectively (Al-Saleem, 2008; Gracey, 2004).

One of the most significant writing genres is functional writing skills that offer individuals the necessary knowledge, skills, and understanding. It empowers them to operate confidently, effectively, and autonomously in academic, personal, and professional environments. Individuals possessing such skills are proficient in participating in and advancing in education, training, and employment, while also

developing and achieving a wide range of skills, attitudes, and behaviors that enable them to make positive contributions to their school, local community, and workplace (Onchera & Manyasi, 2013).

Writing and reading are essential components of academic education, with writing being used extensively in both lower and higher education settings, including universities. Students must independently develop their ideas on a given topic when engaging in academic writing assignments, such as writing essays or learning journals. This process produces long-lasting and significant knowledge (Nückles et al., 2020). Galbraith (1992) argues that Vygotsky's theories are rooted in the idea of writing as a tool for thought and learning, emphasizing the significant role of human language in fostering thought and reasoning processes.

Britton's theory (1980), based on Vygotsky's ideas, suggests that a significant portion of our long-term memory knowledge is implicit and not easily accessible. Klein (1999) refers to this as the shaping-at-the-point-of-utterance hypothesis. Writing transforms this implicit knowledge into explicit insights, enabling thoughts to take shape and solidify. As emphasized by Sweller et al. (1998), the process of writing itself is believed to generate cognitive load that is relevant, triggering the construction of knowledge essential for learning.

Cognitive load is the cumulative mental effort required in working memory (Sweller et al., 1998). Exceeding the optimum cognitive load decreases an individual's capacity to process new information and perform tasks, such as functional writing assignments. The situation is critical because effective writing necessitates the simultaneous processing of multiple factors, including grammar, logical coherence of content, and adapting the message to a specific audience.

Diverse learning tactics, including online learning, can effectively decrease cognitive load by offering innovative educational opportunities. Students may utilize technology to investigate virtual settings, interact with instructional applications on their tablets or mobile phones, and gain knowledge through authentic simulations of the physical world. However, new research suggest that certain design aspects present in digital learning can lead to an augmentation in cognitive load. For example, fully engaging in a virtual environment during an educational task can offer a unique and groundbreaking learning experience compared to conventional media. Nevertheless, this captivating engagement can also exhaust learners' cognitive capacities, causing them to be distracted from the actual process of learning (Nückles et al., 2020).

Microlearning has arisen as a pedagogical methodology wherein knowledge is assimilated in bite-sized fragments to facilitate improved memory preservation, captivate students, and procure miniature content for adaptable learning settings like mobile learning and mobile applications. Mobile applications are intrinsic to contemporary society and represent a prevailing tendency within the realm of digital education (Nami, 2020).

2 Literature Review

2.1 *Learning-on-the-Go: Mobile-Based Microlearning*

Microlearning, a fast-evolving format, provides convenience, economizes time, and introduces new learning opportunities (Dolasinski & Reynolds, 2020; Zarshenas et al., 2022). This pedagogical technique, also referred to as “bite-sized learning” relies on delivering discrete units of information through short-term, focused activities (Reinhardt & Elwood, 2019; Kapp & Defelice, 2019). By implementing a learner-centric approach and employing a multi-modal design, microlearning augments student engagement and performance (Dolasinski & Reynolds, 2020).

The concept of microlearning, as it is recognized, emerged during the early 2000s (Hug et al., 2005). It was introduced as a media-didactic strategy that is in line with the demands of a knowledge-based society and optimizes the capabilities of information and communication technology. Anticipating the advancements in mobile and wearable computing devices, microlearning adopts a pervasive and omnipresent approach to learning. Its aim is to assist learners in integrating learning tasks into their daily routines and completing them during periods of free time, while minimizing the time and mental effort required for a single significant activity.

Evidence from various studies indicates that microlearning is an effective teaching and learning method across disciplines, including language, engineering, and nursing (Fang, 2018; Nikou, 2019; Reinhardt & Elwood, 2019; Shamir-Inbal & Blau, 2022; Wang et al., 2020). This approach breaks down instructional material into “chunks” or “bite-sized” pieces, utilizing various resources such as PDFs, podcasts, infographics, films, augmented reality, and chatbots (Kohnke, 2021). This not only aids memory and recall (Kapp & Defelice, 2019) but also caters to students with shorter attention spans (Chadha & Kumar, 2018; Eldridge, 2017). Further, microlearning is a quick and efficient technique that includes online courses, training, seminars, and workshops.

In addition to developing literacy skills (Kohnke, 2023a, b), thinking skills (Betancur-Chicué et al., 2023), and soft skills (Romanenko et al., 2023), microlearning can reduce cognitive load. It aims to mitigate cognitive overload—a significant barrier for modern learners—by reducing the amount of information and making instructional materials more engaging (Jomah et al., 2016).

2.2 *Microlearning and Skills Development*

Microlearning has emerged as a significant educational approach for improving English language skills, particularly in higher education and language acquisition situations. This teaching method, characterised by short, focused learning chunks, has shown effectiveness in enhancing student engagement, retention, and overall educational experience. Integrating microlearning into English language training can be very beneficial when combined with modern technologies and multimedia

materials. Barus (2023) asserts that microlearning has promise in English language education by employing infographics and online resources to enhance learners' engagement with linguistic and cultural aspects. Furthermore, Lin et al.'s (2023) promote a comprehensive microlearning instructional design that integrates learning segments to enhance communicative competences and collaboration abilities among English language learners.

This interconnectedness is crucial, since it alleviates the challenges associated with discrete chunk learning, which may impede the acquisition of comprehensive language skills. Sankaranarayanan et al. (2023) demonstrate that there should be an increasing scholarly focus on microlearning as a pedagogical approach to improve language learning outcomes. Gorham et al., (2023) found that microlearning enhances peer feedback skills and second language proficiency, both crucial for effective language acquisition. The capacity to provide and accept feedback is essential for language acquisition, and microlearning facilitates this by delivering structured, succinct information that may be readily assimilated and used.

The incorporation of multimedia and technology in microlearning markedly improves interaction and engagement in English reading, as emphasized by Kurniawan et al., (2024), who document significant advancements in language literacy among young learners. The increasing use of social media platforms such as TikTok for English as a Foreign Language (EFL) instruction (Meliana & Seli, 2023) highlights the flexibility of microlearning to align with contemporary student preferences, whilst Gagné and Casademont (2024) stress its significance in improving metalinguistic awareness among multilingual learners.

2.3 Functional Writing Skills in English as a Foreign Language English for Specific Purposes (ESP) Contexts

The functional approach to language learning, and specifically to writing, is rooted in the principle that language is a tool for communication and should be learned and taught as such. This approach contrasts with more structural approaches that emphasize the rules and forms of language in isolation. Here is a closer look at the functional approach based on the insights of Hartnett (1997) and Halliday (1994):

1. *Purpose-Driven Learning*: The functional approach believes that language should be learned and taught in context, with an emphasis on how it fulfills specific communicative purposes. This means that instead of just teaching grammar rules, the focus is on how language is used in real-life situations to achieve certain goals, like making a request, giving an opinion, or narrating an event.
2. *Meaningful Use of Language*: As per Hartnett (1997), the functional approach supports the meaningful use of language. This means that learners are encouraged to use language in ways that convey genuine meaning, rather than just memorizing and repeating phrases without understanding their implications or nuances.

3. *Systemic Functional Linguistics (SFL)*: It is a theory that posits that language is a system of choices for expressing meaning. It is based on three metafunctions: (1) the ideational metafunction, which focuses on how language expresses ideas and conveys information; (2) the interpersonal metafunction, which examines how language enacts social relations, including modality and mood; and (3) the textual metafunction, which focuses on how language creates specific discourse or texts, including how parts of a text are linked together cohesively and information is organized within a text.
4. *Integrated Communication*: In every piece of communication, all three of Halliday's metafunctions are present to some extent. They interplay and influence the choices of content and form in the text. For example, a formal letter would have a different structure, tone, and choice of words than an informal chat between friends.
5. *Application in Writing*: When applying the functional approach to writing, learners are taught to consider the purpose of their text, the audience they are writing for, and the most effective way to convey their message. They are encouraged to think about the choices they make in terms of vocabulary, grammar, and structure and how these choices affect the overall meaning and effectiveness of their communication (Salem, 2013, 2018).

Onchera and Manyasi (2013) emphasize that mastering functional writing skills equips people with the necessary expertise and comprehension to function competently and autonomously in educational settings, daily life, and professional environments. People, regardless of their age, with these competencies can not only advance in their education and careers but also cultivate a wider set of qualities and mindsets, positioning them to positively impact their educational institutions, communities, and workplaces. In addition, Salem (2018) asserts that for students majoring in business, functional writing skills encompass those required for academic tasks, like crafting formal reports, as well as those they will use professionally, such as composing meeting agendas and minutes.

Several studies have delved into the benefits of various teaching methods for improving functional writing skills. One such study by Shehata (2023) aimed to evaluate the effects of task-based learning on the English as a Foreign Language (EFL) functional writing skills and attitudes of second-year IT students at Minia Sadat's Academy for Management Sciences. Results indicated a significant positive shift in scores from the initial to the subsequent EFL functional writing tests and the attitude scales. Furthermore, a strong correlation was observed between these two areas.

In addition, Salem (2013) examined the impact of a program centered on the writing workshop approach in enhancing functional writing skills of prospective English teachers at Hurghada faculty of education. The results highlighted that the program based on the writing workshop approach significantly bolstered the participants' functional writing proficiency. In another study by Salem (2018), the efficacy of the flipped classroom approach in bolstering the functional writing skills, higher-order thinking (HOTS) skills, and mitigating writer's block of business students was

examined. The study findings underscored notable improvements in the experimental group in terms of functional writing abilities and HOTS, and a decline in instances of writer's block when compared to the control group. Furthermore, findings indicated consistent enhancement in the skills and a reduction in writer's block.

Another study was conducted by Alqomoul and Alroud (2019) to assess the impact of a systematic approach on enhancing functional writing skills among public school students in Tafila's Directorate of Education, Jordan. The findings indicated a notable advantage for the experimental group in comparison to the control group, with statistically significant differences observed.

2.4 *Soft Skills*

The term *soft skill* has varying definitions depending on the researcher and context. To gain a better understanding of this concept, it can be helpful to compare it to hard skills or technical skills. Hard skills refer to technical procedures or hands-on operations that can be easily taught, measured, monitored, and quantified. In contrast, soft skills pertain to a person's attributes, which can be categorized into three groups: personal characteristics, interpersonal skills, and problem-solving/decision-making abilities. Soft skills hold significance for students and employers, although they present challenges in terms of instruction (McCale, 2008; Rabi'ah Husin et al., 2015).

Higher education institutions exert much effort to improve soft skills hand in hand with hard skills (Alieksieieva et al., 2020; Cornali, 2018; Karimova, 2020; Emanuel et al., 2021). The role of higher education surpasses merely delivering technical knowledge or specialized competencies; it is instrumental in cultivating holistic individuals equipped with an array of nontechnical abilities. Such proficiencies empower individuals to adeptly interact with their environment, synergize with colleagues, enhance performance, and realize goals. Contemporary society is progressively recognizing the value of these nontechnical attributes, often labeled as *soft skills*, *interpersonal capabilities*, *universal skills*, or *transferrable competencies*, vital for the evolution of the knowledge-driven economy (Laker & Jimmy, 2011; Pereira & Raposo, 2019; Viviers et al., 2016; Vasanthakumari, 2019).

Soft skills are understood as innate knowledge embedded in human cognition, possessing a highly individualistic nature (Asbari et al., 2020; Chen et al., 2018; Perez-Fuillerat et al., 2018; Zebal et al., 2019). These skills represent nontechnical abilities, encompassing cognitive and social aspects that supplement technical proficiencies (Asher & Popper, 2019; Laari et al., 2021). These competencies are deeply entrenched in one's behaviors and lived experiences, influenced by personal ideals, principles, and emotional aspects (Hartley, 2018).

Central to soft skills is the ability to articulate ideas, placing communication skills at its core. Many individuals, especially non-English majors and those for whom English is a secondary language, often struggle with foundational communication abilities. The term *language competency* denotes proficiency in using a language, both in speech and writing. It is essential to distinguish soft skills from social

skills; the latter is a subset of the former. Social skills encompass abilities like learning, analysis, time management, and innovation, transcending mere interpersonal interactions (Guerra-Baez, 2019). Furthermore, life skills, a component of soft skills, can be classified into three groups:

1. *Interpersonal capabilities*: assertive communication, negotiation, trustworthiness, collaboration, and empathy.
2. *Cognitive abilities*: encompassing problem-solving, decision-making, critical thinking, self-assessment, analytical reasoning, and comprehending consequences.
3. *Emotional regulation*: recognizing and managing emotions, especially during high-stress situations or when experiencing strong emotions like anger or sorrow (Mangrulkar et al., 2001; Salem, 2022).

2.5 Cognitive Load

The capacity of working memory inhibits the acquisition of secondary biological knowledge. Learners must devote their working memory capacity to learning tasks to gain new knowledge (Clark et al., 2006; Sweller et al., 2019). Cognitive overload occurs as a result of increased intrinsic working memory load from complicated cognitive tasks, as well as the allocation of working memory resources to nonlearning activities (Paas & van Merrinboer, 2020). According to cognitive load theory (CLT) (Kirschner et al., 2018; Sweller et al., 2019), learning necessitates the use of resources from humans' working memory. However, working memory is thought to be limited in terms of the amount of information that can be processed concurrently as well as the duration that information can be kept. When these constraints are exceeded, cognitive overload occurs. The quantity of mental resources necessary to complete a learning activity is classified as intrinsic, extraneous, or relevant cognitive load (Leppink & Van der Heuvel, 2015; Sweller et al., 2019).

Intrinsic cognitive load (ICL) is the mental effort needed to process the complexity of a learning task, influenced by the task's structure and learners' prior knowledge. Higher prior knowledge leads to lower cognitive load, as learners can apply existing structures to new information. Extraneous cognitive load (ECL) is the mental effort needed to process instructional materials, not contributing to essential learning. Germane cognitive load (GCL) involves processing information to construct new knowledge structures. GCL interacts with ICL and ECL but is not an independent type. Instructional designs should address the interaction of materials and working memory capacity to reduce learners' germane load (Orru & Longo, 2019; Sweller et al., 2019).

By using information chunking to prevent cognitive overload, microlearning can successfully reduce cognitive load (Ayres et al., 2014). It employs the Just-In-Time learning approach, uses multimedia to employ dual coding theory (Paivio, 2013), and spaces out learning over time, which is more effective according to the spacing

effect (Carpenter et al., 2012). Microlearning also reduces stress, which may lead to a reduction in cognitive load (Arnsten, 2015).

While traditional instructional strategies can effectively improve soft skills, some research has identified barriers to soft skill development in traditional classroom settings, such as large class sizes, an emphasis on academic achievements, and insufficient training periods (Nganga et al., 2015). As a result, mobile-based microlearning emerges as a viable technique for improving soft skills and reducing cognitive load among university students. When deciding on microlearning, consider factors such as the ability of a method to encourage individualization and personalization, its ability to facilitate an engaging and flexible educational process, its compatibility with learners' unique personality traits, and its ability to effectively utilize available resources (Romanenko et al., 2023).

Therefore, this chapter tries to validate the following hypotheses:

- H1: There are statistically significant differences between students' performance using mobile-based microlearning instructional activities and non-microlearning groups in posttest scores in functional writing skills.
- H2: There are statistically significant differences between students' performance using mobile-based microlearning instructional activities and non-microlearning groups in posttest scores in soft skills.
- H3: There are statistically significant differences between students' performance using mobile-based microlearning instructional activities and non-microlearning groups in posttest scores in cognitive load.
- H4: There are positive attitudes of business major university students in the experimental group toward the use of mobile-based microlearning activities.

3 Methods

To investigate the research questions and assess the proposed hypotheses, the present study employed a sequential explanatory mixed methods approach to gather data and perform diverse analyses. The research design employed in this study is a sequential exploratory mixed methods design, as seen in Fig. 1.

Sequential explanatory mixed methods design (Creswell et al., 2003; Tashakkori & Teddlie, 2003; Creswell & Plano Clark, 2007; Riazi & Candlin, 2014) is a two-phase procedure that integrates the analysis of quantitative and qualitative data. In the first phase, the researcher gathers and evaluates quantitative data, to identify connections among variables (Ivankova et al., 2006; Kroll & Morris, 2009). This is particularly useful in educational studies, where researchers track test results, attendance, or performance indicators of students. In the second phase, qualitative data is collected and evaluated, offering a more in-depth understanding of the quantitative results. This can be achieved through focus groups, interviews, or open-ended survey questions. The qualitative data helps clarify the reasons behind the quantitative results, such as explaining how a teaching strategy works by capturing the

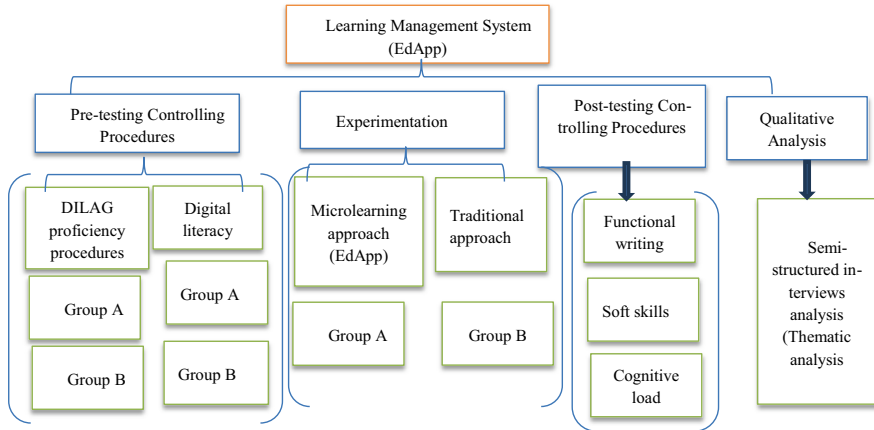


Fig. 1 Sequential explanatory mixed methods design

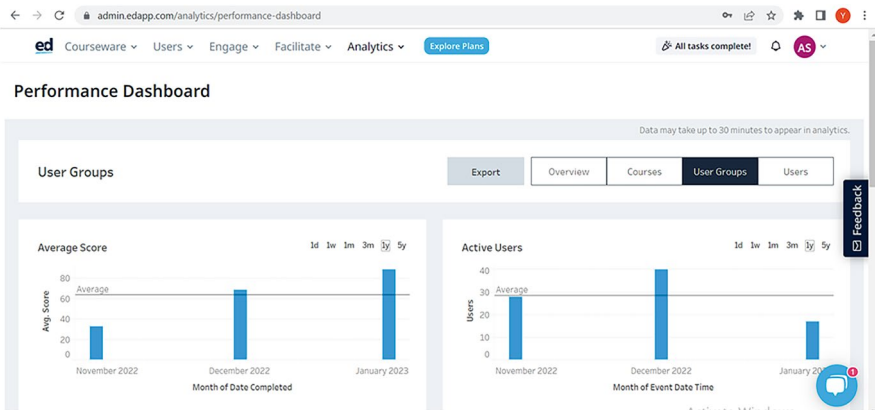


Fig. 2 Screenshot of the EdApp platform

experiences of both teachers and students. Once both phases are completed, researchers integrate the findings to gain a more comprehensive understanding of the research issue. This approach reveals improvements in student performance in the quantitative phase, while revealing greater levels of student motivation and involvement in the qualitative phase.

The students assigned to the initial experimental group (group A) were provided with access to EduApp (www.eduapp.com) to get them involved in the micro-contents the researcher designed (i.e., functional writing, communication skills and teamwork skills). The students logged into the microlearning platform and studied the content and got involved in the online collaborative work to enhance their target skills (refer to Fig. 2).

The control group (group B) was provided with a compilation of non-microlearning activities (traditional lectures), primarily offline in nature. These tools were intended to assist them in enhancing their specific skills. The selection of the intervention is mostly influenced by the process writing approach. In contrast to the product-oriented method, which focuses on the outcome, the process-oriented approach to writing places emphasis on the sequential actions to arrive at the ultimate version of their work. Salem (2008) suggests that instructional strategies have shifted from focusing on the written final product to the writing process, aiming to enhance understanding and comprehension for both readers and writers. The current focus is on diverse methodologies and cognitive processes used by writers, particularly in developing functional writing skills.

3.1 Participants

Two intact classes were used, with one randomly allocated as experimental groups and the other as a control group. Group A includes (44) ESP learners (business majors) and Group B includes (41) 18- to 22-year-old students taking an Business English course at Sadat Academy for Management Sciences, Alexandria Branch for credit hours. The experimental group's sample size was determined using a power analysis carried out with G*Power software. The analysis attempted to ensure that the study had sufficient statistical power to likely identify the impacts of interest. The researcher employed a vigilant estimate of the impact size and established the required power level at 0.80, a standard alpha level of 0.05. The computed sample size of 44 for the experimental group was deemed adequate to reach the necessary power level, therefore improving the reliability and validity of the study results. The study tested participants' language skills using the admission test, a college entrance requirement, and DIALANG, an online adaptive diagnostic tool. Writing skills in both groups were at the B1 level, according to DIALANG test findings (levels B1 to C2).

For the study's outcomes to be fully attributable to the online microlearning methods, all students completed DIALANG to measure their basic English ability. The experimental groups, who trained to use online microlearning modules and traditional lectures, had similar digital literacy backgrounds, therefore a digital literacy scale was used to ensure comparability.

3.2 Research Instruments

- (a) *The Functional Writing Skills Test (FWST)*: It evaluates functional writing skills of business English students in the CMS, banking major. FWST includes writing business reports and proposals, emails, agendas and minutes, and CVs and resumes. The test scores 100 points in four 25-point segments. The FWST had multiple-choice, open-ended, and essay questions. Close study of Table 1

Table 1 Internal consistency coefficients of FWST

No.	Dimension	Cronbach's alpha
1	Writing business reports and proposals	0.74
2	Writing business emails	0.73
3	Writing agenda and minutes	0.71
4	Writing CVs and resumes	0.78
Total score		0.75

showed that the FWST question reliability coefficients and total test score are excellent enough to assess CMS business majors' functional writing skills. Table 1 shows excellent correlation coefficients for internal consistency, which indicates test validity. Test validity ensures the meaningfulness of test components, ensuring researchers accurately measure behaviors, such as business majors' functional writing skills, thereby ensuring the validity of the test.

- (b) *Soft Skills Test*: The soft skills test assesses business majors' performance in communication and teamwork. It consists of three components: demographic data collection, theoretical knowledge testing, and situational questions for practical application. The test collects demographic data, evaluates theoretical knowledge, and assesses students' applied communication and teamwork principles in real-world situations. The test has a cumulative score of 50 and a Cronbach's alpha coefficient of 0.89, indicating strong internal consistency.
- (c) *Multidimensional Cognitive Load Scale for Physical and Online Lectures (MCLS-POL) scale*: The MCLS-POL scale measures cognitive load in physical and online lectures. Andersen and Makransky developed the MCLS-POL in 2021. The cognitive load scale (CLS) is one of the most verified and widely used self-report measures of intrinsic, extraneous, and germane burden. CLS has three basic parts. The first is the three-item intrinsic load (IL). IL items include "The activity covered concepts and definitions that I perceived as very complex." The second, extraneous load (EL), which includes 12 items, is divided into four categories: instruction (4 items, "The instructions and/or explanations during the activity were very unclear"); noise (3 items, "Noises in the environment made it difficult to focus on the learning content"); and devices (5 items, "Technical issues made learning ineffective"). The third is the four-item germane load (GL). GL items include "The activity really enhanced my knowledge and understanding of [course subject]." On a five-point Likert scale, responses range from 1 (strongly disagree) to 5 (strongly agree). The MCLS-POL's Cronbach's alpha of 0.85 indicates strong internal consistency.
- (d) *Semi-structured Interviews*: University students' views on using microlearning were examined. Based on the concepts, here are some interview questions: Can you describe your microlearning experiences? How did microlearning affect your soft skills, especially communication, and teamwork? How did microlearning affect your brain load? Was the information easy to comprehend? Was there anything difficult to learn through microlearning? Can you describe them?

4 Results

4.1 Quantitative Study Results

To validate the research hypotheses 1, 2, and 3 (H1, H2, and H3), independent samples *t*-test was utilized. It revealed significant differences in all measures within the experimental group in both pre- and posttesting. Table 2 shows the independent sample *t*-test between the experimental and control groups.

Table 2 reveals that following the intervention, both the experimental and control groups exhibited significant changes in their respective measures. In the experimental group, participants improved functional writing skills, with the mean scores increasing significantly to 90.00 (SD = 7.50) after the intervention ($t(43) = 4.68, p < 0.001$). A similar pattern was observed in communication skills, where the mean score improved to 32.00 (SD = 3.81) in the posttesting ($t(43) = 4.76, p < 0.001$). Teamwork skills also witnessed a notable progress, with the mean score rising up to 25.00 (SD = 4.02) after the intervention ($t(43) = 4.02, p < 0.001$). With regard to cognitive load, participants experienced a reduction in their cognitive load, as reflected in the mean scores decreasing to 56.00 (SD = 4.90) in the post-intervention ($t(43) = 2.90, p = 0.007$) (Fig. 3).

Table 3 shows the analysis of covariance (ANCOVA) findings comparing experimental and control post-intervention scores across measures. To find significant group differences, each metric was statistically analyzed. For functional writing skills, the post-intervention mean difference between the experimental and control groups is not statistically significant. Communication skills differed

Table 2 Independent samples *t*-test between the experimental and control groups

Group	Measure	Testing	M	SD	<i>t</i> -value	<i>Df</i>	<i>p</i> -value
Experimental group	Functional writing	Pre-intervention	75.00	8.66	3.12	43	0.003
		Post-intervention	90.00	7.50	4.68	43	0.001
	Communication skills	Pre-intervention	22.00	3.50	4.21	43	0.001
		Post-intervention	32.00	3.81	4.76	43	0.001
	Teamwork skills	Pre-intervention	14.00	2.42	3.89	43	0.005
		Post-intervention	25.00	4.02	4.02	43	0.003
	Cognitive load	Pre-intervention	70.00	5.01	2.76	43	0.009
		Post-intervention	56.00	4.90	2.90	43	0.007
Control group	Functional writing	Pre-intervention	70.00	9.92	2.55	40	0.015
		Post-intervention	85.00	7.99	3.72	40	0.001
	Communication skills	Pre-intervention	21.00	3.31	2.50	40	0.018
		Post-intervention	29.00	2.51	2.78	40	0.008
	Teamwork skills	Pre-intervention	13.00	2.29	2.89	40	0.007
		Post-intervention	23.00	2.48	3.12	40	0.003
	Cognitive load	Pre-intervention	68.00	4.73	2.31	40	0.027
		Post-intervention	58.00	4.80	2.59	40	0.013

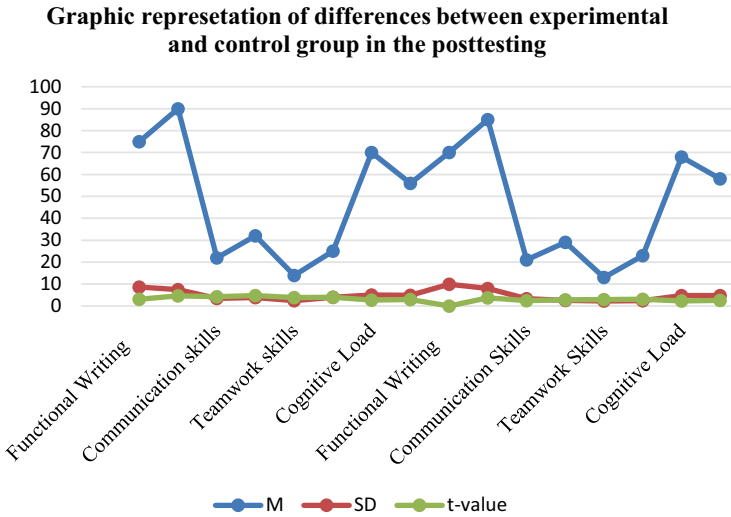


Fig. 3 Independent samples *t*-test between the experimental and control groups

Table 3 ANCOVA results comparing post-intervention scores between groups

Measure	Source	<i>Df</i>	Mean square	<i>F</i>	<i>p</i> -value	Partial η^2	Adjusted mean (experimental)	Adjusted mean (control)
Functional writing skills	Group	1, 80	5.30	3.68	0.059	0.044	85.00	80.00
	Error	80	1.44					
Communication skills	Group	1, 80	8.24	16.50	0.001	0.173	31.12	28.01
	Error	80	0.50					
Teamwork	Group	1, 80	6.35	18.42	0.001	0.189	24.08	21.97
	Error	80	0.34					
Cognitive load	Group	1, 80	10.21	20.15	0.000	0.203	55.92	64.15
	Error	80	0.51					

significantly between groups, the mean difference is statistically significant. The participants’ scores in teamwork skills differed significantly between groups; the experimental group’s mean score is 24.08 which seems to be considerably higher than the control group (21.97). Cognitive load scores analysis showed a significant difference between experimental and control groups. Findings show significant mean differences. The intervention reduced cognitive strain during tasks, as the experimental group had a mean cognitive load of 55.92 compared to the control group (64.15).

4.2 *Qualitative Study Results*

To stand on the experimental group participants' attitudes toward mobile-based microlearning activities, semi-structured interviews were conducted. These semi-structured interviews showed that business majors generally have positive attitudes toward using mobile-based microlearning with exaggerated possibilities of using it in their future learning. Interviews revealed several major themes: (1) improved soft skills, (2) alleviation of intrinsic cognitive load, (3) mitigation of extraneous cognitive load, (4) enhanced germane cognitive load, and (5) preferences for microlearning.

5 Discussion

This study investigated the impact of mobile-based microlearning on the improvement of functional writing skills, soft skills, namely in the communication and teamwork skills, as well as its influence on cognitive load among business university students. Findings revealed that the experimental group showed improvement across various assessed domains, such as functional writing skills, communication, teamwork, and cognitive load.

The use of online microlearning-based microcontent modules improved functional writing, communication, and teamwork skills among business university students, while also decreasing cognitive load. This suggests that microlearning effectively reduces the mental effort required for learning associated with learning, thereby enhancing the overall efficiency of the learning process. The data suggests that microlearning has been a successful tool for enhancing learning outcomes.

The study's affirmative results corroborate previous research conducted on the impact of microlearning in various educational settings (Liu, 2022; Gross et al., 2019). Microlearning modules are effective in enhancing soft skills like communication, leadership, and cooperation due to their succinct and focused nature. The flexibility and accessibility of microlearning enables university students to actively participate in the curriculum according to their preferred pace and comfort, accommodating their demanding schedules.

The research findings suggest that this study makes a substantial contribution to the current understanding of microlearning in various aspects. Specifically, the enhancement of retention and learning transfer through Microlearning is evident, indicating its effectiveness in improving retention and facilitating learning transfer. These results are in line with Gohar's (2023) prior research, which showed enhancements in vocabulary development and reduced cognitive load among university students. Moreover, this study expands on these findings by indicating that microlearning also improves functional writing skills and soft skills like communication and teamwork, particularly among business students.

Furthermore, the utilization of mobile-based microlearning training has been beneficial in reducing the cognitive load that students often experience. The study reveals that microlearning plays a role in decreasing cognitive load, consistent with Alrehaili's (2021) research demonstrating that a microlearning environment based on the theory of cognitive load enhances achievement. This research further confirms that microlearning can ease cognitive burdens, making complex information more manageable and comprehensible for learners.

In addition, the outcomes of this study align with the preferences of modern learners, thus supporting Lin et al.'s (2023) framework for comprehensive language learning, emphasizing the importance of adapting educational strategies to contemporary learner preferences. The positive results observed with mobile-based microlearning underscore its efficacy in meeting the preferences of today's students, who prefer brief, targeted, and interactive learning sessions.

In accordance with the research by Romanenko et al. (2023), this study indicates that microlearning enhances student engagement and interactivity. The notable enhancements in functional writing and soft skills indicate that microlearning methods are more engaging and interactive compared to traditional approaches, resulting in improved learning outcomes. Furthermore, the study highlights the significance of continual reinforcement in skill development, a fundamental aspect of microlearning. This underscores the notion that frequent, concise learning sessions can lead to sustained enhancements in both academic and soft skills, establishing microlearning as a valuable tool for continuous education and professional growth.

Microlearning is advantageous in the context of imparting soft skills to university students. The platform demonstrates proficiency in the areas of personalization and engagement, hence fostering an active and learner-centered approach to education. Microlearning is a pedagogical approach that is well suited to accommodate the diverse personalities of learners, while also seamlessly integrating with various technological tools and resources. The efficacy of faculty-led microlearning in higher education institutions is evident via its extensive adoption, as it effectively engages students, facilitates meaningful learning experiences, and promotes meaningful associations with everyday life and the global context (Skalka & Drlík, 2018; Romanenko et al., 2023).

6 Conclusions

Microlearning offers convenience, reduced time investment, and new learning opportunities. By breaking down learning into small, focused modules, microlearning can improve literacy skills namely functional writing skills and higher-order transferable skills and interpersonal skills such as communication and teamwork skills from the one hand and alleviating cognitive load. Simplifying complicated

concepts into bite-sized microlearning modules helps business majors retain and apply knowledge. This learning method ensures deep understanding and everyday application of interpersonal skills. Microlearning's self-paced, readily comprehended information makes it appealing and successful. Thus, it helps students learn critical soft skills and provides a lifelong learning and professional success.

Mobile-based microlearning is a flexible method that reduces the mental burden of learning by offering bite-sized information in well-designed modules. This approach helps students absorb and retain information, making learning smoother and allowing them to focus on key subjects. Microlearning's mobile apps and internet platforms allow students to access modules at their convenience, reducing time and cognitive stress. As students enter the professional world, microlearning meets the needs of modern workers by focusing on content engagement, improving knowledge retention, and preparing them for the digital world. Its small design allows for more scheduling and access flexibility, meeting students' needs and developing essential skills.

7 Limitations

Despite promising results, the study had limitations. First, although the results were statistically significant, the small sample sizes (44) in the experimental group and (41) in the control group limit the generalizability of the findings. More samples would increase the study's ability to detect real effects. Second, the research focused on communication and teamwork soft skills. The study did not address problem-solving, collaboration, or adaptation, despite their importance in professional progression. To fully understand the effectiveness of microlearning, more research may be needed on its effects on a wider range of interpersonal skills. Third, the study's short length and one post-intervention evaluation may not capture the long-term impact of microlearning on cognitive load and soft skills on cognitive load and soft skills. A later examination may reveal the durability of the effects.

Despite the study-controlled design with experimental and control groups, external variables may affect the outcomes. Future study may use more control measures or randomization to account for unintended influences. Last, cognitive load was assessed by self-report. Educational research often uses self-reported measurements; however, they are biased and unreliable. Future studies could utilize objective metrics or observations to address these issues.

Informed Consent Policy

Informed consent was obtained from all participants before their involvement in the study. The process of obtaining informed consent was designed to ensure that participants fully understood the nature of the research and their role within it.

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Confirmatory Factor Analysis of UAE Teacher Licensing Scales: Empirical Validation



Mohammed Borhandden Musah

Abstract *Purpose:* this study investigates the psychometric properties of the UAE teacher licensing scale through construct and convergent validities given the absence of empirical evidence of the scale validation in the literature. *Method:* the study randomly sampled 241 teachers undertaking a postgraduate diploma in teaching at a private university in Al Ain City. Both principal component analysis and confirmatory factor analysis were performed to test and validate factor structure of the four (Professional and ethical conduct construct, Professional knowledge construct, Professional practice construct, and Professional growth construct) latent constructs of the UAE teacher licensing scale. *Findings:* the results of the principal component analysis revealed that professional conduct latent construct is indexed by four independent factors, the professional knowledge latent construct is underpinned by two reliable factors, the professional practice latent construct is structured by three reliable factors, and the professional growth latent construct consists of three reliable factors. Furthermore, the results of the confirmatory factor analysis provided evidence of construct validity of the retained factors. In addition, the results of average variance extracted, and composite reliability index values demonstrated additional evidence of divergent and convergent validities of the scale. *Originality/value:* the results are imperative given the fact that there have been no empirical studies conducted to rigorously validate the scale. The study being the first of its kind in the UAE context to empirically validate the psychometric properties of the scales since its development, would be remarkable contribution to the Ministry of Education and teacher licensing department to revisit teacher preparation programmes for quality improvement. Establishing validated scales helps policymakers rely on the data to gain a clear understanding of the strengths and weaknesses of the education system. This information enables them to identify areas that require improvement and make well-informed policy choices.

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Keywords UAE teacher licensing scale · Confirmatory factor analysis · Principal component analysis · Average variance extracted · Composite reliability index

1 Introduction

Preparing highly qualified and competent teachers using relevant standards of knowledge, conduct and practice in their workplace is instrumental in materializing national educational goals for any given country (Abdallah, 2018; Ministry of Education, 2018). As such, insuring that certified and skilful teachers work across learning institutions built to support excellent teaching and learning is critical to achieving ideal and modern school reform initiatives. The terms teacher licensing and teacher certification are often used interchangeably. In order to legally operate as teachers, especially in the twenty-first century, teachers must possess a teaching licence, which is a certification of their eligibility in the teaching profession (Keller et al., 2016; Alabdulmenem, 2019; Gallagher et al., 2019). This educational goal has led learning institutions to establish programmes that cater for this goal. Policymakers are convinced that teacher licensing keeps irregularities out of the teaching profession and guarantees at least a minimum of quality teaching for the learners (Alabdulmenem, 2019).

The standards often set in teacher licensing programmes (TLP) address the fundamental practices required by all teachers enabling them to function effectively in their various areas of expertise (Ibrahim & Al Riyami, 2022). These standards are seen as one communal core set of educational basic requirements that apply to all teachers at all levels. Another key focus of the TLP is how to model teachers to professionally equip them to perform exemplary conduct and practice that directly affect learner development. Modelling teacher professional conduct and practice is observed as the most important component instrumental to teacher quality (Schiering et al., 2023; Simmie, 2021; Kit et al., 2023). Over the last three decades, countries including the UAE have gradually moved to mandate the TLP programmes. Thus, TLP programmes have spread widely around the globe for educational quality improvement. A move that has led each country to have its own TLP programme to address national educational needs. Components of TLP programmes internationally differ according to national education goals.

Saudi Arabia, for instance, even though teacher certification in Saudi Arabia is yet to be officially enacted, its TLP standards have been well-established and are implemented through two teacher tests conducted by the National Centre for Assessment (NCA), which are meant to assess teachers' knowledge and skills in relation to teacher professional standards (Alabdulmenem, 2019). Furthermore, a framework for teacher standards developed by the Education and Training Evaluation Commission identified three key areas: professional values and responsibilities with three sub-areas, professional knowledge with four sub-areas, and

professional practice with three sub-areas that cater to teacher quality (Education and Training Evaluation Commission, 2017; Maash, 2021).

In Oman, teacher certification is based on a five-dimensional framework, which includes quality teaching, meeting learners' needs, effective assessment methods, teacher self-evaluation, and the effectiveness of teacher leadership. Teachers are required to demonstrate exceptional competencies in these areas across two cycles. Teachers are expected to display exceptional skills in two key areas. The first Cycle focuses on a broad curriculum with an emphasis on pedagogy and is exclusively available to female teacher candidates. Meanwhile, the second Cycle emphasizes specialization and is designed for male teachers specializing in maths and science (Maash, 2021).

With reference to Bahrain, the MOE Bahrain emphasizes standards that uphold teacher certification in three areas similar to the dimensions of UK professional framework areas; core skills, core knowledge, and professional values (Maash, 2021; Higher Education Council, 2015).

In Kuwait, teacher certification goes into a three-stage framework before they are licensed. First, teachers are granted a 2-year preliminary licence after completing the teacher preparatory programme. Second, qualified teachers are given a regular licence after the first 2 years. Finally, teachers must submit a report outlining their efforts within 4 years of receiving the regular licence. This stage also lasts for 2 years, after which outstanding teachers acquire a professional licence after 6 years of teaching. They are then granted a professional licence (Maash, 2021; Aljassar & Altammar, 2020).

In Qatar, a three-phase approach is followed to certify professional teachers. Initially, a portfolio of best practices is compiled based on evidence of the teacher's education support, professional's or school leader's collected, reviewed, and annotated practices. Subsequently, this portfolio is submitted alongside the teacher's application for a full professional licence. Next, the application undergoes evaluation by the Attestation Committee, whether at a local or national level, and the decision is then relayed to the Professional Licensing Office. Finally, the agency makes the determination to either accept or reject the application, and if deemed necessary, awards a professional licence (Alabdulmenem, 2019; Supreme Council of Information & Communication Technology, 2009).

The UAE, like any other GCC country, is not exempt from this educational quality improvement initiative. This is because teachers are seen as either the hope or bane of UAE schools and the success of students. A McKinsey report of 2007 as cited in (Dailey et al., 2015) argues that "the quality of an educational regime cannot go beyond the quality of its educators". This has brought TLP into serious business as the plans were carried out to materialize the initiative.

When the TLP pilot programme commenced, over 600 schoolteachers from across the UAE took part in the pilot study, laying the groundwork for the UAE's inaugural teacher licensing system initiative (Abdallah & Musah, 2021). This change is expected to transform the landscape and elevate the standard of teaching in the country. Consequently, teachers, cluster managers, vice principals, and principals will need to exhibit their commitment to the teaching and managerial roles by

acquiring a licence within a 5-year timeframe, which will become mandatory by 2021 (Pennington, 2017). It is expected that the introduction of this licensing system will enhance educational standards across the UAE. However, some school-teachers have expressed apprehension about the potential impact on their roles. The UAE Ministry of Education (MOE) has announced the commencement of the licensing process, which involves assessing over 5000 public and private school teachers as well as other education professionals nationwide, by April 2018 (Zaman, 2018). In-service teachers in the country will be evaluated using two tests: one in pedagogy and the other in subject-matter specialization according to UAE MOE officials (Zaman, 2018). Those who meet both criteria will be granted a licence, while others who do not make it through the tests will be asked to undergo training before retaking the tests. The MOE has developed a well-articulated scale for the TLP tests programme. To establish objectivity of the TLP tests results, the National Qualifications Authority (NQA) has developed a comprehensive scale in four instructional areas with 99 performance indicators (Zaman, 2018; National Qualification Authority, 2015).

Teacher licensing programmes in the UAE and other Gulf Cooperation Council (GCC) countries have been the subject of considerable interest in recent years. The main aim of these programmes is to improve the quality of education and foster a higher level of professionalism among teachers.

1.1 The Significance of Contextually Scale Validation

Validating the scale in the UAE educational context refers to the process of ensuring that educational assessments, measurement tools, and practices are reliable and valid for use in the country's diverse educational settings. This process involves conducting rigorous research and analysis to determine the effectiveness and appropriateness of these tools and practices within the UAE's specific cultural, linguistic, and educational context (Alhebsi et al., 2015). The validation of the scale holds great importance for teacher preparation programmes and educational quality improvement, with significant potential implications (Karabenick & Noda, 2004; Moss & Schutz, 2001). Having a validated scale serves diverse purposes in TLP programmes including: enhancing teacher preparation programmes, promoting equity and fairness, improving educational quality, informing policy and curriculum development, and strengthening international comparability.

Enhancing teacher preparation programmes: By validating the scale, teacher preparation programmes in the UAE can ensure that their assessment methods are in line with the educational goals and priorities of the country. This process helps to create reliable measures for evaluating the knowledge, skills, and competencies of aspiring teachers. As a result, it supports the selection, training, and evaluation of teachers. Through the validation of assessment tools, teacher preparation programmes can have confidence in the results and make informed decisions about programme enhancements (Karabenick & Noda, 2004; Moss & Schutz, 2001).

Promoting equity and fairness: Validating assessment scales is essential in reducing biases and promoting objectivity when evaluating student performance. By

validating the scales, educators can identify and address any cultural, linguistic, or contextual factors that may influence assessment outcomes. This process helps minimize the impact of these factors, leading to more accurate and fair assessments. Ultimately, it ensures equal opportunities for all students, regardless of their backgrounds or circumstances (Alhebsi et al., 2015; Epstein & Sheldon, 2006).

Improving educational quality: Validating the scale is crucial for enhancing educational quality in the UAE. When assessments accurately measure the desired learning outcomes, educators can make informed decisions to improve teaching and learning practices (Fullan, 2015). Validated assessments provide reliable information on student progress, strengths, and areas for improvement. This enables teachers to effectively customize their instruction and interventions, ultimately leading to improved educational outcomes and overall quality.

Informing policy and curriculum development: according to (OECD, 2013), validating the scale supports evidence-based decision-making in educational policy and curriculum development. When assessment tools are validated, policymakers can rely on the data to understand the strengths and weaknesses of the education system, identify areas of improvement, and make informed policy choices. Validated assessments also help in aligning curriculum standards, instructional strategies, and learning objectives with the UAE's specific context and needs.

Strengthening international comparability: The validation of assessment scales in the UAE educational context contributes to the country's participation in international assessments and benchmarking studies. Validated assessments ensure that UAE students' performance can be compared accurately with students from other countries, allowing for meaningful international comparisons (Darling-Hammond & Banks, 2010). This enables policymakers and educators to gain insights into the UAE's educational standing globally and identify areas for further development.

1.2 UAE Teacher Licensing Scale

Professional and Ethical Conduct Construct

The first standard in the TLP scale is labelled as the professional and ethical conduct (PEC) construct. It addresses teacher knowledge and commitment to UAE heritage and cultural values through promoting integrity, respect, fairness, and commitment to supporting learning for all learners (Abdallah, 2018; Zaman, 2018). The PEC construct comprises five factors: respect and promote UAE values indexed by seven items, personal and professional ethics formed by seven items, accountability for learners constituted by seven items, compliance with national and organizational expectations indexed by two items, and establishing communication and collaboration constituted by eight items (National Qualification Authority, 2015; Abdallah & Musah, 2021).

Professional Knowledge Construct

The second construct in the TLP scale is termed the professional knowledge (PK) construct. The construct examines teacher understanding of how students learn and

develop with special reference to the diversity of learner needs and characteristics in culturally diverse classrooms (Hair et al., 2019). The PK construct consists of three factors: knowledge of learning and diversity indexed by six items, knowledge of the curriculum formed by nine items, and knowledge of the theoretical basis of teaching comprised six items.

Professional Practice Construct

The third construct in the TLP scale is labelled as the professional practice (PP) construct. This construct examines the teacher's efficacy in creating conducive learning environments that intrinsically and extrinsically motivate learners through a safe and supportive learner-centred environment. Differentiated assessments and the use of appropriate instructional technologies are also emphasized in the construct (Hair et al., 2019). The PP construct comprises three factors; positive learning environment comprised 9 items, learner-centred teaching formed by 11 items, and assessment for learning indexed by 11 items.

Professional Growth Construct

The final construct is identified as professional growth (PG). It examines the teacher's inclination towards self-development leading to his/her professional growth through reflection on performance in order to identify developmental needs, attending to the identified needs, and evaluating their impact on teaching and learning in the modern school context (Zaman, 2018; National Qualification Authority, 2015; Hair et al., 2019). The PG construct is indexed by three factors; reflection on own practice constituted by eight items, engaging in professional growth formed by four items, and determining the impact on learner achievement constituted by four items.

Although the TLP scale has been well-thought out, articulated, and studied, arguably, no empirical investigation was carried out to evaluate the psychometric properties of the scale. As such, this study aims to investigate the psychometric properties of the UAE teacher licensing scale through construct and convergent validities given the absence of empirical evidence of the scale validation in the literature. Therefore, this study poses the following hypotheses:

The five-factor model of professional and ethical conduct is valid and reliable.

The three-factor model of professional knowledge is valid and reliable.

The three-factor model of professional practice is valid and reliable.

The three-factor model of professional growth is valid and reliable.

2 Method

2.1 Participants

A random sampling technique was employed to select 241 participants. The determination of the sample size was guided by the principles of confidence interval and margin of error accuracy (Hair et al., 2019; Kline, 2023; Collier, 2020). A confidence interval is a numerical range utilized to estimate population characteristics,

aiming to obtain precise results that closely reflect the target population. The narrowing of the confidence interval enhances the likelihood of achieving accurate estimations (Fornell & Larcker, 1981; Vockell & Asher, 1998). Moreover, as the sample size increases, the confidence interval becomes narrower, leading to potentially more accurate estimates (Vockell & Asher, 1998). The sample size of this study was determined using the guidelines suggested by (Vockell & Asher, 1998; Ferguson, 1981). A confidence interval of 95% and a margin of error of $\pm 5\%$ were used, resulting in a suggested sample size of 384 participants. The received questionnaires accounted for 62.8% of the total response rate, which is considered a reasonable percentage indicating good quality.

2.2 Data Analysis

The data underwent analysis using sophisticated statistical tools. Analytically, various techniques were employed to analyse the gathered dataset. Descriptive analysis was conducted using Predictive Analytics Software (PASW) version 25.0, followed by principal component analysis (PCA). Additionally, Analysis of Moment Structures (AMOS) version 23.0 was utilized to perform Confirmatory Factor Analysis (CFA) to assess the convergent and divergent validities of the TLP scales.

3 Results

The results of descriptive analysis revealed that 74 (30.7%) of the participants were male teachers, while 167 (69.3%) females responded to the survey. With reference to the school curriculum used in the sampled schools, 39 (16.2%) schools use the MOE curriculum, British curriculum, and others like the Indian curriculum, Pakistani curriculum etc., while 124 (51.5%) use the American curriculum. The analysis also revealed that the majority, 74 (30.7%) of the participants were aged between 31–35, followed by participants aged more than 40 years, 65 (27.0%), followed by the 36–40 years age group, 59 (24.5%). Furthermore, 85 (35.3%) were identified as English teachers, followed by 65 (27.0%) as science teachers, followed by 61 (25.3%) math teachers, followed by 24 (10.0%) Arabic teachers, while only 6 (2.5%) participated in the study in the category of others. In addition, 93 (38.6%) accounted for teachers who have been working in their respective schools for between 1 and 5 years. This was followed by teachers with work experience ranging between 6 and 10 years, 85 (35.3%), followed by teachers with work experience ranging between 11 and 15 years, 44 (18.3%). Teachers with work experience ranging between 16 and 20 years accounted for only 10 (4.1%). Teachers with more than 20 years' work experience were the least participants in the study 9 (3.7%). Table 1 depicts the details.

Table 1 Distributions of demographic variables

Variable	Frequency (N)	%
<i>Gender</i>		
Male	74	30.7
Female	167	69.3
Total	241	100
<i>School curriculum</i>		
MOE curriculum	39	16.2
American curriculum	124	51.4
British curriculum	39	16.2
Others	39	16.2
Total	241	100
<i>Age group</i>		
25–30	43	17.8
31–35	74	30.7
36–40	59	24.5
More than 40	65	27.0
Total	241	100
<i>Major</i>		
English	85	35.3
Science	65	27.0
Math	61	25.2
Arabic	24	10.0
Others	6	2.5
Total	241	100
Total	582	100
<i>Experience</i>		
1–5 years	93	38.6
6–10 years	85	35.3
11–15 years	44	18.3
16–20 years	10	4.1
More than 20 years	9	3.7
Total	241	100

3.1 Principal Component Analysis of Professional and Ethical Conduct

An initial PCA with Varimax rotation was conducted to uncover the underlying structure for the 31 items that comprised the professional and ethical conduct construct in the TLP scale, aiming to examine the alignment of the items under the hypothesized factors. The analysis unveiled five interpretable factors. Nevertheless, only four factors were retained for further analysis, as the final extracted factor contained only one item after removing several cross-loading items.

The five derived factors represented 74.01% of the total variance in professional and ethical conduct. Their determinant score of 2.18 indicated a value higher than 0.00001, suggesting the absence of multicollinearity issues. Therefore, the fundamental assumption was satisfied. In general, to fulfil the assumption, the determinant score needs to exceed 0.00001.

Notably, the inter-correlation among the items was deemed satisfactory, supported by the statistically significant result of Bartlett's Test of Sphericity, $\chi^2 (406) = 14.28$, $\rho \leq .001$, KMO = .90. The MSA, which examines patterns between variables rather than item correlations, varied from .50 to .89.

The first retained factor, "*respect and promote UAE values*", originally consisted of seven hypothesized items under this factor. Only one item (PEC_RPUAE7) was excluded due to its loading under a different factor. As a result, the researcher maintained this factor since no loading violation occurred against the retention criteria.

Regarding factor two, labelled "*be accountable for and to learners*", all seven items initially hypothesized for this factor were appropriately grouped under it. This indicates that all items satisfied the inclusion criteria ($\geq .50$).

Factor three, labelled "*demonstrate personal and professional ethics*", initially comprised seven hypothesized items. Remarkably, all items were accurately loaded under the hypothesized factor, demonstrating an absence of factorial complexity or low loading issues associated with this factor.

The last factor, designated as "establish communication and collaboration", initially encompassed eight hypothesized items. However, the analysis revealed that only five items aligned with this factor. Further examination showed that Items PEC_ECC2 and PEC_ECC8 had factorial complexity on two factors, and Item PEC_ECC6 did not meet the inclusion criteria ($\geq .50$). Therefore, all three items were excluded from subsequent analysis. More details can be found in Table 2.

3.2 Principal Component Analysis of Professional Knowledge

A second PCA was conducted to examine the structure of the 21 items measuring *professional knowledge*. Initially, three factors were hypothesized. The analysis identified two interpretable factors with eigenvalues exceeding one, meeting a fundamental criterion. The rotation demonstrated that these two factors accounted for 67.17% of the variation.

The determinant value of the two factors was 1.61, surpassing the threshold of .00001. This indicates the absence of multicollinearity issues in the construct, satisfying the fundamental assumption. To meet this assumption, the determinant score should be greater than .00001.

Furthermore, the degree of inter-correlation among the items was also adequate; Bartlett's Test of Sphericity was statistically significant, $\chi^2 (78) = 31.31.37$, $\rho \leq .001$, KMO = .93. The MSA, which does not determine correlations between items *per se* but also patterns between variables, varied between .73 and .89.

Table 2 Professional and ethical conduct; factor loading, reliability, means, and standard deviations

No.	Item	Factor loading				MSA	M	SD
		RP UAEV	BAL	DPPE	ECC			
PEC_RPUAEV3	Integrate knowledge and respect for Islamic values and how they influence UAE society into teaching and learning experiences and related activities	.82				.70	4.52	.78
PEC_RPUAEV5	Demonstrate respect for cultural and other diversities within the school community	.76				.81	4.64	.69
PEC_RPUAEV4	Align planning and teaching with the educational vision and aspirations of the emirates	.74				.92	4.50	.74
PEC_RPUAEV1	Integrate the heritage and culture of the UAE into teaching experience and learning and related activities	.74				.86	4.58	.69
PEC_RPUAEV2	Implement school policies and procedures that promote appreciation of the heritage and culture of the UAE	.69				.88	4.62	.64
PEC_RPUAEV6	Encourage learners to respect diversity and multiculturalism in society	.68				.91	4.31	1.00
PEC_BAL7	Design learning experiences that foster entrepreneurial spirit and innovation to suit all learners		.82			.87	4.41	.90
PEC_BAL5	Contribute to peaceful developments across school that fulfils learners' talents, interests, capabilities, and aspirations		.78			.80	4.48	.82
PEC_BAL8	Follow emirate and national laws and regulations		.71			.86	4.52	.71
PEC_BAL4	Contribute to innovative approaches to optimize learners' achievements		.70			.87	4.41	.79
PEC_BAL3	Advocate with colleagues and parents for the best interests of learners		.70			.76	4.54	.70
PEC_BAL1	Implement school policies and procedures that safeguard learners' physical, emotional, and psychological wellbeing		.68			.87	4.42	.77
PEC_BAL2	Create a learning environment that promotes learners' optimal performance		.60			.77	4.55	.69

(continued)

Table 2 (continued)

No.	Item	Factor loading				MSA	M	SD
		RP UAEV	BAL	DPPE	ECC			
PEC_ DPPE7	Demonstrate high standards of work quality			.74		.52	4.60	.72
PEC_ DPPE5	Provide equal opportunity for all learners and parents			.73		.80	4.59	.79
PEC_ DPPE2	Follow the national code of ethics			.72		.68	4.64	.69
PEC_ DPPE1	Act honestly in professional relationships with individuals and organizations			.70		.70	4.54	.67
PEC_ DPPE3	Follow the organizational code of conduct			.70		.64	4.65	.64
PEC_ DPPE6	Demonstrate high levels of attendance and punctuality			.67		.70	4.51	.81
PEC_ ECC3	Work collaboratively with colleagues				.78	.50	4.64	.63
PEC_ ECC4	Extend collaboration through relevant emirate, national, and international networks				.77	.89	4.70	.59
PEC_ ECC7	Engage parents as partners in their children’s learning				.67	.73	4.74	.56
PEC_ ECC5	Work respectfully with school leadership				.65	.89	4.79	.51
PEC_ ECC1	Establish efficient classroom routines				.61	.82	4.66	.59
Construct reliability		.90	.93	.89	.90			

Variables with factor loadings below .50 were omitted and sorted based on their loadings on each factor

Note: *RP UAEV* respect and promote UAE values, *BAL* be accountable for and to learners, *DPPE* demonstrate personal and professional ethics, *ECC* establish communication and collaboration

*Source of the survey instruments: NQA, 2015. Les Transformations

The first factor, which represents *Demonstrate knowledge of the theoretical basis of teaching*, was retained. All six initially hypothesized items aligned perfectly with this factor. As a result, the factor was retained by the researcher, as there were no violations of loading criteria, factorial complexity, or cross-loading issues.

In relation to factor two, which was labelled as *demonstrate knowledge of curriculum*, was initially indexed by nine items. To elaborate on this conclusion, all retained items fulfilled inclusion criteria of ($\geq .50$). However, the analysis revealed that only five items were properly fulfilled. Items (DKC1, DKC2, DKC8, and DKC9) were all discarded due to exhibiting cross-loading and factorial complexity related issues. Table 3 presents the details.

Table 3 Professional knowledge principal component analysis

No.	Item	Factor loading		MSA	M	SD
		DKTBT	DKC			
DKTBT4	^a Integrate knowledge of variations in learner language proficiency into teaching and learning experiences and related activities	.83		.88	4.46	.76
DKTBT3	Integrate knowledge of learning differences between genders into teaching and learning experiences and related activities	.82		.85	4.50	.68
DKTBT6	Integrate knowledge of cognitive differences into teaching and learning experiences and related activities	.79		.80	4.59	.65
DKTBT1	Integrate knowledge of stages of personal development into teaching and learning experiences and related activities	.77		.87	4.54	.72
DKTBT2	Integrate knowledge of stages of cognitive development into teaching and learning experiences and related activities	.77		.82	4.53	.68
DKTBT5	Integrate knowledge of cultural differences into teaching and learning experiences and related activities	.76		.70	4.44	.73
DKC5	Produce lesson planning that shows sound knowledge of effective content delivery		.83	.85	4.54	.79
DKC7	Produce lesson planning that includes the development of core learning skills		.80	.87	4.48	.82
DKC3	Produce curriculum and lesson planning that show sound subject knowledge		.79	.88	4.48	.78
DKC6	Produce lesson planning that identifies cross-curricular connections		.78	.84	4.51	.80
DKC4	Demonstrate subject knowledge within, before and beyond the phases taught		.67	.83	4.50	.79
Construct reliability		.92	.94			

Factor loadings less than .50 have omitted and variables have been sorted by loading

Note: *DKTBT* demonstrate knowledge of theoretical basis of teaching, *DKC* demonstrate knowledge of curriculum

^aSource of the survey instruments: NQA, 2015. Les Transformations

3.3 *Principal Component Analysis of Professional Practice*

A subsequent PCA was conducted to explore the fundamental structure of the 31 items comprising the professional practice construct. Initially, three factors were hypothesized for this construct. The analysis generated three coherent factors with eigenvalues exceeding one. Furthermore, the rotation indicated that the professional practice construct accounted for 79.37% of the variation.

The determinant score of these factors was 2.23, signifying that it exceeded 0.00001. This suggests the absence of multicollinearity issues related to the

construct. Hence, the fundamental assumption was upheld. It is important to note that to fulfil the assumption, the determinant score should surpass 0.00001.

Additionally, the level of inter-correlation among the items was satisfactory, as evidenced by the statistically significant result of Bartlett's Test of Sphericity, $\chi^2(190) = 62.37, \rho \leq .001, KMO = .92$. The MSA, which doesn't establish direct item correlations but rather examines patterns between variables, ranged from .59 to .90.

The first retained factor, "*promote positive learning environments*", initially comprised nine hypothesized items under this factor. The analysis revealed perfect indexing of all items under this factor, except for item (PP-PPLE2), which showed cross-loading on two factors and was thus removed due to this complexity. All other items demonstrated loadings above .50. Therefore, the researcher maintained the factor as there was no violation of the loading criteria.

Regarding factor two, labelled "*demonstrate learner-centred teaching*", out of the 11 initially hypothesized items for this factor, only 6 items were correctly situated under this factor. Other items were excluded due to concerns related to factorial complexity, cross-loading, and low loading (<.50). Therefore, the items that did not satisfy the inclusion criteria were removed from subsequent analysis.

The final factor, which focused on *using assessment for learning*, was initially conceptualized with 11 items. However, the analysis indicated that only four items truly represented the factor and were consequently kept for further examination. Many of the excluded items displayed cross-loading and factorial complexity issues. Additional details are available in Table 4.

3.4 Principal Component Analysis of Professional Growth

Another PCA was employed to examine the ultimate construct. Initially, 3 factors consisting of 16 items were hypothesized for this construct. The analysis indicated three coherent factors with eigenvalues surpassing one. These three derived factors of the professional growth construct explained 82.19% of the variation.

The determinant score of these factors was 2.96, signifying that it exceeded 0.00001. This suggests the absence of multicollinearity issues related to the construct. Hence, the fundamental assumption was upheld. It is important to note that to fulfil the assumption, the determinant score should surpass 0.00001.

Additionally, the level of inter-correlation among the items was substantial, as evidenced by the statistically significant result of Bartlett's Test of Sphericity, $\chi^2(78) = 35.30, \rho \leq .001, KMO = .92$. The MSA, which not only establishes correlations between items but also identifies patterns between variables, varied from .73 to .90.

The initial factor, identified as "*engage in professional growth*", was composed of four items as hypothesized. All four items cohesively aligned under this factor with loadings exceeding ($\geq .50$).

Table 4 Professional practice principal component analysis

No.	Item	Factor loading			MSA	M	SD
		PPLE	DLCT	UAL			
PPLE8	^a Apply consistent, positive approaches to deal with unwanted behaviours, taking into account social and emotional factors	.82			.90	4.63	.74
PPLE9	Support the development of self-discipline and personal responsibility	.80			.85	4.55	.74
PPLE4	Establish high expectations for learners and provide appropriate levels of support and challenge	.79			.90	4.54	.72
PPLE7	Establish positive behaviour expectations that are clear to learners	.78			.87	4.49	.79
PPLE6	Use available space to display information and learners' work	.78			.90	4.49	.74
PPLE1	Organize the classroom and its facilities to ensure the physical safety, comfort, and emotional security	.76			.89	4.56	.74
PPLE3	Establish routines to facilitate efficient and effective learning	.69			.90	4.49	.78
PPLE5	Organize future, equipment, and resources effectively to facilitate learning and develop learners' independence	.65			.88	4.49	.79
DLCT5	Provide appropriate levels of challenge to high achievers		.80		.89	4.50	.74
DLCT7	Collaborate with parents, colleagues, and outside specialists to provide holistic support for learners with special educational needs		.80		.91	4.53	.72
DLCT8	Demonstrate understanding of learner dynamics by arranging groupings to optimize learning		.80		.88	4.43	.76
DLCT9	Manage teaching time and transitions to optimize learning		.68		.89	4.51	.81
DLCT4	Monitor progress and adjust teaching to ensure the progress of different groups of learners		.65		.90	4.54	.80
DLCT11	Promote responsible and safe technology use by learners		.62		.83	4.39	.78
UAL3	Use summative assessments—with reference to relevant benchmarks—to measure learner attainment and progress			.85	.85	4.45	.87
UAL2	Use ongoing formative assessment to measure progress			.83	.83	4.50	.83
UAL6	Use assessment information to guide lesson planning			.81	.89	4.57	.64
UAL11	Provide timely information to parents about any concerns			.75	.87	4.50	.85
Construct reliability		.94	.91	.87			

Factor loadings of less than .50 have been omitted and variables have been sorted by loading on each factor

Note: *PPLE* promote positive learning environments, *DLCT* demonstrate learner-centred teaching, *UAL* use assessment for learning

^aSource of the survey instruments: NQA, 2015. Les Transformations

Regarding factor two, designated as “*reflect on own practice*”, eight items were initially hypothesized for this factor. However, only five items were appropriately loaded under this factor. Nevertheless, items (PG_ROP4, PG_ROP6, and PG_ROP7) displayed cross-loading issues and were therefore excluded from additional analysis.

The ultimate factor, defined as “*determine impact on learner achievement*”, was initially conceptualized with four items. However, the analysis uncovered that only three items appropriately represented this factor. Upon examination, it was found that Item PG_DILA1 exhibited factorial complexity due to cross-loading on two factors; consequently, it was removed from further analysis. More details can be found in Table 5.

3.5 *Evaluating the Measures’ Construct Validity and Reliability*

Advanced assessment of the psychometric properties of the items within the UAE teacher licensing scales was conducted employing comprehensive analysis to ascertain construct validity and reliability. Initially, confirmatory factor analysis (CFA) was utilized to appraise the measurement models for the four constructs and their underlying factors. Subsequently, the study also examined the convergent and discriminant validity and reliability of the constructs through calculations of the composite reliability index (CRI) and average variance extracted (AVE).

The AVE is a technique used to evaluate both convergent and discriminant validity of a specific construct (Fornell & Larcker, 1981; Bagozzi, 1981). It is calculated as the square root of the average communality, as per (Fornell & Larcker, 1981). To demonstrate the validity of a specific construct and its convergence, it is recommended to achieve a benchmark of at least $\geq .50$ (Hair et al., 2019; Fornell & Larcker, 1981; Bagozzi, 1981).

The CRI evaluates the effectiveness of the observed variables in representing each structure. It is a stricter evaluation criterion compared to coefficient alpha (Fornell & Larcker, 1981; Raykov, 1998). According to Fornell and Larcker (1981), Bagozzi (1981), the standard cut-off value for CRI should be ≥ 0.70 or greater.

Professional and Ethical Conduct CFA

An initial CFA employing maximum likelihood (ML) was carried out to evaluate the four-factor model of the professional and ethical construct. The preliminary findings of the measurement model for the four-factor construct indicated relatively inadequate fit statistics: $\chi^2(264) = 494.072$, CFI = .88, TLI = .86, NFI = .88, RMSEA = 0.09, and $\chi^2/df = 2.00$. Although the χ^2/df value was within acceptable limits, the comprehensive assessment of the model indicated a poor fit. Nevertheless, the model displayed an enhanced fit with the data. Consequently, the model was modified, and three inter-correlations among six error terms were released, as suggested by the modification indices (MIs) parameters (Hair et al., 2019; Kline, 2016). Based on the recommendations from the modification indices (MIs), connections between the error terms 5 (Item PEC_RPUAE3) and 6 (Item PEC_RPUAE5), 12 (Item

Table 5 Professional growth principal component analysis

No.	Item	Factor loading			MSA	M	SD
		EPG	ROP	DILA			
EPG2	Share professional knowledge and practices to facilitate professional growth of self and colleagues	.82			.86	4.46	.73
EPG4	Develop technology skills continuously to maintain up-to-date knowledge and application	.79			.85	4.58	.62
EPG1	Engage in collaborative professional learning communities within and beyond the school	.78			.89	4.54	.66
EPG3	Engage in action research to enhance teaching and learning	.70			.87	4.61	.73
ROP1	Reflect critically on own practice and self-assess in relation to appropriate professional standards		.78		.88	4.61	.69
ROP2	Engage in discussion with colleagues to create consistent understanding of professional standards		.70		.89	4.53	.72
ROP3	Use range of strategies to reflect critically on own teaching in relation to its effectiveness for learners		.70		.86	4.56	.72
ROP8	Plan appropriate strategies and timelines to meet professional goals		.69		.88	4.63	.65
ROP5	Discuss key professional strengths and identify areas for development		.59		.87	4.24	1.00
DILA4	Evaluate the impact of professional development on learner achievement			.86	.89	4.48	.76
DILA2	Evaluate the impact of the outcomes of professional development on teaching practices			.75	.86	4.41	.75
DILA3	Apply outcomes of professional development activities judiciously to improve learner outcomes			.65	.70	4.56	.72
Construct reliability		.91	.92	.91			

Factor loadings less than .50 have been omitted and variables have been sorted by loading on each factor

Note: *EPG* engage in professional growth, *ROP* reflect on own practice, *DILA* determine impact on learner achievement

*Source of the survey instruments: NQA, 2015. Les Transformations

PEC_LAB5) and 13 (Item PEC_LAB8), and 15 (Item PEC_DPPE7) and 16 (PEC_PEC_DPPE5) were established. As a result, the discrepancies reduced, leading to a more favourable model fit with the sample data $NFI = .92$, $CFI = .92$, $TLI = .91$, $PCLOSE = .001$, $RMSEA = .07$. Additionally, the value of 1.64 for χ^2/df indicated an excellent fit, according to (Hair et al., 2019; Schermelleh-Engel et al., 2003). Figure 1 presents the details.

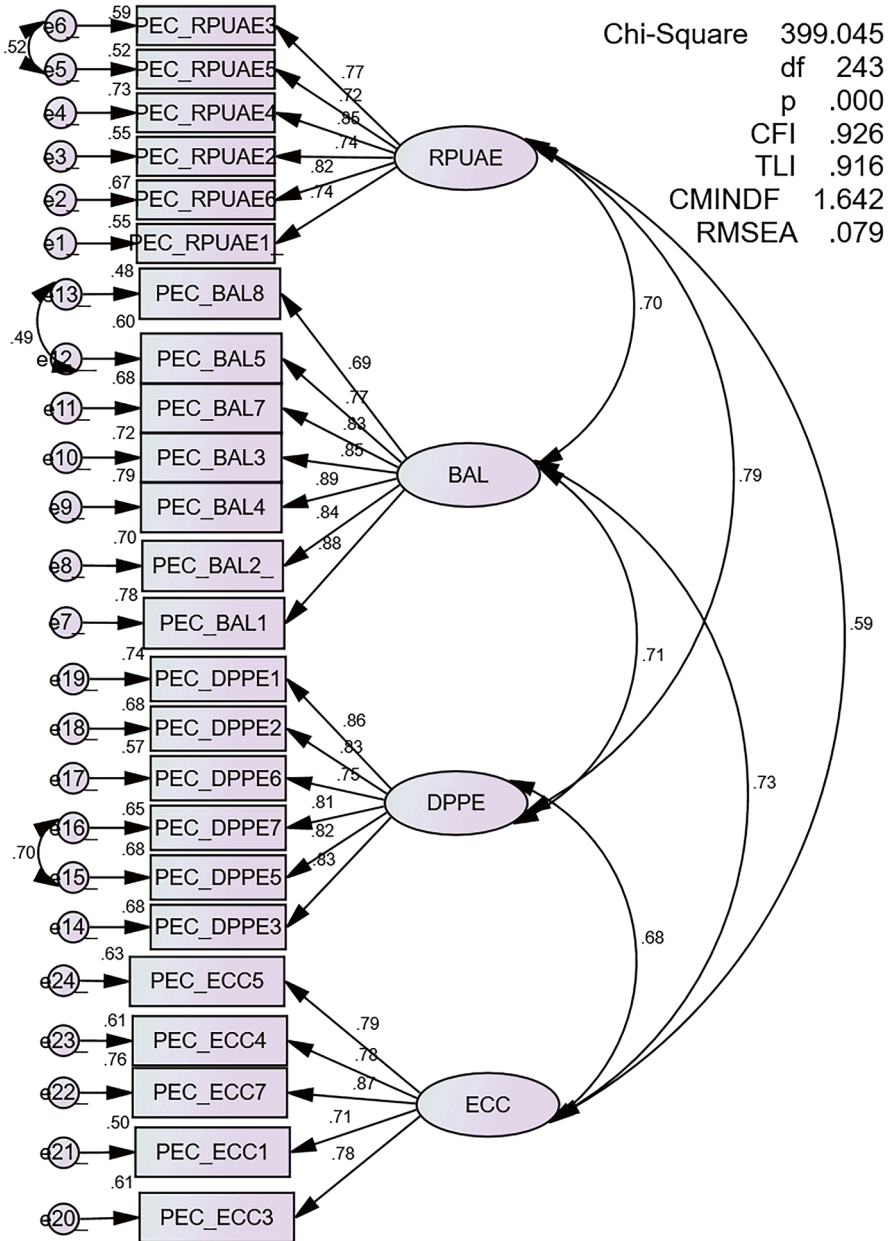


Fig. 1 Professional and ethical conduct measurement model assessment

The AVE analysis of the professional and ethical conduct construct also showed significant estimation for each of the retained factors. The estimates, which ranged from .60 to .68, met the suggested AVE value (Raykov, 1998). The findings indicate

Table 6 Reliability and validity analysis of professional and ethical conduct sub-scales

Construct	α	AVE	CRI
RP UAE	0.90	.60	.90
BAL	0.93	.68	.94
DPPE	0.89	.67	.92
ECC	0.90	.62	.89

Note: Composite Reliability Index (CRI) formula = $(\sum \text{factor loading}d^2)/(\sum \text{factor loading}d^2 + \sum e_j)$.
 Average variance extracted (AVE) formula = $(\sum \text{factor loading}d^2)/(\sum 1 - \text{factor loading}d^2 + \sum e_j)$

strong evidence of convergent validity for the professional and ethical conduct sub-scales. Notably, the CRI values ranging from .89 to .94 provide robust evidence of construct reliability for these scales. These results conform to the criteria established by Kline (2023), where a CRI of .70 or greater is required. Moreover, the factor's internal consistency estimates indicate substantial values ranging from .89 to .93 (Coltman et al., 2008). These results indicate that the sub-scales for professional and ethical conduct exhibit evidence of convergent reliability and divergent validity. Therefore, hypothesis 1 is confirmed. More details are presented in Table 6.

Professional Knowledge Construct CFA

Another CFA employing maximum likelihood (ML) was employed to evaluate the two-factor model of the professional knowledge construct. The initial results of the measurement model for the two-factor dimension indicated relatively inadequate fit statistics: $\chi^2(43) = 135.725$, CFI = .93, TLI = .91, NFI = .93, RMSEA = 0.098, and $\chi^2/df = 3.15$. Even though values of χ^2/df , NFI, TLI, and NFI fell within acceptable limits, the overall assessment of the model indicated a poor fit. The model, however, did not demonstrate improved fit to the data. As a result, the model was reassessed, and five inter-correlations among 10 error terms were released, guided by the recommendations of the modification indices (MIs) (Hair et al., 2019; Kline, 2016). Based on the suggestions provided by the modification indices (MIs), connections between the error terms 2 (Item DKTBT2) and 6 (Item DKTBT6), 2 (Item DKTBT2) and 3 (Item DKTBT1), as well as 15 (Item PEC_DPPE7) and 2 (Item DKTBT2), 9 (Item DKC3) and (Item DKC7), and 9 (Item DKC3) and (Item DKC4) were established. Consequently, the revised model showed improvement, resulting in a better fit to the sample data. NFI = .97, CFI = .97, TLI = .96, PCLOSE = .033, RMSEA = .08. Additionally, the value of 1.82 for χ^2/df indicated an excellent fit, according to (Hair et al., 2019; Schermelleh-Engel et al., 2003). Figure 2 presents the details.

Moreover, the AVE assessment of the professional knowledge construct also revealed noteworthy estimates for each of the retained factors. The estimations, spanning from .76 to .83, aligned with the recommended AVE value (Raykov, 1998). These findings indicate that the professional knowledge sub-scales demonstrated evidence of convergent validity. Notably, the construct reliability of the scales, as determined by the CRI values, also presented strong evidence of construct reliability, ranging from .89 to .94. These results satisfied the criteria established by Kline (2023), where a CRI of .70 or greater is required. Furthermore, the estimations for internal consistency of the factors demonstrated notable values, falling

Chi-Square 69.473
 df 38
 p .001
 CFI .978
 TLI .968
 cmin/df 1.828
 RMSEA .089

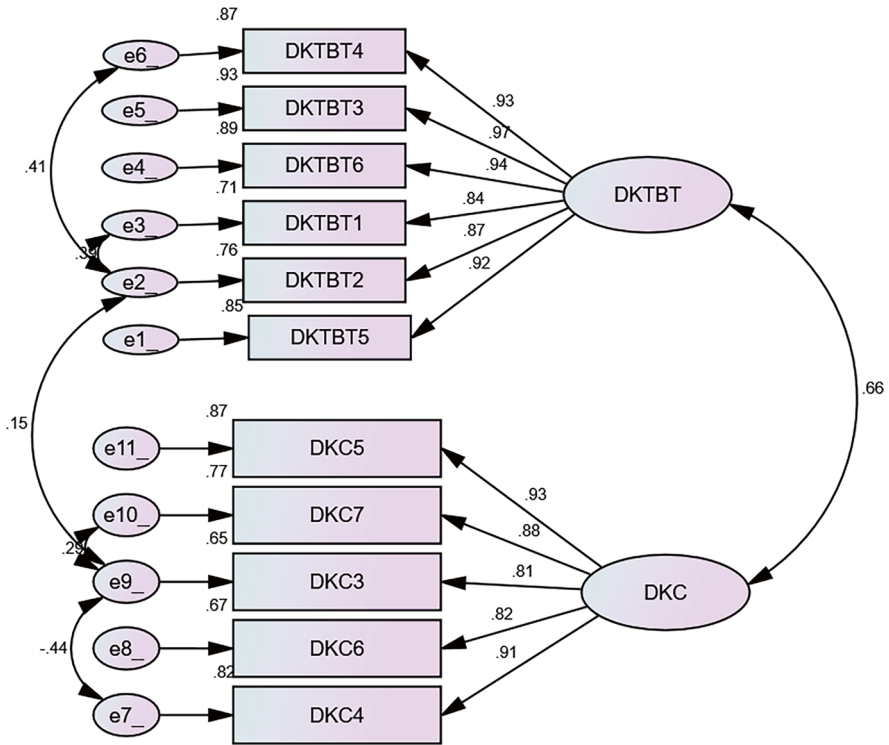


Fig. 2 Professional knowledge measurement model assessment

Table 7 Reliability and validity assessment of professional knowledge sub-scales

Construct	α	AVE	CRI
BKTBT	0.92	.88	.96
DKC	0.94	.76	.94

within the range of .89 to .93 (Coltman et al., 2008). The results presented in Table 7 provide evidence supporting hypothesis 2, as they demonstrate the convergent reliability and divergent validity of the professional knowledge sub-scales.

Professional Practice Conduct CFA

A third CFA with ML was performed to evaluate the professional practice construct's three-factor model. The analysis revealed poor fit statistics in the initial results of the measurement model for the three-factor construct: $\chi^2(132) = 464.132$, CFI = .89, TLI = .87, NFI = .89, RMSEA = 0.011, and $\chi^2/df = 3.50$. Even though the value of χ^2/df was within acceptable bounds, the total estimation of the model revealed a poor model fit. The model did not, however, fit the data better. Consequently, the model was re-estimated, and four inter-correlations among eight error terms were freed based on the suggestions of the parameters of modification indices (MIs) as suggested by (Hair et al., 2019; Kline, 2016). The links between the error terms 1 (Item PPLE5) and 3 (Item PPLE1), 1 (Item PPLE5) and 7 (Item PPLE9), 10 (Item PEC_DLCT10) and (Item DLCT9), and 10 (Item DLCT8), 9 (Item DKC3), were made based on the MIs' suggestions. The revised model improved as a result, and a better model fit to the sample data was held NFI = .92, CFI = .92, TLI = .91, PCLOSE = .003, RMSEA = .08. Additionally, the value of 2.76 for χ^2/df indicated an excellent fit, according to (Hair et al., 2019; Schermelleh-Engel et al., 2003). Figure 3 presents the details.

Interestingly, the AVE analysis for the professional practice construct also demonstrated significant estimation for each of the retained factors. The estimates, which ranged from .51 to .72, met the suggested AVE value (Fornell & Larcker, 1981; Vockell & Asher, 1998; Bagozzi, 1981). These results show that the professional practice sub-scales exhibited convergent validity evidence. It is interesting to note that the construct reliability of the scales as determined by the CRI values, also demonstrated strong evidence of construct reliability, which ranged from .83 to .94. These findings met the criteria set forth by (Hair et al., 2019), where a CRI of .70 or greater is required. Moreover, the factor's internal consistency estimations show significant values ranging between .87 and .94 (Nunnally, 1975). These findings demonstrated that professional knowledge scales established evidence of convergent reliability and divergent validity. Thus, hypothesis 3 is accepted. Table 8 depicts the details.

Professional Growth Conduct CFA

A final CFA with ML was performed to evaluate the professional growth construct's three-factor model. The analysis revealed poor fit statistics in the initial results of the measurement model for the three-factor construct: $\chi^2(51) = 121.720$, CFI = .96, TLI = .95, NFI = .93, RMSEA = 0.093, and $\chi^2/df = 2.38$. Even though values of χ^2/df , CFI, TLI, and NFI were within acceptable bounds, the total estimation of the model, however, demonstrates poor model fit. Consequently, the model was re-estimated and one inter-correlation among two error terms was freed based on the suggestions of the parameters of modification indices (MIs) as suggested by the parameters of the MIs. The link between the error terms 7 (Item ROP3) and 9 (Item ROP1) was made based on the MIs' suggestions. The revised model improved as a result, and a better model fit to the sample data was established. NFI = .95, CFI = .97, TLI = .97, PCLOSE = .020, RMSEA = .08. In addition, the value of 1.81 for χ^2/df indicated an excellent fit, according to (Hair et al., 2019; Schermelleh-Engel et al., 2003). Figure 4 presents the details.

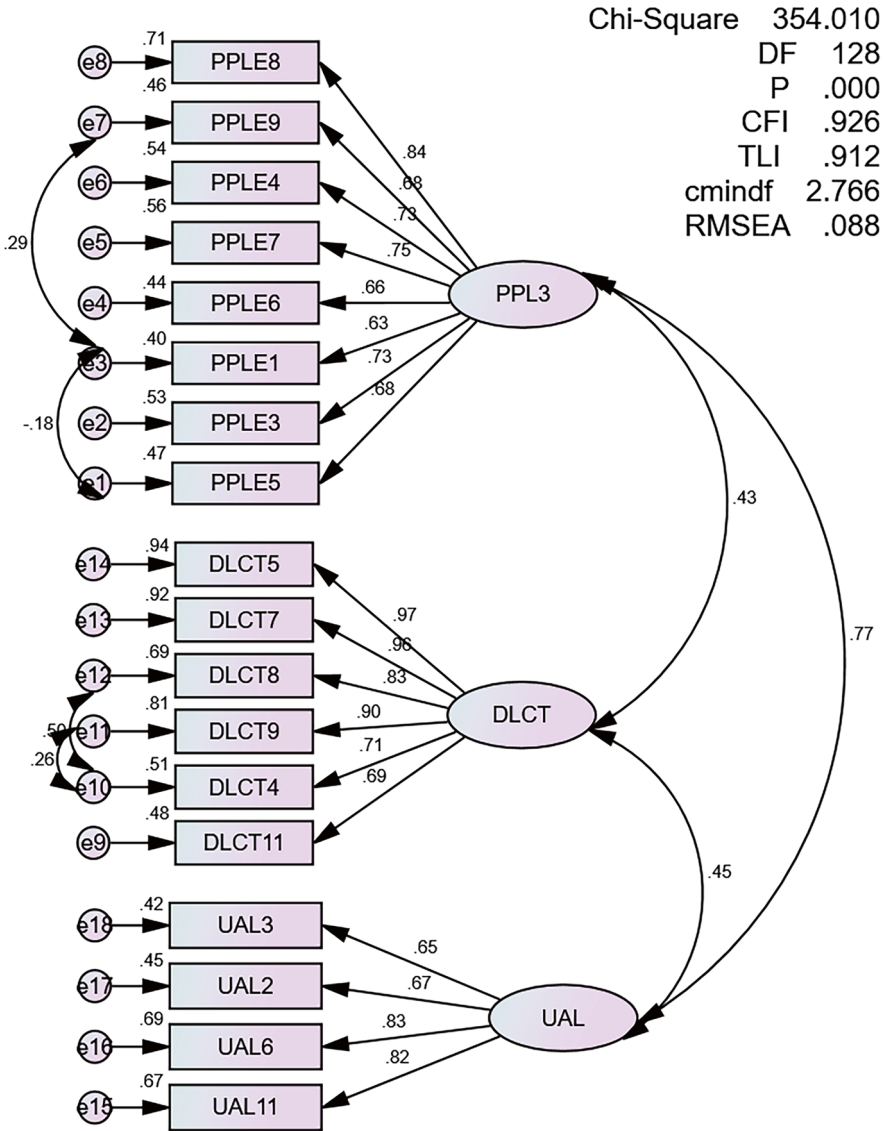


Fig. 3 Professional practice measurement model assessment

Table 8 Reliability and validity analysis of professional knowledge sub-scales

Construct	α	AVE	CRI
PPE	0.94	.51	.90
DLCT	0.91	.72	.94
UAL	0.89	.94	.83

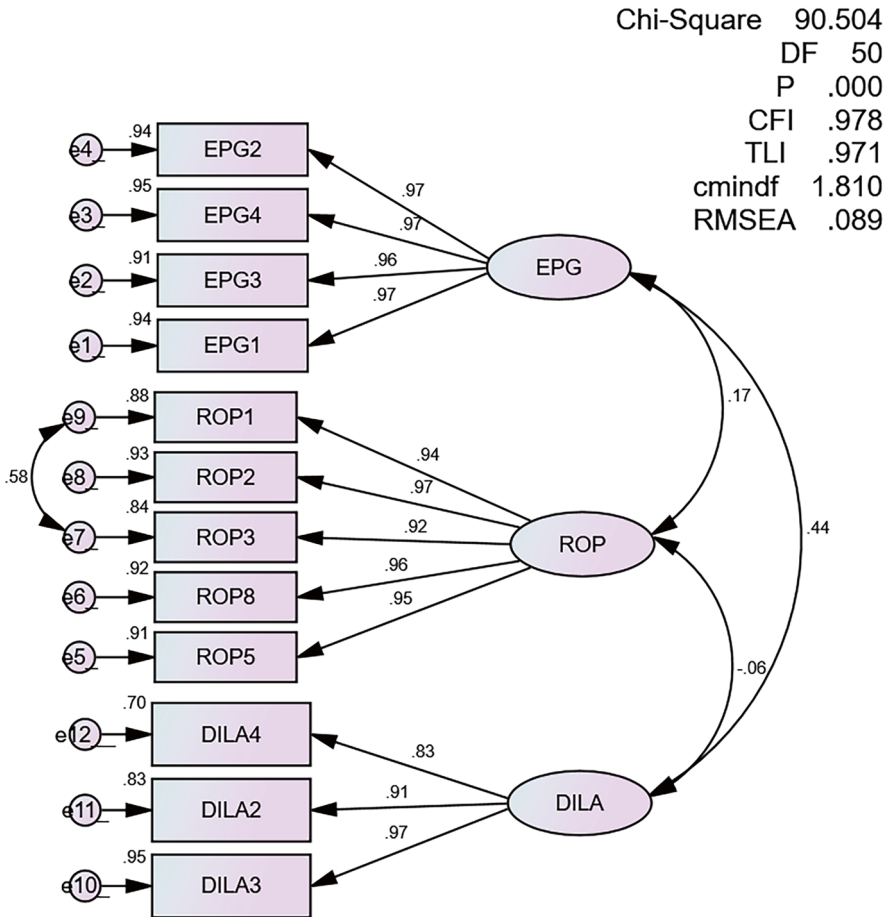


Fig. 4 Professional growth measurement model assessment

Moreover, the AVE analysis of the professional growth construct indicated proper estimation for the three factors, showcasing AVE values ranging from .81 to .98. These values indicate evidence of construct and convergent validities for the professional growth construct (Hair et al., 2019; Fornell & Larcker, 1981; Bagozzi, 1981). The CRI outcomes also indicated significant evidence of construct reliability for the three factors, ranging from .90 to .98. These values exceeded the recommended CRI cut-off ratio of 0.70 (Hair et al., 2019; Fornell & Larcker, 1981; Schermelleh-Engel et al., 2003). Additionally, the results of internal consistency for the factors also indicated significant values, varying from .91 to .92 (Nunnally, 1975). These findings confirm that hypothesis 4 is upheld, indicating the validity and reliability of the professional growth construct. More details are presented in Table 9.

Table 9 Reliability and validity analysis of professional growth sub-scales

Construct	α	AVE	CRI
EPG	0.91	.94	.98
ROP	0.92	.98	.90
DILA	0.91	.93	.93

4 Conclusion

From the findings, it can be concluded that the validated scale of the UAE teacher licensing programme exhibited substantial evidence of psychometric validity. Overall, the retained four constructs with their associated factors demonstrated construct and convergent validity and reliability given the results of both PCA and CFA. Specifically, the professional and ethical conduct construct is structured by only four factors out of five in the original scale. Similarly, the analysis retained two valid and reliable factors initially hypothesized for the professional knowledge construct. The analysis also reached the conclusion that both professional practice and professional growth constructs were represented each by three valid and reliable factors each.

Because the literature lacks empirical evidence of scale validation, this study's major contribution is the exploration of the UAE teacher licensing scale's psychometric properties through construct and convergent validities. The outcomes provided empirical evidence of the retained scales' validity and reliability, as they underwent thorough and advanced assessment via average variance extracted and composite reliability calculations.

Practically, establishing psychometrically valid instruments for teacher licensing scale helps policymakers and managers of teachers' preparatory programmes alike enhance their understanding, development, and assessment of professional conduct, knowledge, practice, and growth, ultimately leading to improved performance and success of teachers in their respective fields.

5 Limitations and Suggestions for Future Research

The exploration of UAE teacher licensing scales has certain limitations. Initially, the study validated the UAE teacher licensing scales solely among in-service teachers from Al Ain City, omitting teachers from other Emirates. Future studies should sample in-service teachers from other Emirates to allow comprehensive data collection from different perspectives and experiences. Second, another key limitation of the study was the sample size. The study used 241 participants. Given the total number of 99 items in the TLP scales, this number did not meet the minimum

requirement of either of the two statistical tools; PCA and CFA, used in the study. Each requires a minimum of five to one ($5 \times 99 = 495$) for adequate analysis. Thus, future studies should increase the sample size to an average of 10 to 1 (10×99) or an ideal sample size of 20 to 1 ($20 \times$) for comprehensive analysis. Another limitation is the exclusive use of reflective indicators for all CFA measurement models. Consequently, the researcher cautioned that relying solely on reflective indicators could lead to potential misspecification of a model (Kline, 2016; Coltman et al., 2008; Wetzels et al., 2009).

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Sustainable Agriculture Through AI-Powered Pollination: Transforming Large-Scale Date Palm Agriculture in the Middle East



Gnana Rajesh, AlMoutasim Sulaiman AlMayahi,
and Mohammed Abdallah AlHarrasi

Abstract In this research, we analyzed a specific problem that our farmers have been facing for a long time, namely the pollination of the palm trees and the location where it is mainly needed. Our objective is to measure the effectiveness of integrating artificial intelligence (AI) technology into large-scale date palm pollination in Oman. Further, our study aims to measure the resources saved by this technology and to determine which location will benefit from using this technology. To achieve the research goals, we adopted a hybrid approach methodology. We argue that this is the greatest way to accomplish our goals because there are many farmers whom we consulted about pollination and how the use of AI and drones might benefit them in the future. We rely on their responses, opinions, and experiences. Second, most people think that the use of this combination will reduce labor costs in palm tree pollination, and it would improve the quality of palm tree crops. In another analysis, there was a different thought about this combination. In conclusion, this technology would help a huge number of farmers in pollination with benefits such as cost, efficiency, and time saving. Increasing the quality and quantity of dates produced by pollination can improve a country's export earnings and trade balance. Dates are, in the end, a significant cultural and historical emblem in Oman and are frequently connected to customs and holidays. It would enable Oman to retain its cultural history and increase tourism by encouraging the development and production of dates through pollination.

Keywords Pollination · Artificial intelligence · Palm · Drones

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1 Introduction

Date palms play a vital role in Oman's culture and history. There is about 7 million date palms in Oman that needs a lot of effort for maintenance by farmers. Integrating modern technology will save enormous time and energy for the farmers. There are many palm trees around that no one cares, especially along the streets. Implementing modern technologies will allow farmers to pollinate a large number of trees and make use of them. Thus, this case can benefit from the combination of artificial intelligence and drones. The integration of AI into large-scale date palm pollination in Oman involves the use of artificial intelligence technology to enhance and optimize the process of pollinating date palm trees. AI algorithms and machine learning techniques are applied to analyze data, such as weather patterns, tree conditions, and pollination requirements, to determine the most efficient and effective strategies for pollination. Agriculture has always depended on certain unchanging understandings and agricultural practices. Water content, ideal temperature, soil composition, fertilizer types, and many other factors, for instance, all have an impact on the agriculture sector and productivity. However, individual farmers rely solely on their own experiences gained over time, rather than actively working together to increase production in a dynamic way. Through the use of dynamic measurements and statistics collected from various locations, this research seeks to maintain and analyze these values using artificial intelligence (AI) and machine learning. The main goal is to maximize productivity and health and minimize costs (Alawfi & Almaawali, 2023). By leveraging AI, farmers and researchers can improve pollination success rates, increase yield, and optimize resource utilization in date palm cultivation. This integration represents a significant advancement in agricultural practices, providing a more sustainable and efficient approach to date palm pollination in Oman.

The use of artificial intelligence in pollination operations presents a novel solution to the problems faced by conventional farming methods due to resource scarcity, climate change, and manpower shortages. This research is important as it looks at how AI may improve crop yields, improve pollination efficiency, and guarantee sustainable farming practices—all of which will protect the Middle East's economic stability and food security. The goal of this study is to determine whether drones and AI technologies can be used to pollinate date palms on a massive scale. Our goal is to assess how well this strategy works in terms of increasing productivity, reducing resource consumption, and determining the best places to put it into practice. We investigated the possible advantages and issues related to AI-powered drone pollination by using a hybrid methodology that combines farmer discussions and data analysis. In addition to economic concerns such as cost and yield, this study explores how this technology could transform date palm pollination in Oman and affect national identity and cultural features related to date farming.

1.1 Problem Statement

The problem arises mainly in big farms as these farms require many farmers to pollinate all the palms. Farmers take weeks to pollinate all the palms; this was and still is a problem for all farmers. Moreover, it is inefficient to let a vast number of farmers do a simple task rather than working on more beneficial tasks. Some research has been carried out regarding this issue, and the solution was to use a drone to pollinate the palm. To solve this problem, our team managed to integrate AI into drones. Also, the drone will be able to recognize the palm fields and pollinate each palm one by one in an efficient way. If the issue is not resolved quickly, farmers will waste their money, time, and effort. To determine the feasibility of this idea, the impact on farms, and the urgency of its need for implementation, we discussed with farmers and distributed a questionnaire in multiple locations.

1.2 Research Aim and Objectives

The aims and objectives of the study are to:

- Measure the effectiveness of integrating artificial intelligence technology in large-scale date palm pollination in Oman.
- Explore the potential impact of AI-assisted pollination on labor costs and efficiency.
- Determine the quality and quantity of palm tree crops.

1.3 Innovation Significance

To achieve the research goals, we adopted a hybrid approach methodology. We can argue that this is the greatest way to accomplish our goals because there are many farmers who we can consult about pollination and how the use of AI and drones might benefit them in the future. We can rely on their responses, opinions, and experiences. In addition, we used primary and secondary data. Furthermore, this is a descriptive study because we are relying on data and human opinions. By using these approaches, we will know the farmers and society need such an idea to improve their palms and their productivity. Also, this research will enhance other ideas for other projects in the future using the phenomenal combination. Moreover, this topic advances knowledge of plant pollination mechanisms and advances agricultural research. For interdisciplinary research spanning computer science, agriculture, and botany, the use of AI algorithms and machine learning approaches in optimizing pollination tactics offers new research directions.

In terms of science, this integration enables a more thorough investigation of the complex interaction between environmental elements, tree conditions, and effective

pollination. Researchers can find patterns and correlations that were previously hard to find by studying large-scale data sets and using AI algorithms. This broadens our understanding of the pollination dynamics that are unique to date palm trees and can also be used for other crop species. Finally, the integration of AI into extensive date palm pollination is significant from an academic, scientific, and innovative standpoint since it increases knowledge, enhances agricultural techniques, and promotes effective and environmentally friendly farming practices.

1.4 Scope and Limitation of the Research

Our study is focused on Al Batinah. We have also selected multiple farms in Al Rustaq and Al Suwiy. Those farms would help us examine our goal. The improvement of AI algorithms, data analysis, and the creation of a decision support system are the main foci of the research on the massive pollination of date palms in Oman. Improving pollination tactics entails data collection, algorithm development, and field testing. The limitation of this study includes the lack of generalizability to other areas or species of palm trees, the requirement for a strong technological infrastructure, and assuring cost-effectiveness and accessibility for farmers are some of the difficulties.

2 Literature Review

2.1 Related Literature

A study (Salomón-Torres et al., 2021) emphasizes the significance of appropriate pollen application for fruitful date production. It underlines how important it is to achieve ideal pollination to obtain the fruit quantity and quality needed. In one method, where cutting-edge technology was blended with low-cost, high-yield crop management, short palm trees were preferred (Al-Arab et al., 2013). Drones have shown their ability to outperform conventional techniques and enhance fruit quality during harvest (Ahmed et al., 2021). Time saving and great efficacy are the two benefits of mechanical pollination (Hajian, 2005). Drone use is anticipated to reduce farming expenses and guarantee legal compliance (Ahrwar et al., 2019). However, when liquid sprays are manually applied with pressurized ground pumps, considerable pollen and water loss occurs (ICARDIA, 2017). Liquid suspension sprays can be applied manually or mechanically, and both methods have demonstrated the capacity to increase fruit set percentages while using little date palm pollen (DPP) (Rehna & Mukil, 2021). Drone use is still in its infancy despite the potential advantages of automating pollination and reducing income loss (Ibrahim, 2019).

Large date farms have difficulties due to the traditional pollination method's manpower and pollen requirements (Alyafei et al., 2022). Although only a few farmers presently utilize it, a technique that seeks to balance production costs and yield through the application of cutting-edge technology is chosen for short palm trees (Al-Arab et al., 2013). Compared to conventional approaches, drones have the potential to increase fruit quality during harvest (Ahmed et al., 2021). Modern irrigation systems allow for precise yield achievement with much less irrigation water application than old surface irrigation methods, even if the best yield of date palms is attained while providing all irrigation water requirements. Thus, the ongoing efforts to create contemporary irrigation systems enhance agricultural productivity, irrigation water management, and the need for less irrigation water inputs (Mohammed et al., 2021). Modernizing the current conventional methods of date palm care, harvesting and post-harvesting procedures, trade, and marketing is necessary for long-term sustainable development because they have not reached the necessary requirements. In this regard, this chapter tries to highlight possible solutions and opportunities by outlining the current state of date palm agriculture in Bahrain as well as the dangers facing the industry's growth and conservation (Almansoori et al., 2015).

2.2 *Related Studies*

One study (Al-Arab et al., 2013) focuses on the use of cutting-edge technologies and short palm trees for low-cost, high-yield crop management. It evaluates how well this strategy works to improve agricultural practices. Another study (Ahmed et al., 2021) compares the effectiveness of drones to conventional approaches for enhancing fruit quality during harvest. It assesses any potential benefits of employing drones for this. In a study by Hajian (2005), the benefits of mechanical pollination were examined. These benefits include time savings and high efficacy. This study evaluates mechanical pollination methods' efficacy and their potential advantages for date production. A study (Ahirwar et al., 2019) investigating drone use in agriculture looks at the possible cost savings and improved compliance brought on by this technology's adoption. It evaluates how drones generally affect agricultural activities. In another study (ICARDIA, 2017), the effects of manually applying liquid sprays using pressurized ground pumps are assessed. It emphasizes the need for alternate strategies by concentrating on the loss of pollen and water that results from this practice. A study by (Rehna & Mukil, 2021) looked at the manual and mechanical application of liquid suspension sprays to increase fruit set percentages with the least amount of date palm pollen (DPP) use. It evaluates how well these methods work at improving pollination results. A study (Ibrahim, 2019) explores the usage and limitations of drones to automate pollination and reduce revenue loss. It looks at the opportunities and problems that come with using drones in agricultural contexts.

This research discusses the difficulties large date farms encounter as the conventional pollination method is labor- and pollen-intensive. It emphasizes the demand for more practical and successful methods to meet these difficulties. Together, this research shed important light on date farming's use of cutting-edge technology, such as drones, the significance of correct pollen delivery, and the benefits of mechanical pollination (Alyafei et al., 2022). Artificial intelligence in smart farming offers a practical answer to the problems facing agricultural sustainability today. Time series analysis, deep learning, and machine learning are crucial to smart farming. Agriculture involves a wide range of operations, including crop selection, crop yield prediction, categorization of soil compatibility, water management, and so on. Time series analysis is used for agricultural demand forecasting, commodity price prediction, and crop yield production forecasting. Machine learning algorithms are utilized for crop selection and management. Deep learning techniques are used for crop selection and crop production forecasting (Akkem et al., 2023). They also discuss the difficulties faced by large-scale date farms and highlight the possible advantages and restrictions of drones in automating the pollination process. Commercial date plantations and feasible date production are being promoted by the Egyptian government and business sector, who are persuaded by the potential of date production. Date palm production, processing, marketing, and planting continue to face numerous challenges despite their significant contributions to Egyptian agriculture. The main hurdles to the date palm in Egypt are low-quality cultivars, inadequate farm management, pests and illnesses, barriers to the market, and a lack of relevant research (Bekheet & El-Sharabasy, 2015).

3 Research Methodology

3.1 Research Method

We have used mixed approach methods to achieve the research objectives. We have used this method as this is the best way to achieve our objectives; this is so because there are many farmers whom we queried about pollinating and how the combination of AI and drones would help them in the future of pollinating so we can depend on their answers, their point of views, and experience. Also, we have used both primary and secondary datasets. Further, this is descriptive research as we are depending on statistics and people's thoughts.

3.1.1 Qualitative and Quantitative Methods

Surveys: To collect statistical data on farmers' opinions about employing drones and artificial intelligence (AI) and their experiences with pollination, we sent structured questionnaires to a large number of farms. **Pilots or Experiments:** The

pollination was carried out using AI and drones in real-world situations to test strategies and get data on how effective they are in comparison to more conventional approaches. Interviews: In-depth discussions with farmers were conducted to get their specific viewpoints, first-hand accounts, and insights into the application of artificial intelligence and drones to pollinate crops. Focus groups: The team engaged in conversations among farmer groups to delve into shared perspectives and produce rich, in-depth information. Comprehensive Insights: A complete picture of the issue was obtained by combining the rich, contextual material from focus groups and interviews with the numerical data from surveys and tests.

3.1.2 Primary and Secondary Data

Primary Data: This refers to all of the first-hand information you get from the farmers via focus groups, questionnaires, interviews, and experiments. Since primary data is unique to our study questions and objectives, it is essential to our study. **Secondary Data:** This includes already published information from sources such as government publications, industry reports, academic studies, and other pertinent papers. Secondary data gave a foundation for identifying trends and gaps in the literature and helped contextualize our findings within it. **Validation and triangulation:** Cross-verification is made possible by using several data sources, which improved the validity and reliability of our conclusions. **Practical Relevance:** Direct communication with farmers guaranteed that the study is based on their needs and experiences, which increased the applicability and usefulness of the conclusions.

3.2 Research Instrument

The proper instrument that would benefit our research is the questionnaire because it is the fastest and most affordable way to survey many individuals. Further, by standardizing data gathering through questionnaires, it is possible to compare and analyze results more easily. By using statistical software, data can be evaluated quickly, making it simple to spot patterns and trends. We have shared the questionnaire on the social media platforms such as Twitter, Instagram, and WhatsApp. The answers provided us with a wealth of information for our research.

3.3 Sampling Design and Technique

We have chosen a nonprobability type sampling as we are focusing on several farmers. We have not selected an exact number, but we are going to use more than 80 participants. We used convenience sampling because it offers a wide range of qualitative information. Convenience sampling offers a way to gather thorough feedback

from multiple perspectives. One can rapidly and effectively approach people about topics using this technique to obtain the required information. Surveys can even persuade tailors to assist by providing more details about a person's demographic profile to develop generalizations about a larger group in the future.

4 Result Analysis

Based on Fig. 1 48% of respondents had heard of the use of drones and AI for palm tree pollination, while 52% had not. This shows that this application may be known to some extent but is not yet well known. Although the use of drones and AI to pollinate palm trees may be gaining popularity and attention, it is still a relatively new topic and is not frequently discussed among the public.

The fact that 76% of respondents—compared to 24% who do not—think that using drones with AI might save labor costs in pollinating palm trees suggests that there is a consensus that this technology has the capacity to do so. Most respondents are aware of the benefits of employing. This observation emphasizes the alleged advantages and efficiency that drones and AI integration in palm tree pollination operations can provide. A considerable belief in the positive effects of this technology on crop quality is suggested by the finding that 68% of respondents think drones with AI could increase the quality of palm tree crops, while 32% do not. Most responders are aware of the potential advantages that drones with AI algorithms could offer to the pollination process, including improved resource use, enhanced accuracy, and precision (Fig. 1).

Efficiency (44%), cost (20%), and environmental impact (36%) are the three factors that respondents emphasize when assessing the employment of drones and AI for palm tree pollination. They consider economic viability, acknowledge the potential for higher productivity and yield, and stress the significance of sustainable

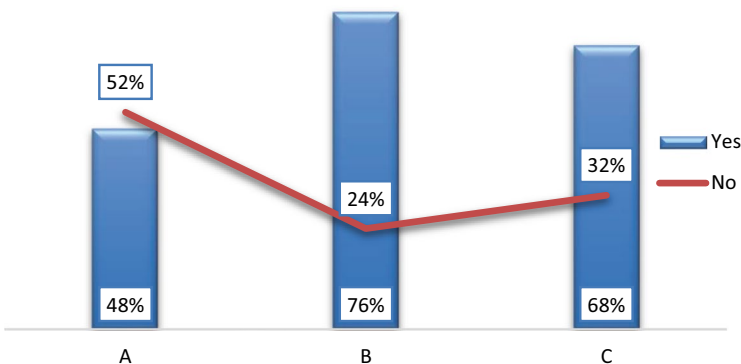


Fig. 1 Potential benefits of AI and drone

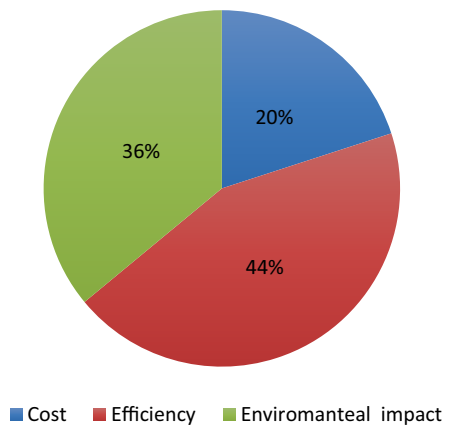
practices. A thorough evaluation of the advantages and implications of the technology is ensured by taking these elements into account.

The observation from Fig. 3 demonstrates that respondents generally agree that using drones and AI to pollinate palm trees is a novel and unproven technique. The majority (60%) and a sizeable portion (16%) strongly concur with this viewpoint. A lesser portion (12%) expresses neither agreement nor disagreement, whereas just 4% or 8% strongly disagree. This widespread agreement highlights the idea that this technology represents a fresh and mostly unknown method of pollinating palm trees. The findings show that respondents strongly agree that deploying drones for pollination can considerably increase agricultural productivity. This belief is shared by a total of 83.3% of people, of whom 33.3% strongly agree with it and 50% feel that drones are having a revolutionary effect on agriculture. About 12.5% of people express neither agreement nor disagreement with the statement, while only 4.2% disagree. No one expresses a strong dissent. The observation demonstrates the universal acceptance of drones' potential to increase agricultural productivity and the general support for their use in pollination techniques.

According to the responses, adopting technology like drones for pollination as opposed to conventional techniques is generally seen favorably. The responses refer to multiple sides:

- **Productivity and efficiency:** Several responders emphasize the great productivity of drones in pollination, highlighting their capacity to cover vast areas swiftly and precisely. This is said to be a strategy to improve production and demand less time and effort.
- **Access to difficult regions:** Drones are commended for their capacity to access difficult regions that may be difficult for other techniques to access. This is viewed as a benefit since it makes it possible to pollinate plants in places that would otherwise be inaccessible.

Fig. 2 Key factors in evaluating drones and AI



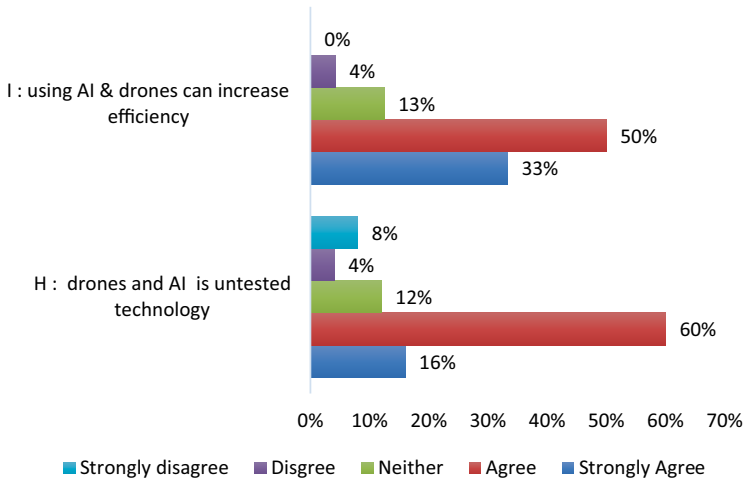


Fig. 3 AI and drones in agriculture: efficiency and impacts

- **Cost and labor reduction:** A few responders highlight the potential to lower labor costs and simplify pollination for farmers in comparison to conventional approaches.
- **Environmental and health considerations:** Some respondents agree that it is important to consider how employing drones for pollination would affect the environment and human health. It is crucial to make sure the technology does not endanger the local ecosystem or compromise the security of residents and animals in the target area.

Overall, the replies show a favorable opinion of the use of drones for pollination, noting benefits including effectiveness, accessibility to challenging terrain, cost savings, and potential environmental implications. However, there is also a recognition of the necessity for continual study, creation, and cautious application to maximize the advantages and lessen any potential disadvantages.

5 Result Discussion

5.1 Findings

The examination of the reactions gives significant experiences into the impression of utilizing innovation like robots for fertilization contrasted with customary strategies. These discoveries shed light on different parts of the subject, including mindfulness, convictions, concerns, and, in general, perspectives toward the combination of robot innovation in fertilization processes. First and foremost, it was seen that the use of robots and man-made intelligence for palm tree fertilization is not yet well

known, with 48% of respondents monitoring it. This suggests that, despite the fact that some of this technology is known, it is still a relatively new and unknown concept in the public domain. Notwithstanding, among the individuals who knew about the utilization of robots and man-made intelligence for fertilization, there was an agreement that this innovation could possibly save work costs. A critically larger part of 76% of respondents trusted in its ability to diminish work necessities in pollinating palm trees. This finding mirrors the acknowledgment of the advantages of utilizing simulated intelligence-fueled robots to robotize fertilization processes and reduce the requirement for physical work.

In addition, respondents demonstrated a significant belief in the technology's positive effects on crop quality. The majority of respondents, 68%, believed that AI-equipped drones could improve the crop quality of palm trees. This conviction exhibits the confidence encompassing the work of robots and simulated intelligence in fertilization processes, as respondents recognized the potential benefits that this innovation could offer. These benefits incorporate better asset use, upgraded exactness, and accuracy in the fertilization cycle. The positive impression of utilizing robots and artificial intelligence to upgrade the nature of palm tree harvests mirrors the apparent worth and possible advantages of this innovation in horticultural practices.

While evaluating the work of robots and simulated intelligence for palm tree fertilization, respondents accentuated three key variables: proficiency, cost, and ecological effect. Proficiency was the most underlined factor, with 45.8% of respondents featuring its significance. This accentuates the requirement for mechanical arrangements that can advance fertilization processes, eventually prompting expanded efficiency and asset productivity. The subsequent component, cost, was recognized by 16.7% of respondents. This finding recommends that partners perceive the monetary feasibility and potential expense reserve funds related to the utilization of robots and man-made intelligence in fertilization. The third component, natural effect, was stressed by 37.5% of respondents. This features the meaning of maintainable practices in horticultural activities and the need to consider the environmental ramifications of robot-based fertilization. These discoveries underscore the significance of a thorough assessment of the benefits and ramifications of involving robots and man-made intelligence in palm tree fertilization.

Worries about the expected adverse consequences of involving robots and man-made intelligence for palm tree fertilization on conventional pollinators were obvious in the reactions. About 39.1% of respondents communicated an elevated degree of worry about the conceivable damage that this innovation could pose to conventional pollinators. This tracking down features the need to keep up with the capability of conventional pollinators in the regular fertilization process and to oversee and limit any unfriendly effects on them. Supportable strategies for pollinating palm trees should guarantee a fair harmony between the upsides of innovation and the necessities of pollinators. Besides, the respondents' perspectives on the conceivable adverse consequences of involving drones in fertilization on the climate were fairly questionable. While 20.8% of respondents accepted that drone-based fertilization could adversely affect the climate, an equivalent number of respondents suspected

something. Of most of the respondents, 58.3% were hazy about the conceivable natural impacts of this innovation. This finding underscores the requirement for additional exploration and examination to all the more likely grasp the environmental effects of involving drones in fertilization.

Besides, respondents, for the most part, concurred that involving robots and simulated intelligence for palm tree fertilization addresses a new and untested innovation. This viewpoint was strongly supported by the majority (60%), highlighting the perception that this technology is still in its infancy as a tool for exploration and adoption. In order to fully comprehend the capabilities and limitations of drones and AI in the context of pollination, this observation reaffirms the need for ongoing research, experimentation, and evaluation.

5.2 Recommendations

As per the study discoveries, there are a few significant proposals for individuals in Al Batinah. The first is to bring issues and information about drone-based fertilization to light among ranchers and different partners. Studios, preparing projects, and data crusades, among other instructive drives, ought to be carried out to scatter data about the advantages, the execution rules, and the best practices related to this creative innovation. Ranchers can settle on informed choices and consistently coordinate robots and computer-based intelligence into their fertilization rehearses in the event that they are furnished with vital information and abilities.

Another basic proposal is to allot assets for innovative work exercises to additionally examine the possible advantages and natural effects of involving drones and computerized reasoning in fertilization. To better comprehend the effects on traditional pollinators and to devise strategies to mitigate any potential negative effects, additional research is required. This will guarantee that the technology is optimized for the best possible crop results at the lowest possible environmental impact. In addition, it is recommended to evaluate the viability and efficiency of drone-based pollination by carrying out pilot projects and field trials in a variety of agricultural settings. The technology's practical difficulties, performance metrics, and potential scalability can all benefit from these initiatives.

At long last, the suggestions for involving robots and man-made intelligence in palm tree fertilization incorporate bringing issues to light, directing extra exploration, laying out severe guidelines, and sending off pilot projects. Partners can amplify the advantages of this trans-developmental innovation while guaranteeing mindful reception and alleviating possible adverse consequences by carrying out these suggestions. Taking on imaginative fertilization practices will work on horticultural effectiveness, efficiency, and supportability, adding to the general prosperity of ranchers and the climate.

6 Conclusion and Future Work

6.1 Conclusion

The exploration questions intended to comprehend the issue in this review, which focuses on AI Batinah, show that the utilization of robots and simulated intelligence for palm tree fertilization has huge potential for further developing productivity, bringing down work costs, further developing yield quality and tending to natural worries. As the results show, respondents are becoming more mindful of this innovation, with the greater part recognizing its advantages concerning work reserve funds and harvest quality improvement.

The information likewise stresses the meaning of extra innovative work to address concerns, upgrade the innovation, and guarantee its reasonableness for different agrarian settings. The respondents, for the most part, concurred that involving robots and man-made intelligence for palm tree fertilization is a novel and untested innovation, underlining the significance of continuous exploration to all the more likely figure out the biological impacts and defeat potential execution challenges. This requires designating assets and supporting exploration drives pointed toward surveying natural effects and recognizing and carrying out moderation procedures.

Based on the feedback received, it is recommended that farmers and stakeholders become more aware of drone-based pollination through educational initiatives and information campaigns. This will aid in the spread of knowledge about the benefits, best practices, and guidelines for effectively implementing this technology. Farmers will be able to make informed decisions about the integration of drones and AI into their pollination practices if they are equipped with the necessary skills and understanding. To ensure the successful adoption of drones and AI in palm tree pollination, a balance between maximizing crop outcomes and ensuring the sustainability of pollination practices will be required.

6.2 Future Work

In this study, we have collected data from different people who are aware of pollination and palms seasons. Further, we have taken people's opinion on how this combination is helpful for the future. However, as it is small research, we could not get deep into this research. Our future plan for the society of farms is to do some interviews and schedule meetings with actual farmers to ask and discuss how this technology would help them pollinate the palm in Oman. Moreover, we are researching about the huge project that has been in progress since 2019 and how they planned to plant a million palm trees in Ibri. Finally, we have presented the idea of AI and how it is going to help everyone in any sector in future.

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Women Political Participation: The Model of the United Arab Emirates (UAE)



Mariam Alzaabi and Ouassila Yaiche

Abstract From a global and historical perspective, women's political participation has progressed slowly. Even in many progressive societies, women continue to lag behind in achieving equal representation in politics. However, over the past few decades, the United Arab Emirates (UAE) has emerged as an inspiring model for the Arab world due to its achievements in empowering women in the political arena. Since its founding in 1971, the UAE has made significant strides in advancing women's political participation, positioning itself as a regional model for inclusive political representation. This paper examines the historical trajectory of women's political participation in the UAE, from the appointment of its first female minister in 2004 to the achievement of gender parity in the parliament in 2019. It will highlight the interconnected role of leadership, public policies, and legislation in driving this progress. Additionally, the paper addresses the challenges Emirati women continue to face in political decision-making, particularly societal norms and cultural expectations, and explores opportunities to further their political representation and inclusion in governance.

Keywords Women's political participation · United Arab Emirates · Gender equality

1 Introduction

Women's political participation is a fundamental pillar of gender equality and a key objective of the 2030 Agenda for Sustainable Development (SDGs), specifically under Goal 5, adopted by all UN member states. However, historically and globally, the progress towards achieving equal representation in politics has been slow, including in the UAE. This disparity is evident in both quantitative and qualitative data

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on women's political engagement. According to the "Women in Politics 2023 Map," only 31 countries have women serving as heads of state or heads of government, and the global average of women representation in ministerial cabinets is just 22.8% (UN Women and Inter-parliamentary Union, 2023). In national parliaments, women's representation remains low, with a global average of 26.5% (UN Women and Inter-Parliamentary Union, 2023). These figures underscore the ongoing challenges in achieving gender parity in political leadership worldwide.

Over the past few decades, the United Arab Emirates (UAE) has emerged as a leading model in the Arab world for advancing women's political participation and integrating them to key decision-making roles. Despite being a young nation, founded in 1971, the UAE made remarkable strides in empowering women in politics. Prior to 2004, there was no female representation in the UAE's cabinet of ministers. By 2023, however, Emirati women constituted almost 30% of the executive, spearheading strong and diverse areas such as foreign policy, climate change, and technology (UAE Government, 2023a). This transformation reflects the UAE's commitment to gender inclusion at the highest levels of political leadership.

In 2006, for the first time, both women and men in the UAE gained the right to participate in the election of members of the Federal National Council (FNC), the country's national parliament. Consequently, this led to the critical achievement of Dr. Amal Al-Qubaisi becoming the first female FNC member to win her seat through a public election. In 2015, Al-Qubaisi's parliamentary career reached a historic milestone as she became the first female Speaker of the FNC, making her the first Arab woman to lead a national parliament in the Middle East. Today, the FNC ranks fourth globally in women's representation in legislative bodies, with women comprising 50% of its membership (IPU, 2023a).

This paper examines the historical evolution of women's political participation in the UAE, from the appointment of its first female minister in 2004 to the achievement gender parity in the FNC in 2019. It will highlight the intertwined role of leadership, public policies, and legislative factors in facilitating the progress of women's political participation in the UAE. Finally, this paper will analyze the challenges Emirati women continue to face in decision-making and identify opportunities to enhance their political representation.

2 Literature Review

2.1 *Women's Political Participation from a Global Perspective*

The issue of women's political participation has been widely examined in academic literature. According to Adler (1996), Norris and Inglehart (2001), Krook and O'Brien (2012), Paxton and Hughes (2018), and Heck (2020), the unequal representation of women in political leadership roles is a global challenge that has persisted throughout history. A significant turning point at a parliamentary level occurred in 1907 when Finland became the first country to elect a woman in parliament,

marking a milestone in women's political participation. Similarly, at a state leadership level, the world witnessed its first elected female prime minister in Sri Lanka in 1960, marking another significant step toward gender equality in politics (Adler, 1996; Paxton & Hughes, 2018). Today, data on women in politics demonstrate that over the past 100 years, there has been a significant upward trajectory in women's political representation. However, women remain far from achieving parity in all aspects of political life (Paxton & Hughes, 2018).

According to Norris and Inglehart (2001), no country had achieved equal representation of women in the parliament at the outset of the twenty-first century. However, as of January 2024, women make up 50% or more of parliament members in seven countries: Rwanda, Cuba, Nicaragua, Mexico, Andorra, Namibia, and the UAE (IPU, 2024). Regional disparities are a clear trend when it comes to the issue of women's participation in politics. At the start of the 21st century, Nordic nations were known to have the most gender-balanced parliaments, while Arab states lagged furthest behind in this regard. This pattern persists today, with the latest regional averages showing the Americas and Europe leading with women representation in all chambers of parliament at 35.1% and 31.9%, respectively. They are followed by Sub-Saharan Africa at 27.3%, the Pacific with 22.5% and Asia at 21.4% (IPU, 2024). The Middle East and North Africa (MENA) region ranks at the bottom of regional averages, with women holding 16.5% of seats in national legislatures (IPU, 2024). This highlights the persistent disparities in women's political participation across regions (Paxton & Hughes, 2018). As a result, many studies have focused on the causes of women's continuous underrepresentation in politics and the factors influencing the apparent differences between different regions and states.

Numerous scholars and academics have examined women's political participation through various empirical and theoretical approaches to explore and explain the factors that hinder or advance women's integration into politics. According to Adler (1996), Norris and Inglehart (2001), Krook and O'Brien (2012), Paxton and Hughes (2018), and Heck (2020), these factors include—yet are not exclusive to—structural, institutional, and cultural factors.

Structural factors encompass levels of socioeconomic development and the percentage of women in leadership positions (Adler, 1996; Norris & Inglehart, 2001; Heck, 2020). Institutional factors include discriminatory laws and practices, electoral systems, limited access to resources, and institutional biases (Norris & Inglehart, 2001; Krook and O'Brien, 2012; Heck, 2020). Finally, cultural factors involve societal beliefs about women, public attitudes towards gender roles in each society, and biased religious traditions (Norris & Inglehart, 2001; Paxton & Hughes, 2018; Heck, 2020).

Heck (2020) underscores that women's equal representation in politics is a multifaceted issue that cannot be explained by a single factor. This conclusion also applies to the work of Adler (1996), who reveals that women's global leadership is not defined by a single pattern but rather by diversity, meaning no clear pattern guarantees women's increasing representation in political leadership roles.

On the other hand, Norris and Inglehart's (2001) work focused on addressing cultural obstacles alongside structural and institutional factors to achieve equal representation. Their findings support Adler's (1996) claim that socioeconomic development alone does not guarantee the success of women in power or political leadership, and not a single pattern ensures or prevents women's success in political life. Nevertheless, Norris and Inglehart (2001) find that traditional attitudes toward gender roles hinder women's political empowerment. Hence, the solution to women's underrepresentation in politics may lie in cultural changes and awareness-raising policies to promote gender equality (Norris & Inglehart, 2001).

Meanwhile, Krook and O'Brien (2012) found that political variables have the most significant impact on gender parity in cabinets compared to social factors, concluding that the structure of political institutions plays a crucial role in determining the inclusion of women in ministerial positions. Like Norris and Inglehart (2001), Krook and O'Brien (2012) emphasize a single factor more than the others in understanding and explaining gender equality in politics, stressing the role of political institutions in promoting women's political integration.

Therefore, the literature underscores that there is no one-size-fits-all approach to understanding and explaining women's underrepresentation in politics.

2.2 Women's Political Participation in the Arab World

In the Arab World, women's political participation is a particularly complex and multifaceted issue. As one of the world's most turbulent and fragmented regions, shaped by political instability and socio-economic challenges, the Arab world presents an interesting case for women's participation in political life (Basiri, 2016). To understand the subject comprehensively, it is initially important to examine the historical trajectory of women's political participation in the region.

According to Ahmed (2021), many Arab nations recognized women's rights to vote in the late 1950s and 1960s, including Djibouti, Algeria, Egypt, Syria, Lebanon, Tunisia, Libya, Palestine, and Morocco. However, these rights did not translate into the proper integration of women into politics in the Arab world. According to Norris and Inglehart (2001), women's representation as members of parliament in the MENA region accounted for less than 5% in the early 2000s. While this average has increased, reaching 16.5% in 2023, this percentage still places the MENA region below the global average of 26.9% for women's representation in parliaments (IPU, 2024).

In terms of representation in the executive branch of government, the first-ever Arab female minister was Iraqi, appointed in 1959 (Jawad, 2021). In the 1990s, eight out of 22 Arab countries had one to two female ministers, and by 2017, most Arab countries had female representation in the cabinet, with the exception of Saudi Arabia and Comoros (Al Maaitah et al., 2011; ESCWA, 2017). Thus, despite the apparent progress being made in recent decades, women in the MENA region remain underrepresented in all aspects of political life (Norris & Inglehart, 2001; Al Maaitah et al., 2011; Paxton & Hughes, 2018; Heck, 2020).

Before examining the different factors influencing women's political participation in the Arab world, it is essential to note here that the Gulf states, renowned for their oil economies (i.e., UAE, Qatar, Kuwait, Oman, Bahrain, and Saudi Arabia), offer a thought-provoking perspective on women political participation in the Arab world. Norris and Inglehart (2001) underscored that these countries historically barred women by law from participating in political life, specifically in voting and running for parliament. All GCC countries granted political participation rights to women in the early 2000s, except for Saudi Arabia, which did not extend this right until 2015 (Ahmed, 2021; Jawad, 2021). What makes these countries interesting to examine is the fact that the UAE, a Gulf state, has led the Arab world in female representation in parliament, with women comprising 50% of Federal National Council (FNC) seats since late 2019 (IPU, 2023b; IPU, 2024). Hence, it provides a compelling case study on women's political participation in the Arab world.

To understand the disparities between different Arab countries in their approach to women's political leadership, several Western and Arab scholars have adopted different approaches to explain this issue. A prevalent theme in Arab studies is the emphasis on cultural factors and their effects on women's political participation. Fayadh (2021) and Al Maaaitah et al. (2011) examined the role of traditions, culture, and religion in women's political participation in the Arab World. However, recent studies such as Çavdar (2022) reject this premise, emphasizing that a culturalist perspective exaggerates the influence of religion and culture in the MENA region. Çavdar (2022) highlights that understanding the role of structural, institutional, and cultural factors is equally important in analyzing the variables shaping women's political participation in the Arab World. The study underscores the significance of the political economy, institutions, and social movements in relation to women's political participation in the MENA region.

Other studies, such as Welborne and Buttorff (2022), AlKhalwaldeh (2018), and Amaydia (2018), identify gender quotas as a central theme in understanding women's participation in political life in the Arab world. These studies examined the adoption and implementation of gender quotas in different Arab countries, highlighting the limitations and advantages of this approach in the region. Welborne and Buttorff (2022) underline that the literature on this matter still lacks an assessment of the actual "legacy" these quotas have left over the past two decades. Meanwhile, Amaydia (2018) argues that female quotas are ineffective without proper implementation and enforcement.

Remarkably, both AlKhalwaldeh (2018) and Amaydia (2018) confirmed that along with gender quotas, factors related to culture and traditions have significantly enhanced the political participation of Algerian and Jordanian women. This suggests that implementing regulations such as a quota system alone is insufficient without also addressing challenges related to societal perceptions of women in politics from a cultural and traditional perspective.

A final noteworthy point was made by Jawad (2021), who explicitly asserts that the volatility of the MENA region does not provide a favorable environment for women's advancement in any aspect of life, let alone political leadership. The study emphasizes that, in the case of Iraq—an Arab state experiencing ongoing instability

in the past 50 years—adopting new policies regarding women’s political participation remains a low priority for policymakers, making it difficult for women to demand their political rights.

Thus, studying the issue of women’s political participation in the Arab world requires a comprehensive understanding of all aspects, including history, culture, institutions, and socio-economic conditions.

2.3 Women’s Political Participation in the United Arab Emirates (UAE)

The United Arab Emirates (UAE) presents a unique model for empowering women and enhancing their presence in decision-making, especially within the MENA region. To analyze the UAE’s approach to women’s political participation, many academics and researchers emphasize the importance of considering socio-economic and cultural contexts alongside the leadership’s role in promoting women’s greater participation in political life.

Al-Zaabi and Al-Rababah (2006) analyze women’s political participation in the UAE, comparing it with other Gulf and Arab states. The authors highlight the importance of understanding the cultural and socio-economic context when examining gender-related matters in the Arab world, underscoring that Arab countries should not duplicate Western models blindly. They also emphasize that while Emirati women were not granted their full political rights at the time, they were not completely deprived of them. The study reveals that although women were not represented in the UAE parliament, capacity-building projects were in place to prepare them as future parliamentarians. In addition, the UAE leadership at the time advocated for women’s participation in decision-making processes. Nevertheless, due to cultural and social sensitivity of the issue, they sought a gradual approach aligned with broader social change.

Furthermore, Hesketh and Williams (2021) offer a recent take on the UAE model for empowering women politically. The study examines Emirati public policy aimed at promoting gender equality and compares it with Rwanda, one of the most advanced countries in this area. The study concludes that a robust legislative environment, combined with public policies and leadership support, has facilitated the growth of Emirati women’s political participation.

However, to fully grasp how Emirati women’s political participation has advanced in the last two decades, we must highlight the work of Al-Ghaffi (2011), Al-Hammadi and Tohami (2021), and Ahmed (2021). Regarding the executive branch, they identify the pivotal moment of the appointment the first-ever female minister in 2004 and how it led to a domino effect, resulting in the subsequent appointment of more female ministers in the government.

As for parliament, Al-Ghaffi (2011), Al-Hammadi and Tohami (2021), and Ahmed (2021) underscore how the “Political Empowerment Program” announced

in 2005, led to the first-ever Federal National Council (FNC) elections of 2006, resulting in the election of the first Emirati female parliamentarian, Dr. Amal Al-Qubaisi. The program was championed by Sheikh Khalifa bin Zayed Al-Nahyan, President of the UAE from 2004 to 2022, who pledged political reforms as part of his legacy as a leader of the Emirates. As a result, the FNC membership mechanism changed from being fully appointed by the leadership of each Emirate to a system in which half of the members were elected through a public vote (Al-Ghaffi, 2011; Ministry of FNC, 2010; Al-Hammadi & Tohami, 2021).

The UAE held its first-ever parliamentary elections in 2006 for the 14th legislative term of the FNC. While only one woman was elected to the FNC through this general election, the UAE government appointed eight other women as FNC members for the 14th legislative term of the parliament, resulting in a representation rate of 22.5% (Al-Hammadi & Tohami, 2021). By the 16th legislative term, FNC members elected the first female speaker in its history, making her the first woman to lead an Arab parliament (Al-Hammadi & Tohami, 2021). As for the 17th legislative term, the leadership of the UAE went a step further in leveling the playing field for Emirati women in the FNC by enacting a 50% gender quota for women in the parliament. This decision was made by Sheikh Khalifa bin Zayed Al-Nahyan, President of the UAE, in 2019 (Al-Hammadi & Tohami, 2021). Implementing this reserved quota in the FNC has positioned the UAE among the top five countries globally for women's parliamentary representation (Welborne & Buttorff, 2022). Interestingly, Al-Ghaffi (2011) concluded that implementing a gender quota system for the FNC seats would be an effective instrument in increasing women's representation.

Despite all these achievements, Emirati women continue to face challenges in decision-making processes. According to Al-Othman (2011), Al-Ghaffi (2011), and Abu Al-Khair (2019), cultural and social factors—such as traditional gender roles, societal expectations, and limited access to education—significantly influence and restrict Emirati women's participation in political life. These barriers continue to limit women's educational and career choices, making it difficult for them to enter politics.

Therefore, cultural and social factors must be considered alongside leadership, policies, and law when analyzing Emirati women's political participation.

3 Methodology

This paper examines the historical trajectory of women's political participation in the United Arab Emirates (UAE) using secondary data analysis. Through an in-depth literature review, it explores existing research on Emirati women's political participation. Data was collected from various secondary sources, including books, scholarly journals, government documents, government documents, official websites, media sources, and newspaper articles.

4 Historical Trajectory of Women's Political Participation in the UAE

In this section, we examine the historical trajectory of Emirati women's political participation by analyzing their representation in the executive and legislative branches of government, specifically in the Cabinet of Ministers and the Federal National Council (FNC), the UAE's parliament.

4.1 Historical Trajectory of Emirati Women in the Cabinet of Ministers

4.1.1 Quantitative Female Representation as Ministers in the UAE (2004–2023)

Perhaps the most prominent feature distinguishing the UAE's approach to women's political participation and representation is its gradual implementation in achieving this goal. Quantitative data demonstrate that the participation of Emirati women in the Cabinet of Ministers occurred progressively, aligning with the requirements of each stage of the state's growth and development (Al-Zaabi & Al-Rababah, 2006; Al-Ghaffi, 2011; Al-Hammadi & Tohami, 2021).

Prior to 2004, no Emirati woman had ever taken on the role of a minister, which was also the case in most Gulf States. Qatar and Oman led the way, with Qatar appointing its first female minister in May 2003 and Oman in March 2004 (Murad, 2020; Ali, 2004). In November 2004, the UAE followed suit by appointing Sheikha Lubna Al-Qasimi as Minister of Economy and Planning, making her the first female minister within the framework of the UAE's Council of Ministers (AlBadri, 2006).

While 2004 marked the beginning of Emirati women's participation in the executive, appointing a single female minister out of 21 resulted in a representation rate of only 4.8%—a relatively modest achievement (Ministry of Cabinet Affairs, 2016). Nevertheless, this number has increased both proportionally and significantly over the past two decades. Currently, there are 10 female ministers out of 34, equaling a representation rate of 29.4%—the highest recorded representation of Emirati female ministers in the UAE's history, as demonstrated in Table 1 (UAE Government, 2023a).

4.1.2 Qualitative Female Representation as Ministers in the UAE (2004–2023)

On a global scale, a gender-based division in ministerial positions persists, with women in politics often assigned portfolios related to gender equality, human rights, and social protection, while men still dominate decision-making in economic and defense matters (UN et al., 2023).

Table 1 Historical trajectory of quantitative representation of Emirati female ministers within the cabinet of ministers of the UAE

#	Ministerial cabinet formation number	Number of female ministers	Total number of ministers	Percentage of female ministers
1	Sixth Formation Amendment (2004)	1	21	4.8%
2	Seventh Ministerial Formation (2006)	2	32	8.7%
3	Eighth Ministerial formation (2008)	4	25	16%
4	Ninth Ministerial Formation (2009)	4	22	18.2%
5	Modification of the ninth formation (2011)	4	24	16.8%
6	Tenth Ministerial Formation (2013)	4	24	16.8%
7	Eleventh Ministerial Formation (2014)	4	24	16.8%
8	Twelfth Ministerial Formation (2016)	8	29	27.6%
9	Thirteenth Ministerial Formation (2017)	9	32	28.1%
10	Fourteenth Ministerial Formation (2020)	9	33	27.3%
11	Fifteenth Ministerial Formation (2021)	9	33	27.3%
12	Ministerial reshuffle (2022)	9	32	28.1%
13	Ministerial reshuffle (2023)	10	34	29.4%

Sources: Ministry of Cabinet Affairs (2016) and the official portal of the UAE Government (2023a)

Nevertheless, the ministerial positions held by Emirati women within the executive have been diverse. From 2004 until 2023, 14 Emirati female ministers were appointed to various ministerial positions (see Table 2). They represent key sectors, including economy, foreign policy, education, social affairs, technology and advanced sciences, food security, climate change, culture, youth, tolerance, government development, and federal national council affairs (Ministry of Cabinet Affairs, 2016; UAE Government, 2023a; UAE Government, 2023b).

4.1.3 Young Emirati Females in the Cabinet of Ministers

We must highlight the remarkable and significant presence of young Emirati women in the UAE Cabinet of Ministers. As pointed out by Al-Ghafli (2011), Reem Al-Hashimi was the youngest Arab female minister when she was appointed in 2008 at only 29 years old (Ezzat, 2012).

Table 2 Female ministers in the cabinet of ministers of the UAE (2004–2023)

#	Female minister name	Ministerial portfolio	Period	Years of service
1	Sheikha Lubna Al-Qasimi	Minister of Economy and Planning	2004–2006	13 years
		Minister of Economy	2006–2008	
		Minister of Foreign Trade	2008–2009	
		Minister of Development and International Cooperation	2009–2016	
		Minister of Tolerance	2016–2016	
2	Maryam Al-Roumi	Minister of Social Affairs	2006–2016	10 years
3	Reem Al-Hashemi	Minister of State	2008–2016	15 years
		Minister of State for International Cooperation	2016-to date	
4	Dr. Maitha Al-Shamsi	Minister of State	2008-to date	15 years
5	Jamila Al-Muhairi	Minister of State for General Education Affairs	2016–2021	5 years
6	Najla Al-Awar	Minister of Community Development	2016–2017	1 year
7	Noura Al Kaabi	Minister of State for Federal National Council Affairs	2016–2017	7 years
		Minister of Culture and Knowledge Development	2017–2020	
		Minister of Culture and Youth	2020–2023	
		Minister of State	2023-to date	
8	Ohood Al-Roumi	Minister of State for Happiness and Wellbeing	2016–2017	7 years
		Minister of State for Government	2017–2020	
		Minister of State for Development and the Future	2020-to date	
9	Shamma Al-Mazroui	Minister of State for Youth Affairs	2016–2023	7 years
		Minister of Community Development	2023-to date	
10	Hessa Buhumaid	Minister of Community Development	2017–2023	6 years
		Minister of State	2023-to date	
11	Maryam Al-Muhairi	Minister of State for Future Food Security	2017–2020	6 years
		Minister of Climate Change and Environment	2021-to date	
12	Sarah Al-Amiri	Minister of State for Advanced Sciences	2017–2020	6 years
		Minister of State for Advanced Technology	2020–2022	
		Minister of State for Public Education and Advanced Technology	2022-to date	

(continued)

Table 2 (continued)

#	Female minister name	Ministerial portfolio	Period	Years of service
13	Sarah Al-Musallam,	Minister of State for Early Education	2022-to date	1 year
14	Maryam Al-Hammadi	Minister of State	2023-to date	–

Sources: Ministry of Cabinet Affairs (2016) and the official portal of the UAE Government (2023a)

This practice of valuing youth was amplified when the UAE appointed the world’s youngest female minister in 2016, Shamma Al-Mazroui (UAE Government, 2023c). At the age of 22, Al-Mazroui was responsible for leading the Youth portfolio. In the ministerial reshuffle of February 2023, she was assigned a new role as the Minister of Community Development (UAE Government, 2023a).

Another notable example to highlight is Sarah Al-Amiri, a young female minister assigned to the Advanced Sciences portfolio in 2017 at the age of 30. Al-Amiri’s name is associated with significant achievements in space and technology, locally and internationally, such as the Emirates Mars Exploration Project (Ministry of Industry and Advanced Technology, 2023). In 2022, Al-Amiri was assigned an additional portfolio, the Public Education portfolio, making her Minister of State for Public Education and Advanced Technology (Ministry of Industry and Advanced Technology, 2023).

The presence of youth in the UAE executive authority demonstrates that the UAE recognizes the vital role of women, including young women, in political life and their contribution to decision-making.

4.2 *Historical Trajectory of Emirati Women in the Federal National Council (FNC)*

We divide the FNC history into three stages to explore the historical trajectory of Emirati women’s political participation in the UAE Parliament.

4.2.1 **State Establishment (1972–2004)**

During the state’s establishment stage (1972–2004), men exclusively represented the FNC. At the time, the method for selecting FNC members was determined by the local authority of each Emirate (Al-Ghafli, 2011; Al-Zaabi & Yaiche, forthcoming). As a result, each ruler used appointment as a method for selecting FNC members—no ruler considered choosing a woman as a parliament member at that stage. Hence, in the absence of another mechanism for women’s political participation in parliamentary work, Emirati women were not represented in the FNC from its first

legislative term to the 13th legislative term, from 1972 to 2004 (Al-Ghaffi, 2011; Al-Hammadi & Tohami, 2021; Al-Zaabi & Yaiche, [forthcoming](#)).

Nevertheless, according to Al-Zaabi and Al-Rababah (2006) and Al-Zaabi and Yaiche ([forthcoming](#)), Emirati women's participation in the FNC was an ambitious project led by the UAE leadership under Sheikh Zayed bin Sultan Al-Nahyan, the founder and president of the UAE (1971–2004), and his wife, Sheikha Fatima bint Mubarak. In 1998, Sheikha Fatima selected several prominent Emirati women for a training program to familiarize them with FNC work (Al-Zaabi & Al-Rababah, 2006; The Office of the Vice President of the Cabinet for Media Affairs, 2007; Al-Zaabi & Yaiche, [forthcoming](#)). In 2002, in a public statement, she advocated for Emirati women to enter the FNC as members for the first time since its establishment in 1972 (Al-Zaabi & Al-Rababah, 2006; Al-Zaabi & Yaiche, [forthcoming](#)). This demonstrates that UAE leadership carefully enacted the gradual participation of Emirati women in politics.

4.2.2 Empowerment Stage (2005–2019)

In 2005, the FNC framework underwent a significant change, which led to the inclusion of Emirati women into parliamentary work as members of the FNC. On November 3rd, 2004, Sheikh Khalifa bin Zayed Al Nahyan assumed the presidency of the UAE, succeeding his father, Sheikh Zayed. During the Emirati National Day celebration on December 2nd, 2005, Sheikh Khalifa announced the “Political Empowerment Program,” promising vital reforms to enhance political participation in the UAE (Ministry of FNC, 2010; Al-Zaabi & Yaiche, [forthcoming](#)).

Within the framework of this Political Empowerment Program, the system for selecting members of the FNC was modified by Supreme Council Resolution No. 4 of 2006, which stipulates that half of the members of the FNC shall be elected, while the other half shall be appointed (Al-Ghaffi, 2011; Al-Zaabi & Yaiche, [forthcoming](#)). Due to these amendments, Emirati women were granted the right to vote in the first legislative elections on an equal basis with men. In the history of the UAE, equally with their male counterparts. This allowed them to run as candidates for FNC (Al-Ghaffi, 2011; Al-Zaabi & Yaiche, [forthcoming](#)).

From 2006 onward, Emirati women gained representation in the FNC by election and appointment. In 2006, Dr. Amal Al-Qubaisi became the first woman to win an FNC through elections, while eight other women were appointed by the rulers of the seven Emirates, resulting in a female representation rate of 22.5% (Al-Ghaffi, 2011; Al-Zaabi & Yaiche, [forthcoming](#)).

In 2011, the 15th legislative term, the FNC elected its first female Deputy Speaker, Dr. Amal Al Qubaisi (Al-Zaabi & Yaiche, [forthcoming](#)). In that term, female representation in the FNC was 17.5%. Consequently, in the 16th legislative term in 2015, Al-Qubaisi was elected as the first female Speaker of the FNC, making her the first female ever to chair a parliament in the Arab world (UAE Government, 2023d; Al-Zaabi & Yaiche, [forthcoming](#)). In that term, the female representation

rate in the FNC was 20% (Al-Zaabi & Yaiche, [forthcoming](#)). These milestones testify to the cumulative and gradual nature of women's political stature in the UAE.

4.2.3 Equal Representation Stage (2019-Present)

Finally, in 2019, the FNC entered a new phase of its progress, which can be described as the equal representation stage (2019-present). This new era is characterized by achieving gender parity in the FNC. Presidential Decision No. 1 of 2019 marked this milestone by mandating a 50% quota for women's representation in the FNC, applying to both elected and appointed seats (Al-Hammadi & Tohami, 2021; Al-Zaabi & Yaiche, [forthcoming](#)). As a result of this landmark decision, the 17th legislative term of the FNC (2019–2023) witnessed its first period of gender-balanced representation. This elevated the UAE's global ranking, placing it fourth in women's equal representation in parliaments (IPU, 2023b; Al-Zaabi & Yaiche, [forthcoming](#)).

Table 3 summarizes the three stages that the Federal National Council (FNC) development and the key characteristics of each period (Al-Zaabi & Yaiche, [forthcoming](#)).

5 Factors Enabling Emirati Women's Political Participation

According to the 2023 Gender Gap Report, the UAE ranks first regionally in gender equality (World Economic Forum, 2023). This achievement can be attributed to the nation's progressive vision, leadership, and its interconnected role in adopting policies, strategies, and legislation that foster women's participation in politics, which will be examined in the next section.

5.1 Policy Making and the Role of Leadership

Since the establishment of the Federation, several national strategies and policies have been adopted to support women's empowerment, including: the Strategy for Eradicating Illiteracy and Educating Emirati Women (1975), the National Strategy for the Advancement of Emirati Women (2002), the National Strategy for the Empowerment and Leadership of Emirati Women (2015–2021), and the National Policy for Women's Empowerment in the UAE (2023–2031) (Al-Shamsi, 2021; "Fatima bint Mubarak," 2023).

The policies and strategies were developed based on the visions of the UAE leadership, represented by the founder, Sheikh Zayed bin Sultan Al Nahyan, and his wife, Sheikha Fatima bint Mubarak, President of the General Women's Union, which was established in 1975. Both strongly believed in the importance of women

Table 3 Emirati women in the Federal National Council across its three major stages

Stage number	Stage one	Stage two	Stage three
Stage name	State establishment and building stage	Empowerment stage	Equal representation stage
Stage period	(1972 to 2004)	(2005–2019)	(2019-to date)
Stage characteristics	<ul style="list-style-type: none"> • All members of the FNC are men • The mechanism for selecting members is by appointment only 	<ul style="list-style-type: none"> • Women entering the FNC for the first time • Changing the mechanism for selecting members; electing half of the members of the FNC and appointing the other half by the rulers • First female deputy speaker of FNC in 2011. • First female speaker of FNC was elected in 2015 	<ul style="list-style-type: none"> • Implementing the women’s quota system so that the FNC achieves equal representation of women in elected and appointed seats
Women representation percentage	<ul style="list-style-type: none"> • 1st–13th legislative term: Zero 	<ul style="list-style-type: none"> • 14th legislative term: 22.5% • 15th legislative term: 17.5% • 16th legislative term: 20% 	<ul style="list-style-type: none"> • 17th legislative term: 50%

Sources: Al-Zaabi & Yaiche ([forthcoming](#)) and IPU ([n.d.](#))

in shaping individuals and societies. This belief was translated into national work programs that were renewed and integrated into the visions and strategies of the UAE leaders who succeeded Sheikh Zayed (Al-Shamsi, 2021; Al-Zaabi & Al-Rababah, 2006; Al-Ghaffli, 2011).

5.2 *Legislative Environment and the Role of Leadership*

Women worldwide face legislative restrictions that limit their full participation in public and political life. These restrictions differ from one country to another. The legislative environment is an essential support system for women’s access to equal rights with men, in education, healthcare, employment, financing, and participation, including holding local and international decision-making positions (IPU, 2016).

While the UAE Constitution guarantees equal rights for both genders, the UAE leadership took a strategic and methodical approach to addressing numerous legislative gaps, paving the way for a more inclusive political landscape. These reforms and legal amendments contributed to achieving gender equality in many areas of public life, enhancing Emirati women’s participation in politics.

In this context, we point out three prominent leadership figures. First, the late Sheikh Khalifa bin Zayed Al-Nahyan, President of the UAE from 2004 to 2022. His

2005 “Political Empowerment Program” was a promise he upheld throughout his presidency (Al-Ghaffi, 2011). He made pragmatic decisions that accelerated women’s participation in the political sphere during his presidency. His final major contribution in this area was implementing a 50% quota for women in Parliament in 2019 (Al-Hammadi & Tohami, 2021).

Second is Sheikh Mohammed bin Rashid Al-Maktoum, Vice President, Prime Minister of the UAE, and ruler of Dubai. He has had a significant influence on federal decisions, legislation, and the policymaking process, specifically through his visionary leadership of the Cabinet of Ministers from 2006 to the present. Finally, we highlight Sheikh Mohammed Bin Zayed Al-Nahyan, the current President of the UAE and a key policymaker well before his presidential tenure began in 2022.

In this section, we highlight significant legislative amendments that boosted Emirati women’s access to decision-making roles to illustrate how the post-Zayed Era witnessed significant legislative reform supporting women and their rights to participate in public, economic, and political life.

5.2.1 Women in the Judiciary

At the federal level, the appointment of women to judicial positions was delayed until 2019, partly due to a legislative obstacle—Federal Law No. (3) of 1983 on the Federal Judicial Authority. Specifically, Article (18) stipulated that a federal judge must be a Muslim male with full legal capacity (Al-Malas, 2022; Public Prosecution in Ras Al Khaimah, n.a.). Hence, women had no legal right to become federal judges. However, Federal Decree Law No. (13) of 2018 amended some provisions of this law, notably removing the masculinity requirement (Al-Malas, 2022). Following this amendment, the first two female federal judges were appointed in 2019 (Ministry of Cabinet Affairs, n.a.).

5.2.2 Women in the Leadership Roles

The UAE has taken similar decisions to guarantee women’s right to leadership positions, such as the UAE Cabinet’s 2012 decision mandating the representation of Emirati women on the boards of directors of federal agencies and institutions (UAE Government, 2023b).

Moreover, the Securities and Commodities Authority called on companies to develop policies that promote gender diversity in the formation of their boards of directors to encourage women to run for board membership, setting a 20% female quota (UAE GCB, n.a.). If this percentage is not met, companies must disclose the reasons for the inability to achieve this percentage and oblige them to disclose the percentage of women’s representation on the board of directors in their annual report to the government (UAE GCB, n.a.).

5.2.3 Equality in the Wages

According to the International Labor Organization (ILO) (2022), women worldwide earn, on average, 20% less than men. To address this challenge, many countries, including the United States of America, the United Kingdom, Sweden, and other Western nations, have enacted legislation prohibiting gender wage discrimination (ILO, 2022).

The UAE explicitly recognized the principle of equal pay in its legislation by amending provisions of Federal Law No. 8 of 1980 regarding the Regulation of Labor Relations, widely known as the Labor Law. Under Federal Decree Law No. 33 for 2021, the principle of gender pay equality in the private sector was introduced (UAE Government, 2023e). As for the public sector, equality in wages between the genders was set in federal government bodies through a 2019 Cabinet decision (UAE GBC, n.a.).

6 Challenges Facing Women's Political Participation in the UAE

As demonstrated in the previous section, the UAE government has taken significant measures to address key obstacles facing Emirati women's participation in decision-making, specifically through legislative and institutional efforts. However, several cultural, social, and political challenges continue to hinder women's political participation in the UAE, which will be addressed in the following section.

6.1 *The Social and Cultural Factors*

6.1.1 Customs, Traditions, and Societal Heritage

Cultural norms, traditional values, and societal heritage have a significant impact on determining women's participation in public life and political endeavors (Al-Zaabi & Al-Rababah, 2006; Al-Othman, 2011; and Abu Al-Khair, 2019; Paxton & Hughes, 2018). In the case of the UAE, these three factors may prevent Emirati women from completing their education, choosing a specialty, or working. It may even restrict them from working in general or limit their career choices to fields that do not involve working with men (Abu Al-Khair, 2019). These issues directly impact Emirati women's capacity to engage in political activities. Without the right to choose a major in college or a work opportunity, how are women expected to participate in politics or even actively hold decision-making positions actively?

Al-Mazroui (2014) attributed the low participation of Emirati women in the FNC electoral process to the nature of Emirati society and its culture. In the first two electoral cycles of 2006 and 2011, there were few polling centers, making difficult

for women to access them. These centers were co-ed, which further limited many women's ability to participate in the electoral process (Al-Mazroui, 2014). Nevertheless, this issue was addressed in the 2023 elections through an online voting option.

In this context, the Global Women's Forum Dubai concluded that the most appropriate solution to issues related to cultural norms and traditional values that prevent women's participation in public life is to emphasize the quality of education and to develop educational policies that address such matters (Dubai Women Establishment, 2020). It also highlighted the role of the public and private sectors in investing in the infrastructure that supports working women, such as safe nurseries and reliable transportation. These recommendations also serve as a key tool for women's broad participation in political life.

6.1.2 Gender Roles

Traditional attitudes toward gender roles have an significant impact on women's political participation worldwide, including in the UAE (Norris & Inglehart, 2001; Al-Zaabi & Al-Rababah, 2006). This issue arises from the expectation that women should to be solely a caregiver at home, prioritizing domestic roles over external responsibilities. Studies indicate that the traditional view of gender roles continues still impacts women's participation in public and political life in the UAE (Al-Zaabi & Al-Rababah, 2006; Al-Othman, 2011; Abu Al-Khair, 2019).

According to a study conducted by UN Women on gender equality in UAE society, more than half of respondents believe that the media portrays women and men only in traditional roles only (UN Women, 2020). As a result, the General Women's Union in the UAE, in cooperation with UN Women, launched an initiative in November 2020 entitled "The Alliance to Change Stereotypes in Advertising in the Emirates," which aims to change the stereotypical view of women's roles in society (UN Women, 2020).

6.2 The Political Environment

6.2.1 Tribal and Kinship System Vs Political Parties

The tribal system is integral to the political and cultural reality in the Gulf states, including the UAE. Despite modernization process that significantly reduced the influence of the tribal and kinship networks in the political participation process, their remnants remain evident. According to Yaghi and Antwi-Boateng (2015), tribal ties and kinship played a significant role in Emirati voters' preferences during the 2006 and 2011 FNC elections. Hence, without a supportive tribe or even family, women's political participation becomes challenging to achieve.

This issue also exists in democratic societies with political parties. In those societies, many women still face challenges integrating into political parties or gaining confidence to participate in political life (Norris & Inglehart, 2001; Paxton & Hughes, 2018). As a result, many countries have introduced gender quotas within political parties system or established quotas in election laws (Paxton & Hughes, 2018).

While the UAE has no political parties, a 50% gender quota was applied to FNC seats. In the 2023 FNC elections, the percentage of female candidates rose to 40%, compared to 36% in 2019, 22% in 2015, 18% in 2011, and only 14% in 2006 (“The national elections,” 2023; UAE Government, 2023f, Al-Mazroui, 2014). Hence, quotas positively affected women’s political participation in the UAE.

Throughout the first three FNC elections (2006, 2011, and 2015), only one woman per election won a parliamentary seat through the electoral process. However, with the introduction of the gender quota system in 2019, the number of elected women increased significantly, with seven out of 20 available seats were won by women through elections, making up 35% of the elected members. The remaining 13 seats (65%) were filled through appointments by the rulers of each emirate, ensuring that women comprised 50% of the total FNC membership (UAE Government, 2023f, Al-Mazroui, 2014).

Consequently, efforts to strengthen the recognition of women’s political participation in the UAE remain imperative, and the impact of the tribal and kinship networks warrants further study and exploration.

7 Conclusion

This paper showcased the UAE’s historical journey in advancing women’s political participation gradually and methodically. These achievements testify to the nation’s progressive vision, leadership, and interconnected role in adopting policies, strategies, and legislation that foster women’s participation in political domains. Transitioning from zero female representation in the executive and legislative branches in 2004 to achieving gender parity in parliament in 2019 is noteworthy. However, these successful milestones achieved so far must be sustained. Furthermore, efforts to confront present hurdles and anticipated challenges should not be underestimated.

In this light, it would be interesting to see the UAE adopt a single strategy for women’s political participation, addressing the challenges women still face in the political sphere. Previous strategies and policies for women were under the broader theme of women’s empowerment. Hence, adopting a specific strategy could be pragmatic for the UAE’s current stage of development to achieve the results that quotas provide without the need for them.

This strategy should develop positive discriminatory measures towards women in politics—for instance, an acceleration program for women in the executive, allowing more women to become ministers. Additionally, the issue of elevating awareness about the significance of women’s representation in the decision-making

process must be effectively addressed in this strategy. Awareness efforts should span all aspects of public policy, encompassing media, education, religion, culture, and beyond, ensuring a holistic approach to fostering gender equality and empowerment in politics. Moreover, it will most importantly link all the institutions and organizations that work to enhance women's political participation under one umbrella, allowing for a collaborative effort across all boards.

While quotas for women have been influential in the case of the UAE, perceptions of women in politics from cultural and traditional perspectives still need to be addressed. Therefore, further studies should be conducted to understand the role of social and cultural factors in shaping women's political participation. For example, what sociodemographic factors influence attitudes towards women's political participation in the UAE? Norris and Inglehart's (2001) study found that generational shifts in developed societies tend to result in more egalitarian views toward gender roles, with younger generations being more supportive of women's participation. Nonetheless, these findings did not apply to developing nations, where traditional values remain deeply rooted. Consequently, evaluating the UAE's situation in this context is crucial to understanding the intersection of cultural norms and women's political empowerment.

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Meta-Analysis of Using AI-Based Feedback Systems in Developing College Students' Academic Writing Skills



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Abstract In a technology-driven world where using artificial intelligence (AI) systems have dominated in all fields, educational institutions have become keen to embrace innovative tools and applications as a fundamental part of teaching-learning to promote learners' skills and competencies. Automated writing feedback systems, which are AI-based tools, are being used excessively at universities to provide students with immediate and timely written feedback; hence, reviewing, analyzing, and synthesizing the methods and results of existing studies in this regard can be considered a crucial headway. Thus, the current study aimed at meta-analyzing the previous studies relatable to the usage of AI-based feedback systems to improve the academic writing skills of university students. Consequently, 35 studies published between 2015 and 2023 were analytically summarized and grouped based on the meta-analysis guidelines established by Cooper (Management Decision 36:493–502, 1998). The results revealed numerous benefits and some challenges of utilizing this technology. It was displayed, for example, that using AI-based feedback systems can significantly improve students' academic writing skills, increase their engagement, promote self-regulation, trigger meta-cognitive writing skills, and provide personalized feedback that facilitates the learning process. Conversely, some challenges were highlighted, especially the overuse of such technologies that can lead to dependent and reliant learners, in addition to the failure of these systems to provide feedback on writings that necessitate higher-order thinking skills, meanwhile offering generic feedback that ignores individual differences. Accordingly, a model for the optimal use of such systems was suggested in the conclusions.

Keywords AI-based feedback · Academic writing · College students · Meta-analysis

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1 Introduction

As a revolutionary recent trend in education, utilizing artificial intelligence (AI) technology has come into focus as a drastic transformation that can have significant impacts across all educational fields and disciplines (Williams et al., 2019; Nan, 2020; Kewalramani et al., 2021). AI technology constitutes a multidisciplinary field that comprises various domains, such as neuroscience, psychology, linguistics, and mathematics (Göçen & Aydemir, 2020). It was also specified as machine imitation of tasks similar to human cognitive processes, including thinking, reasoning, planning, communicating, and predicting (Russell & Norvig, 2003; Solanki et al., 2021). Additionally, this advancement encompasses interpreting and analyzing data by systems to achieve specific objectives, especially as machines can imitate cognitive functions of the human mind and perform tasks associated with human brain functions (Baker & Smith, 2019). As a concept, AI was initially introduced by John McCarthy in the 1950s. Since 1956, AI has gained recognition as an academic subject worthy of investigation in the realm of education with its potential impact on teaching, learning, and assessment (Cordeschi, 2007). Incorporating artificial intelligence (AI) technologies in various educational fields has witnessed a significant improvement, including language teaching and developing students' academic writing skills.

University students' advanced writing skills are crucial for their achievement in higher education and future careers. Developing proficiency in academic writing performance, demands addressing numerous aspects, such as organization, coherence, clarity, and adherence to scientific criteria (Reid, 1993; Brown, 1994; Kellogg & Raulerson, 2007). Enhancing students' academic writing skills has also been associated with feedback provision, which is a fundamental factor that can provide learners with a deeper insight into their performance guiding them toward language proficiency and significantly contribute to improving their writing quality and scaffolding specific areas, especially syntax and vocabulary (Cho & Schunn, 2007; Graham & Perin, 2007; Cavalcanti et al., 2021).

Additionally, through feedback provision, students can become reflective and self-regulated learners who can identify their strengths and weaknesses. Feedback provision can also be delivered through various methods and modes, including written or spoken formats and may be offered by teachers or peers (Hattie & Timperley, 2007; Butler & Winne, 1995). However, traditional methods of writing instruction and feedback provision often encounter limitations, such as time constraints, subjectivity, and inconsistency (Jensen et al., 2021). Thus, these challenges have stimulated the use of recent technology, such as AI-based feedback systems, as potential alternatives to enhance the writing instruction process by providing automated writing feedback (Haughney et al., 2020). Hence, the usage of machine-learning systems for feedback provision on writing has become widespread. These are AI-based feedback systems that embrace automatic language processing techniques and machine-learning algorithms for analyzing students' writing, identifying errors, and conveying beneficial feedback (Chen & Chen; 2018; Tashakkori & Ebrahimi, 2019;

Alharbi, 2023). Through this technology, students can receive comments and suggestions on their syntax, vocabulary, coherence, and other aspects of their writing performance (Zhai & Ma, 2022).

At higher educational institutions, AI-based tools are being excessively utilized to offer students immediate and personalized comments on their academic writing assignments and projects (Popenici & Kerr, 2017; Tashakkori & Ebrahimi, 2019; Alharbi, 2023). *Turnitin*, *Facebook Studio* (Mann, 2017; Li & Guo, 2020), as well as *Grammarly*, are examples of AI-based feedback systems that can identify plagiarism and provide comments on grammar, vocabulary, and coherence. While research has recommended the use of such systems for feedback provision (Li & Guo, 2020; Ngo et al., 2022), concerns were raised regarding the effectiveness and limitations that may emerge in developing students' academic writing performance.

Despite the growing interest in meta-analyzing AI-based feedback tools (Kang & Han, 2015; Ngo et al., 2022; Zhai & Ma, 2022), the exploration of their benefits and potential challenges in developing college students' academic writing skills has been relatively limited and uneven. Although individual studies have shown promising results, a comprehensive meta-analysis, which is a type of research that involves an analytical, systematic and thorough approach to reviewing a wide range of studies (Fraenkel et al., 2018), has become necessary. Thus, this study aimed to display a systematic synthesis and assessment of recent study findings by providing an overview of the benefits and challenges of using automated writing feedback and evaluation, parallel with outlining principles for the optimal practices using such AI-based applications in higher education to enhance students' academic writing performance.

1.1 Questions of the Study

The research questions that guided this meta-analysis study are:

RQ1: What are the benefits of using AI-based feedback systems for improving college students' academic writing skills?

RQ2: What are the challenges and limitations of using AI-based feedback systems for improving college students' academic writing skills?

1.2 Significance of the Study

Developing university students' academic writing skills has been regarded as one of the essential pillars that should be addressed by language teachers and instructors. Academic writing performance was described as a complex and demanding process encompassing various aspects and approaches. It has also been acknowledged as a

time-consuming and formidable mission (Reid, 1993; Brown, 1994; Kellogg & Raulerson, 2007). In a sense, in this meta-analysis study, which is a type of research method where the findings of previous studies related to a certain theme can be analyzed, synthesized, and evaluated (Fraenkel et al., 2018), the significance of the present study can be recapped as follows:

- The outcomes of such a meta-analysis review can contribute to the current literature by providing a thorough and analytical synthesis of the recent studies on the utilization of AI-based feedback systems to develop college students' academic writing skills. This can be advantageous for educators and practitioners during the implementation of such systems.
- The consequences of this study can be valuable for educators, policymakers, and developers of writing instruction tools in understanding the potential benefits, limitations, and proper practices for integrating AI-based feedback tools into educational contexts.
- These findings concerning the usage of AI technologies in fostering students' academic writing skills may contribute to enhancing educational outcomes in higher education.
- This investigation has been distinguished among other studies (Kang & Han, 2015; Zhang, 2021; Ngo et al., 2022; Zhai & Ma, 2022; Fu & Liu, 2022; Fan & Ma, 2022; Wongvorachan et al., 2022; Zhai & Ma, 2022; Alharbi, 2023) by highlighting the uses of AI-based tools in higher education as few meta-analysis studies synthesized the findings of recent research studies (conducted between 2015–2023) and analyzed the advantages and risks of using these systems for developing college students' academic writing performance along with suggesting principles for optimal practices, as performed in this study.

Overall, the significance of the current study can be stated based on its potential to inspire and guide future practices and research to attain the utmost benefits of using AI-based feedback systems in developing students' academic writing skills. Hence, this meta-analysis study endeavored to analyze the results and methods of the previous studies pertinent to the benefits and challenges of utilizing AI-based feedback systems in developing college students' academic writing skills.

1.3 Definitions of Terms

1.3.1 AI-Based Feedback Systems

AI-based feedback systems, in this study, refer to automated writing evaluation (AWE) applications that are utilized to provide personalized feedback to learners or users. These tools, such as *Turnitin*, *Quillbot*, and *Grammarly*, are powered by the Artificial Intelligence (AI) technology (Fleckenstein et al., 2023).

1.3.2 Academic Writing

This is a formal type of writing that is utilized in high school and university classes. It concerns formulating complete sentences, word choice, grammar, organizing of ideas, and so forth (Oshima & Hogue, 2017). In the current study, the main concern is on enhancing academic writing in the English language for college students.

1.3.3 Meta-Analysis

Meta-analysis is a type of research that involves an analytical, systematic, and thorough approach to reviewing a wide range of studies (Fraenkel et al., 2018) regarding a main concern or question/s. In the current study, 35 studies published between 2015 and 2023 were analytically summarized and grouped based on the meta-analysis guidelines established by Cooper (1998) pertained to the utilization of AI-based feedback systems to improve the academic writing skills of university students.

2 Previous Studies

In the context of displaying previous meta-analysis studies concerning the utilization of AI-based applications or automated writing evaluation tools, different research efforts were conducted to investigate this usage from multiple angles.

Kang and Han (2015), for instance, analyzed the findings of 21 studies considering the effectiveness of using written feedback tools in improving students' accuracy in writing. The findings indicated a medium to large positive impact of such apps on developing students' writing accuracy. It was also revealed that students' proficiency level and the type of genre can influence this improvement. Additionally, Lv et al. (2021) analyzed 17 studies that compared the effect of online human feedback with online peer, and automated feedback on students' written performance. The meta-analysis included 15,678 participants, and the results indicated a major effect of automated feedback on students' writing by considering students' proficiency level and the genre. However, it was demonstrated that teacher online feedback achieved a higher influence on the quality of students' writing than online peer and automated feedback.

Likewise, Ngo et al. (2022) examined the effect of using automated writing evaluation on students' writing by meta-analyzing 24 studies conducted between 1993 to 2021. The findings indicated that using these tools can be beneficial and can have a medium effect on students' writing performance. It was detailed also that using such AI tools can improve vocabulary more than grammar for undergraduate students. Besides, *Grammarly*, as an AI-based application was more effective than *Pigai*.

Zhai and Ma (2022), furthermore, meta-analyzed the efficacy of using automated writing feedback applications on students' writing quality. The results of 26 studies ranging between 2010 to 2022 were analyzed by measuring the effect of using these tools on 2468 participants. The findings demonstrated a significant overall effect on the quality of students' writing. Besides, the moderator analysis revealed that using these AI tools can be more effective in argumentative writing than in other genres. In a study conducted by Fleckenstein et al. (2023), 20 studies were also meta-analyzed investigating the effectiveness of automated writing evaluation (AWE) applications on students writing performance. The findings of the analysis revealed a medium effect of such tools on students' writing performance. However, it was also displayed that such AI-based applications cannot be utilized as a single intervention.

Upon a close look at the meta-analysis studies conducted previously related to the usage of AI-based feedback tools, the current study has been distinguished for various reasons. At first, the previous meta-analysis studies examined the effect size of using these tools on students' writing performance. Conversely, in the present study, 35 research articles ranging between 2015 to 2023 were meta-analyzed to investigate the benefits and the challenges of using such applications in developing college students' academic writing skills. Additionally, a model for optimal usage of AI-based feedback systems or automated writing feedback tools was drawn in the current study taking into account the extracted benefits and limitations developing from this investigation. It is noteworthy that the paradigm of analysis used in this research effort was based on Cooper's (1998) criteria, as this model served the objectives of this study.

3 Method

This study followed the meta-analysis approach in analyzing and synthesizing the existing research efforts regarding the benefits and limitations of using AI-based feedback systems in developing college students' writing skills. The procedures followed were based on the guidelines established by Cooper (1998) as follows:

1. Identification of the research questions:
 - (a) The prompted questions were determined to target the possible benefits and limitations of utilizing AI-based feedback systems on college students' academic writing skills.
 - (b) Then, certain variables and search terms were also specified, such as "AI-based feedback systems," "automated writing evaluation (AWE)," "academic writing skills," "college/university/higher education students," "benefits," and "limitations."

2. Searching for relevant studies: A comprehensive search for academic databases and other relevant sources was conducted to identify studies that meet the inclusion criteria.
3. Selection of relevant studies: The selected studies were determined based on the inclusion criteria, as follows:
 - (a) The chosen studies should have been relevant to the benefits and limitations of using AI-based feedback systems in developing college students' academic writing performance.
 - (b) The selected studies should have been published in peer-reviewed journals.
 - (c) The selected studies should have been available in electronic databases including ERIC, Scopus, Web of Science, ResearchGate, and so forth.
 - (d) The exploration was narrowed to studies published in English from 2015 to 2023.
 - (e) The selected studies must have been developed based on a qualitative, quantitative, or mixed approach following different research designs.
4. Data Extraction and Evaluation: Applicable data from the selected studies were determined by identifying the author/s, year of publication, sample size, and research design.
5. Synthesis of results: The outcomes of the meta-analysis were listed in tables and presented and discussed pertinent to the research questions.
6. Discussion and conclusions: The findings were discussed and some recommendations for optimal implementation and future research were suggested.

4 Findings and Discussion

Based on the meta-analysis approach conducted in the present study that intended to investigate the benefits and challenges of using AI-based feedback systems for improving college students' writing skills, 35 studies were synthesized, analyzed, and presented in tables in light of the research questions:

First: Results Pertinent to Benefits of Using AI-Based Feedback Systems in Improving College Students' Writing Skills

Concerning the study's first question, three main benefits were extracted according to the analytical procedures followed in the present investigation, which were as follows:

- (a) The Role of AI-Based Feedback Systems in Improving Students' Writing Skills and Performance.
- (b) The Role of Using AI-based Feedback Systems in Engaging learners in Writing and Enhancing the Learning Experience.
- (c) The Role of Using AI-based feedback systems in Promoting Self-Regulated Learning and Meta-cognitive Writing Skills.

Table 1 The role of AI-based feedback systems in improving college students' writing skills and performance

Author/s	Design	Participants
1. Li et al. (2015)	Mixed approach	60 students
2. Lu and Li (2016)	Mixed approach (pre-post survey and observations)	26 college students
3. Cheng (2017)	Quasi-experimental	138 college students
4. Tang and Rich (2017)	Mixed approach	460 students
5. Lewis Sevcikova (2018)	Review study	...
6. Luo and Liu (2017)	Quasi-experimental	61 college students
7. Chew et al. (2019)	Quasi-experimental	53 students
8. Wang and Li (2019)	Quasi-experimental	100 students
9. Wang (2020)	Mixed approach	60 students
10. Barrot (2021)	Quasi-experimental	60 students
11. Xu and Zhang (2021)	Quasi-experimental	60 students
12. Nazari et al. (2021)	Quasi-experimental	120 students
13. Hassanzadeh and Fotoohnejad (2021)	Mixed approach	53 students
14. Al-Inbari and Al-Wasy (2022)	Mixed approach	44 students
15. Chen and Pan (2022)	Comparative study	10 students
16. Sun and Fan (2022)	Quasi-experimental	73 students
17. Wang and Han (2021)	Mixed approach	70 Chinese students
18. Zhai and Ma (2022)	Meta-analysis	26 studies
19. Alharbi (2023)	Review study	104 studies
20. Dong (2023)	Quasi-experimental	60 students
21. Rad et al. (2023)	Mixed approach	44 students

In respect of the first benefit, the results are listed in Table 1.

As displayed in Table 1, 21 studies were synthesized and organized related to the efficacy of using AI-based feedback evaluation in improving college students' writing skills, performance, and quality. It was revealed that utilizing such systems and tools can be advantageous in evolving students' writing skills compared with receiving no feedback and can help provide timely and specific feedback to students (Li et al., 2015; Lu & Li, 2016; Cheng, 2017; Tang & Rich, 2017; Lewis Sevcikova, 2018; Luo & Liu, 2017; Chew et al., 2019; Wang & Li, 2019; Wang, 2020; Barrot, 2021; Xu & Zhang, 2021; Nazari et al., 2021; Hassanzadeh & Fotoohnejad, 2021; Sun & Fan, 2022; Wang & Han, 2021; Zhai & Ma, 2022; Alharbi, 2023; Dong, 2023). Using AI-based feedback tools; moreover, was described as beneficial in improving writing accuracy, specifically grammar, vocabulary, and complexity (Li et al., 2015; Lu & Li, 2016; Barrot, 2021; Xu & Zhang, 2021).

Additionally, it was shown that using automated feedback tools was effective in improving students' arguments and critical thinking skills in essay and summary writing (Chew et al., 2019; Hassanzadeh & Fotoohnejad, 2021). It was also confirmed that AI-based feedback tools can improve students' writing general proficiency and performance similar to the teacher/human feedback without highlighting

Table 2 The role of using AI-based feedback systems in engaging learners in writing and enhancing learning experience

Author/s	Design	Participants
1. Wilson and Roscoe (2020)	Quasi-experimental	114 students
2. Zhang (2020)	Case study—descriptive study	3 students
3. Barrot (2021)	Quasi-experimental	60 students
4. Seo et al. (2021)	Descriptive study	12 students/11 instructors
5. Fu and Liu (2022)	Review study	26 studies
6. Wang and Han (2021)	Mixed approach	70 students
7. Fan and Ma (2022).	Review study	22 studies
8. Wongvorachan et al. (2022)	Review study	...
9. Hooda et al. (2022)	Comparative study	...
10. Sun and Fan (2022)	Quasi-experimental	73 students
11. Zhai and Ma (2022)	Meta-analysis	26 studies
12. Alharbi (2023)	Review study	104 studies
13. Rad et al. (2023)	Mixed approach	46 students

noteworthy differences between them. Although there were no significant differences demonstrated between AI-based feedback tools and human/teacher feedback, it was asserted that AI-based feedback tools outperformed human feedback in providing timely and specific feedback which may guide students to focus on the fluency of their arguments. Hence, a blended system of AI-based and teacher-based feedback was suggested (Chen & Pan, 2022). Overall, it can be concluded based on the meta-analyzed studies above that using AI-based feedback can improve students’ writing quality and general proficiency more than receiving no feedback.

Regarding the second benefit based on the analysis, it was demonstrated that utilizing AI-based feedback tools can be engaging and motivating for students in writing, and this can enhance their learning experience as well. The results are displayed in Table 2.

As shown in Table 2, 13 studies were organized pertinent to the function of using AI-based feedback systems in engaging students and enhancing their learning experience. According to the studies above (Wilson & Roscoe, 2020; Zhang, 2020; Seo et al., 2021; Fan & Ma, 2022; Wongvorachan et al., 2022; Hooda et al., 2022, Zhai & Ma, 2022; Alharbi, 2023; Rad et al., 2023), it was confirmed that using AI-based feedback systems and tools can engage and motivate students due to the timely and personalized specific feedback that students receive privately. Additionally, it was revealed by Wilson and Roscoe (2020) that students preferred AI-based feedback systems as this technology empowered them to gain more self-efficacy due to feedback objectivity and consistency. In the same vein, Sun and Fan (2022) as well as Wang and Han (2021) confirmed that using AI-based feedback systems can improve students’ confidence while writing and make them less anxious. Generally, the studies in the previous section which overlap with the first section, revealed positive impacts of using AI-based feedback tools on engaging students in writing.

Table 3 The role of using AI-based feedback systems in promoting self-regulated learning and meta-cognitive writing skills

Author/s	Design	Participants
1. Tang and Rich (2017)	Mixed approach	460 students
2. Cheng (2017)	Quasi-experimental	138 college students
3. Hibert (2019)	Descriptive study	11 students
4. Wilson and Roscoe (2020)	Quasi-experimental	114 students
5. Barrot (2021)	Quasi-experimental	60 students
6. Seo et al. (2021)	Descriptive study	12 students/11 instructors
7. Zhang (2021)	Review study	...
8. Hassanzadeh and Fotoohnejad (2021)	Mixed approach	53 students
9. Wang and Han (2021)	Mixed approach	70 Chinese students
10. Al-Inbari and Al-Wasy (2022)	Mixed approach	44 students
11. Zhai and Ma (2022)	Meta-analysis	26 studies

Regarding the third benefit, it was revealed that using such technologies can promote students' self-regulation and metacognitive thinking skills while writing. These findings are presented in Table 3.

As displayed in Table 3, 11 studies were listed regarding the beneficial role of using AI-based feedback technology in promoting students' self-regulation and meta-cognitive writing skills. It was demonstrated (Hibert, 2019; Wilson & Roscoe, 2020; Barrot, 2021; Zhang, 2021; Al-Inbari & Al-Wasy, 2022; Zhai & Ma, 2022) that using AI-based feedback systems can trigger students' meta-cognitive thinking and enhance their self-regulated learning since this technology can support students in reflecting on their writing and determine their weaknesses and strengths; accordingly, students' higher-order thinking skills and self-efficacy may be improved. It was also asserted by Hibert (2019) and Cheng (2017) that AI-automated feedback can enhance the use of meta-cognitive skills and strategies, especially when students start reflecting on the provided feedback and observing the patterns and trends in the comments received. Zhai and Ma (2022) also reported that this technology can positively affect argumentative writing more than any other writing genre. Additionally, using AI-based feedback technology can provide personalized feedback (Zhang, 2021) and facilitate learners' learning, which improves learners' writing performance.

In summary, it was demonstrated in the previous section that using AI-based feedback technology can improve students' writing skills and performance. Several studies have proven positive impacts on students' learning outcomes and scores, and it was also ascertained that specific aspects can be promoted, such as accuracy and sentence structure; fluency; coherence and complexity. This can be interpreted as these tools can provide timely and immediate feedback as well as explanations and suggestions to students in a way that assists them in rethinking the common writing errors and mistakes so that they can become self-regulated, self-directed, and motivated learners, particularly when they acquaint a deep understanding of

their weaknesses and mistakes. Moreover, using AI-based feedback technology and tools can be motivating for students while writing, especially when they are provided with immediate and personalized feedback giving them more room to make revisions and achieve improvements. These findings came in line with previous meta-analysis studies (Kang & Han, 2015; Lv et al., 2021; Ngo et al., 2022, Zhai & Ma, 2022, Fleckenstein et al., 2023) that confirmed the progressive impact of using AI-based feedback tools on improving students’ written work.

Second: Results Pertinent to the Limitations and Challenges Caused by Using AI-Based Feedback Systems to Improve College Students’ Writing Skills

Although various benefits were displayed previously for using AI-based feedback systems, some limitations and challenges, in the current investigation, also emerged, such as providing generic and unfocused feedback, failure to provide feedback on students’ creativity, subjective ideas and other higher-order thinking skills, lack of experience in implementing and utilizing this technology which may limit students’ progression, and the overusing of such systems may cause lack of self-reliance among students.

The related studies are organized in Table 4.

As shown in Table 4, 9 studies were organized in respect of the limitations and challenges caused by using AI-based feedback systems (Li et al., 2015; Roscoe et al., 2017; Ranalli, 2018; Wang et al., 2020; Seo et al., 2021; Benali, 2021; Han et al., 2021; Wongvorachan et al., 2022; Alharbi, 2023).

One of the challenges that can emerge when students use AI-based feedback systems according to Ranalli (2018) is related to the fact that automated systems tend to provide generic and unfocused feedback which can be related to multiple types of mistakes and errors. Besides, Wang et al. (2020) and Li et al. (2015) displayed that automated feedback systems may fail to provide feedback on students’ creativity, subjective ideas, and other higher-order thinking skills, including reasoning, thinking, and argumentation, in addition to the failure of this technology to provide corrective feedback on certain writing aspects, such as organization styles and cultural issues, which need human/teacher feedback (Wilson & Czik, 2016). Another limitation was also revealed pertinent to the teachers’ and students’ lack of

Table 4 Limitations and challenges caused by using AI-based feedback systems to improve college students’ writing skills

Author/s	Design	Participants
1. Li et al. (2015)	Mixed approach	60 students
2. Roscoe et al. (2017)	Descriptive study	110 students
3. Ranalli (2018)	Developmental study	82 students
4. Wang et al. (2020)	Mixed approach	143 students
5. Seo et al. (2021)	Descriptive study	12 students/11 instructors
6. Benali (2021)	Review study
7. Han et al. (2021)	Mixed explanatory study	280 students
8. Wongvorachan et al. (2022)	Review study
9. Alharbi (2023)	Review study	104 studies

experience in implementing and utilizing this technology which may limit students' progression. Roscoe et al. (2017) also presented a critique of using these systems regarding the specificity and personalization of feedback that details each learner's weaknesses and strengths. Although different benefits of using AI-based systems were presented by Seo et al. (2021), some concerns were also displayed regarding students' responsibility and agency. These limitations and others urged for incorporating teacher feedback while implementing these tools and systems (i.e., Han et al., 2021; Benali, 2021).

Overall, while using AI-based feedback systems and technology can yield multiple benefits, several limitations and challenges may arise. These systems may lack the capability to offer feedback on critical thinking and reflective writing. Besides, some concerns have been raised regarding the over-reliance on automated feedback, which may cause more dependency and reduce self-reliance among students. Another challenge was relevant to the disability of AI-based feedback technology in handling language aspects, such as language complexity, contextualization, cultural sensitivity and discourse issues. Pedagogical issues were also stressed in drawing a balance between technology and human (teacher) feedback. Feedback provision by these systems was also described as generic in a way that disregards individual needs and differences.

5 Conclusions and Suggestions for the Optimal Use

The contemporary study strived to analyze studies regarding the utilization of AI-based feedback systems in developing university students' academic writing skills, highlighting the benefits along with the concerns of this integration. The outcomes showed that utilizing these systems can improve students' academic writing performance, enhance their motivation and engagement, and promote self-regulation and meta-cognitive skills parallel with providing personalized feedback that facilitates the learning process. Conversely, some challenges and limitations were also revealed. Accordingly, some conclusions can be drawn as follows:

- Utilizing AI-based feedback tools can effectively improve students' writing accuracy (i.e., vocabulary and grammar), coherence, and mechanics.
- AI-based tools can provide immediate feedback to students, which can support them to make corrections so that they become motivated, especially low-achieving students.
- Using AI-powered feedback tools can be used as an approach to guide students toward more self-regulation and reflective thinking when they analyze their weaknesses and strengths and then come up with decisions regarding their writing performance.
- AI-based feedback systems can engage students and trigger their intrinsic motivation, which can drive them to invest more effort in leveling up their writing performance and proficiency.

- The overuse of these tools may result in dependent and reliant students, and the excessive reliance may make them lack engaging higher-order thinking skills in writing, such as critical thinking and argumentation.
- AI-based corrective feedback may be insufficient to address certain types of errors and mistakes, such as contextual mistakes and cultural inappropriateness.
- Feedback provision by these tools may lack consideration of individual differences as the provided feedback by these systems tends to be generic.
- Using AI-based feedback tools in improving students' academic writing requires incorporating teacher feedback all along, as these tools can not entirely replace human feedback.

Consequently, the optimal implementation of such technology can be achieved by considering the following suggestions:

1. In know-how sessions, educators should introduce specific principles and guidelines for the effective integration of AI-based systems, and they need to set specific objectives and clear expectations before implementation. It is essential, for instance, to determine the specific objectives regarding the type of academic writing that the teacher and students are targeting (i.e., academic essays, emails, etc.).
2. Educators should provide students with a range of options from automated writing feedback tools and applications to select from based on the learning objectives.
3. Educators and students should discuss the possible challenges and limitations in advance to encourage students to ask for support when needed.
4. Incorporating AI and human feedback can be beneficial. Students can receive timely and immediate feedback by such systems followed by discussions with their teachers to obtain individualized and detailed feedback.
5. As the writing skill is complex and comprises multiple aspects, it is beneficial to use such AI-based systems to emphasize on particular aspects of the writing skills, especially sentence structure, word choice and so forth, to achieve better results.
6. Students should be encouraged to concentrate on the process as well as the product of their writing during the implementation. This requires revising, editing, and re-submitting different versions.
7. Educators should promote students' creativity and critical thinking skills during the writing process on a formative base by supporting them to pass through multiple stages before the final evaluation.
8. Educators and students should discuss the aspects that these systems fail to assess and incorporate teacher and peer feedback to assess what such systems cannot evaluate.
9. Educators should address enhancing students' reflective and critical thinking and guide them to obtain more autonomy and self-determination about their writing performance.
10. Educators should monitor students' progression and schedule feedback sessions that incorporate peer and group evaluation.

Finally, utilizing AI-based systems can achieve various benefits in improving students' academic writing. However, these applications should be used cautiously taking into account different considerations.

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The Right to Privacy and Digital Development



Ahmed M. Bamashmoos

Abstract This study examines the evolving landscape of digital privacy amid rapid technological advancements, employing a comparative analytical approach to explore the effectiveness of self-regulation versus statutory regulations across various jurisdictions. Focusing on the European Union and the United States, the paper leverages a qualitative methodology, utilizing legislative texts, judicial decisions, and expert interviews to assess the adaptability and enforcement of privacy laws. The findings reveal critical gaps in self-regulation practices, suggesting a hybrid regulatory framework that integrates the flexibility of self-regulation with the robustness of statutory measures to enhance privacy protections. This study contributes to the discourse by proposing a balanced approach that accommodates technological innovations while safeguarding fundamental privacy rights, highlighting the need for legal frameworks to continuously evolve in response to digital developments.

Keywords Privacy · Digital development · Data protection

1 Introduction

Consider a scenario where your telecommunication company publicly disclosed all your communications and text messages, your bank made all your financial transactions accessible to the public, or your email provider exposed all your emails to anyone who desired to see them (Kugelmann & Kosin, 2018). Now, consider if these companies could also send your information to others. Although this notion may perturb some individuals, others argue that individuals do not need privacy unless they are engaging in illicit activities (Russkevich, 2023). This statement insinuates that only individuals engaged in illicit activities have grounds to conceal their actions and safeguard their data (Boerman et al., 2018). However, this

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argument is flawed since it disregards other crucial aspects of privacy protection, such as dignity, human rights, and privacy (Pasca, 2020).

1.1 Why Privacy Is of Significance?

Privacy protection holds immense importance for various reasons, including safeguarding personal information, upholding democracy, resisting government interference, and preventing the misuse of personal data in today's technologically advanced world (Samonek, 2021). One of the fundamental values that privacy protection ensures is safeguarding an individual's privacy. Without privacy protection, individuals would constantly live in apprehension of being exposed to external scrutiny and would be hesitant to express themselves freely. Moreover, privacy protection enables individuals to maintain their autonomy and determine the extent to which they want to share and preserve information about themselves. This is crucial for upholding democracy, as privacy protection fosters an environment that empowers individuals to participate in public life actively (Stahl, 2020). Inadequate privacy protection could enable political entities to monitor and disrupt associations, thereby undermining individuals' right to self-determination (Volkova, 2023). The advent of the internet and the growth of digital economies and e-commerce have accentuated the importance of privacy protection. Online organizations now offer free services that rely on personal data for targeted advertising, involving the creation of user profiles based on browsing habits, social network preferences, and other emerging data collection methods (Onufreiciuc, 2020).

1.2 The Collection and Utilization of Individual Data

The collection of individual data involves three primary methods: search engines, websites, and internet service providers (ISPs). Search engines serve as the primary portal for internet users seeking information or websites, exposing individuals to the aggregation and retention of personal data associated with their identities (Zimmerman et al., 2019). This leads to the development of extensive user profiles by search engines, encompassing diverse information such as political beliefs, medical conditions, aspirations, and concerns. When users access search engine results, they typically navigate to websites that gather data through explicit requests for personally identifiable information (PII) or the use of tracking technologies like cookies. These technologies allow websites to accumulate user-specific data, including visited pages, time spent, and interactions, all of which can be linked to the user's identity (Kumar, 2020). In addition, ISPs can collect personal data independently of search engines or website visits. Using deep packet inspection, ISPs scan the contents of data packets during their transmission over the internet, extracting personal information that may include emails, documents, or other forms of

communication, all of which can be linked to the user's identity (Pamies-Estrens et al., 2020).

1.3 Data Utilization

Individual data is collected for various purposes, including enhancing their experiences, targeted advertising, and selling data to data brokers. Websites claim to utilize cookie data to enhance individuals' experiences on their platforms, providing personalized shopping carts, remembering passwords, and offering tailored advertisements (Semerádová & Weinlich, 2023). Additionally, individual personal data is extensively employed for targeted advertising by network advertisers. Through contracts with numerous websites, network advertisers collect individual information from search engines and websites, enabling them to create detailed user profiles and deliver personalized ads based on user's interests, preferences, and browsing history (Durántez, 2023). Furthermore, data brokers play a significant role in the data ecosystem by aggregating and selling individual data to other businesses. These data brokers collect information from various sources, including search engines, websites, social media platforms, and public records, to construct comprehensive profiles of individuals that can be sold to interested parties (Urban et al., 2018).

1.4 Privacy Concerns and Risks

The collection and utilization of personal data by various entities raise significant privacy concerns and risks including loss of control and autonomy, potential for discrimination and unfair practices, data security and breaches, and lack of transparency and control (Binsawad et al., 2022). Individuals may feel a loss of control and autonomy when their personal information is collected and utilized without their explicit consent or knowledge, which can create a sense of surveillance and manipulation, eroding their ability to make independent choices and decisions (Bhatia & Breaux, 2018). Moreover, the use of personal data for targeted advertising and decision-making processes can lead to discriminatory outcomes, perpetuating biases and inequalities that result in unfair treatment or opportunities being denied to certain individuals or groups (Heinrichs, 2021). Additionally, the collection and storage of vast amounts of personal data raise concerns about data security, as data breaches and unauthorized access can lead to identity theft, financial fraud, and other forms of misuse with severe consequences for individuals (McCoy et al., 2023). Furthermore, the lack of transparency and control over personal data collection and utilization makes it challenging for individuals to exercise control and make informed decisions about their privacy (Wong & Henderson, 2020). In the digital era, privacy protection is crucial to safeguard personal information, uphold democratic principles, and mitigate the risks associated with data collection.

Striking a balance between the benefits of data-driven technologies and the protection of privacy rights is essential, ensuring that individuals have control over their information and are not subjected to undue surveillance or discrimination.

1.5 Study Contributions

This study enriches the discourse on digital privacy and regulation by conducting a detailed comparative analysis of self-regulation and statutory frameworks, introducing an adaptable hybrid regulatory model, and providing practical insights into the implementation of these frameworks. The paper underscores the necessity for regulations that evolve in tandem with technological advancements, offering a balanced approach to safeguarding privacy while fostering innovation, with broader implications for policymaking and ethical governance in the digital era.

2 Historical and Comparative Analysis of Privacy Laws

2.1 Privacy in Europe

The rapid development of information and communication technology (ICT) and the information society present challenges for the European Community (EC) and the European Union (EU) in terms of employment and global competitiveness. The EC adopted an information society strategy in 1994, revised in 1996, encompassing policy initiatives on social policy, cohesion, employment, and global standardization. To safeguard personal data and ensure its security, the EC established a common regulation framework for data protection. The General Data Protection Regulation (GDPR, 2016), approved in 2016 and enforced in 2018, exemplifies this framework.

This section provides a historical background and legal analysis of Privacy protection in Europe, focusing on the evolution of the directive and the GDPR. Understanding this system is crucial, as the GDPR's influence extends globally through provisions on transferring personal data. The historical background explores EU measures for data protection, including early attempts by the EC. It examines factors influencing these initiatives and challenges in reaching agreements. Implementing EU data protection policies faced compliance issues, the need for agreements with third countries, and difficulties in transnational regulation within a rapidly changing technological landscape.

European countries have attempted data protection at the national level but realized it required international coordination. The Council of Europe (CE) and the Organization for Economic Cooperation and Development (OECD) pioneered transnational legal instruments for data protection (Peaslee, 1974). While adept at addressing legal aspects of national policies and international trade, these

organizations were not equipped to handle technical and communication technology-related issues directly. For this, the European Parliament called on the European Commission to propose a directive on individual freedom and data processing to protect privacy and address economic challenges arising from disparate national legislation in Europe (The European Parliament, 1975). The European Commission, empowered by articles 100(a) and 113 of the EC Treaty, decided to develop the Directive by merging various systems while recognizing its potential impact on constitutional and national laws. The First Proposal Directive was submitted to the Council, EP, and Economic and Social Committee in 1990, followed by recommendations and discussions (Commission of the European Communities, 1990). The Second Proposal Directive was published in October 1992, consisting of an explanatory memorandum, directive text, financial statement, and impact assessment form (European Commission, 1992). The Council reached a Common Position in 1995, which was further amended based on proposals from the EP (European Commission, 1995). The final Directive was accepted by the European Commission in July 1995, marking an ambitious data protection project. However, the Directive came into effect in 1995 when internet access was limited, and privacy concerns over the internet were not yet prominent. Technological advancements, globalization, inconsistent enforcement across jurisdictions, and inadequate protection for personal data processed outside of Europe eventually led to the development of the GDPR.

On November 4, 2010, the European Commission unveiled a strategy aimed at protecting personal data across all policy areas, including law enforcement, while also minimizing bureaucratic burdens for businesses and facilitating the free flow of data within the EU (European Commission, 2010). The Commission engaged the Article 29 Working Party and the Working Party on Police and Justice to publish the “Future of Privacy” document. On January 25, 2012, the European Commission introduced a significant overhaul of the EU’s 1995 data protection regulations, designed to enhance online privacy rights and boost the digital economy. An agreement on the GDPR was finalized on December 15, 2015, and it received approval from the European Parliament on April 14, 2016. Following extensive preparation and discussion, the GDPR was implemented on May 25, 2018 (European Commission, 2012).

The Regulation establishes guidelines for the protection of natural persons with regard to personal data processing and the free movement of such data. The GDPR upholds the fundamental right to personal data protection, ensuring that this right does not impede or prohibit the free movement of personal data within the Union.

2.2 Privacy in the United States

The legal background of data protection in the United States includes the Constitution, case law, government efforts, state efforts, and industry efforts in privacy protection.

The Constitution Although the US Constitution does not directly articulate a right to privacy, various amendments provide protections that relate to privacy concerns. The First Amendment safeguards individual beliefs, the Third Amendment shields the privacy of the home, the Fourth Amendment guards against unreasonable searches, the Fifth Amendment protects against self-incrimination, the Ninth Amendment recognizes rights retained by the people, and the Fourteenth Amendment pertains to due process and liberty. Nevertheless, the degree to which the Constitution defends privacy rights remains a contentious issue. There can be tensions between privacy rights and the First Amendment, as upholding privacy may sometimes restrict freedom of speech.

Case Law The text provides a historical review of significant case law that has shaped privacy discussions in the United States. The cases highlighted cover a range of topics related to privacy rights and interpretations of the Constitution. The first notable case discussed is *Packer Corporation v. Utah* (1932), where Justice Brandeis suggested that the court should consider the circumstances under which privacy interests are violated, laying the groundwork for the distinction between privacy in the home and the public. The text also covers cases related to intellectual property and privacy, such as *Hoyt v. MacKenzie and others* (1848) and *James Woolsey v. Owen B. Judd* (1855), which explored the question of whether unauthorized publication of letters infringes on the right to privacy or property rights. *Griswold v. Connecticut* (1965) is highlighted as a significant case where the Supreme Court struck down a state law restricting contraceptives, establishing a right to privacy in marital relations. This case introduced the concept of penumbras, or zones of privacy, derived from various amendments in the Bill of Rights. *Katz v. United States* (1967) dealt with government surveillance and the use of eavesdropping devices. The Court expanded the scope of the Fourth Amendment's protection beyond physical premises, stating that it safeguards people, not just places, and requires a reasonable expectation of privacy. Other notable cases include *Stanley v. Georgia* (1969), which invalidated a law prohibiting the possession of obscene materials in the home, and *Roe v. Wade* (1973), which recognized the right to privacy as fundamental in the context of abortion. The text also mentions cases involving privacy in the workplace, such as *O'Connor v. Ortega* (1987) and *United States v. Simons* (2000), where the Court addressed the extent of privacy expectations for public employees.

In summary, the interpretation of the “reasonable expectations of privacy” principle differs between the European Court of Human Rights (ECHR) and US courts. US courts have a broad interpretation allowing for privacy violations if they can be expected, while the ECHR limits privacy expectations to cases where infringement is lawful and justified for reasons like national security or public safety. The European context is more restricted based on legislated exceptions.

Government Efforts in Data Protection The US government has implemented various laws to protect individual privacy and data. These include the Fair Credit Reporting Act (FCRA) in 1970, the Family Educational Rights and Privacy Act (FERPA) in 1974, the Privacy Act in 1974, the Right to Financial Privacy Act (RFPA) in 1978, the Electronic Fund Transfer Act in 1978, the Privacy Protection Act in 1980, the Cable Communications Policy Act in 1984, the Electronic

Communications Privacy Act (ECPA) in 1986, the Computer Security Act in 1987, the Video Privacy Protection Act in 1988, the Computer Matching and Privacy Protection Act in 1988, the Driver's Privacy Protection Act in 1994, the Safe Harbor Agreement, and the Fair Information Practice Principles. In 2015, the Consumer Privacy Bill of Rights Act was proposed but faced criticism for lacking sufficient consumer protections.

States' Efforts in Data Protection Several US states, including California, Connecticut, Hawaii, Illinois, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, New York, North Dakota, Pennsylvania, Rhode Island, Texas, and Washington, have undertaken initiatives to protect data. These efforts encompass various provisions such as access to personal information, rectification, deletion, data portability, opt-out of personal information sales, breach notification, risk assessment, and more. While some of these initiatives may not become laws, they reflect state-level attempts to address data protection issues in the United States.

Industry Efforts in Protecting Individuals' Privacy There have been several industry-led efforts to protect individuals' privacy, including the Individual Reference Services Group (IRSG), the Online Privacy Alliance (OPA), the Council of Better Business Bureaus (BBBOnline), the Network Advertising Initiative (NAI), and the Privacy Leadership Initiative (PLI). These initiatives aimed to establish self-regulation measures and guidelines for privacy protection. However, many of these programs faced challenges such as lack of compliance monitoring, ineffective enforcement, and inadequate participation. They were criticized for being general, lacking credibility, transparency, and failing to keep up with evolving privacy concerns. These experiences support the argument that self-regulation may not be sufficient in ensuring robust privacy protection.

3 Literature Review

The literature on privacy and digital development highlights the significant challenges and considerations in balancing privacy protection with the rapid evolution of technology. This review will explore the various perspectives and findings in the existing literature, focusing on privacy concerns, self-regulation, and regulatory systems.

3.1 *Privacy Concerns and Digital Development*

The rapid development of digital technologies has intensified privacy concerns, particularly regarding the collection, utilization, and security of personal data. The proliferation of digital platforms and services has led to increased data collection, raising significant privacy issues as individuals often lack control over how their data is used and shared (Sharma, 2023). This concern is echoed by other researchers

who emphasize the need for robust privacy protections to address the potential for data breaches and misuse of personal information (Bogossian, 2021).

3.2 Self-Regulation Systems

Self-regulation is often advocated as a flexible and adaptive approach to privacy protection. Proponents argue that self-regulation allows industries to develop standards tailored to their specific contexts, promoting innovation while maintaining privacy (Pratomo et al., 2023). For instance, it has been demonstrated that self-regulation can be effective in industries where rapid technological change is prevalent, as it enables quicker adaptation to new developments compared to statutory regulations (Gorog, 2021). However, criticisms of self-regulation highlight its reliance on voluntary compliance and the potential for conflicts of interest, with arguments that without enforceable penalties, self-regulation may fail to adequately protect consumer privacy (Du et al., 2020).

3.3 Regulatory Systems

Regulatory systems, such as the GDPR in the European Union, are designed to provide comprehensive and enforceable privacy protections. The GDPR is often cited as a model for data protection, establishing stringent requirements for data handling and giving individuals significant rights over their personal data (Asghar et al., 2019). Studies have shown that the GDPR has significantly impacted global privacy practices, influencing regulations in other jurisdictions (Meurisch & Mühlhäuser, 2021). However, the implementation of such regulatory frameworks poses challenges, including compliance costs for businesses and the need for continuous updates to keep pace with technological advancements (Ruslan, 2023).

3.4 Comparative Analysis

Comparing self-regulation and regulatory systems reveals distinct advantages and limitations of each approach. Self-regulation offers flexibility and industry-specific solutions but may lack the enforcement mechanisms necessary to ensure compliance (Montalbano, 2021). On the other hand, regulatory systems provide clear and enforceable standards but can be less adaptable to rapid technological changes (Li et al., 2018). It is suggested that a hybrid approach, combining elements of self-regulation with strong regulatory oversight, could offer a balanced solution,

leveraging the strengths of both systems to enhance privacy protection in the digital age (Thakur et al., 2023).

3.5 Conclusion

The literature underscores the complexity of protecting privacy in the context of digital development. While self-regulation provides flexibility, its effectiveness depends on the commitment of industry participants and the presence of robust enforcement mechanisms (Scholl, 2018). Regulatory systems, exemplified by the GDPR, offer comprehensive protections but face challenges in keeping up with technological changes. A hybrid approach that integrates self-regulation with regulatory frameworks (Mihaela-Sorina et al., 2020) may provide a more effective solution, ensuring that privacy protections evolve alongside technological advancements (Fitsilis, 2019).

4 Methodology

4.1 Paper Design and Approach

This study employs a qualitative, comparative analytical methodology to examine the effectiveness of different legal systems in safeguarding privacy amid rapid digital advancements. We selected various jurisdictions known for their distinctive approaches to privacy regulation, including the European Union and the United States, to provide a comprehensive understanding of global privacy protections. The criteria for selecting these jurisdictions were based on their influential privacy laws, such as the General Data Protection Regulation (GDPR) in the EU and sectoral privacy laws in the United States, and their impact on international privacy norms.

4.2 Data Sources

Our primary data sources included legislative texts, judicial decisions, government reports, and authoritative academic analyses pertaining to privacy laws. We focused on these sources within the specified jurisdictions to capture a broad spectrum of privacy regulations and their implementations. This approach allowed for a detailed examination of the frameworks and their adaptations to technological changes.

4.3 Analytical Framework

The study's analytical framework centered on evaluating the adaptability of privacy laws to technological innovations and their effectiveness in enforcement. We assessed regulatory effectiveness through indicators such as compliance rates, the scope of enforcement actions, and the flexibility of laws in adapting to new technological contexts.

4.4 Data Collection Methods

Data were collected through comprehensive document analysis, involving a thorough review of relevant legal statutes, case law, and regulatory guidelines. This process was supplemented by consultations with legal experts via interviews to gain deeper insights into the practical implementation and challenges of these privacy laws.

4.5 Data Analysis

Our analysis involved a side-by-side comparison of legal provisions across different systems, a thematic analysis of legislative intents, and an examination of case law developments. We used qualitative data analysis software to organize and code the data, ensuring a systematic approach to identifying themes and drawing conclusions.

4.6 Limitations and Ethical Considerations

We acknowledge limitations such as the potential bias in selecting jurisdictions and the interpretative nature of legal analysis. These were mitigated by incorporating a diverse range of sources and expert opinions. Ethical considerations were addressed by ensuring confidentiality and informed consent in expert interviews.

5 Discussion

This section critically analyzes the key findings of our study within the broader context of existing research on privacy and digital development. By examining the dimensions of flexibility and implementation in privacy protection systems, we juxtapose our results with the established literature, identifying gaps and providing a nuanced understanding of where our findings align or diverge from previous

studies. Through this comparative analysis, we aim to highlight the unique contributions of our research and suggest practical recommendations for both policymakers and industry practitioners.

5.1 *Flexibility*

Flexibility holds significant importance in this discussion, as legislation is traditionally characterized by stability and immutability, while technology undergoes rapid and continuous development.

Flexibility in Self-Regulation Systems Advocates from the industry posit that self-regulation systems offer greater flexibility in their implementation, allowing for adaptation to the evolving nature of technology, accommodation of diverse cultures, and differentiation among industries. They contend that privacy regulations would be detrimental to individuals and industries, as they may struggle to keep pace with technological advancements and address the specific needs of different cultures and industries (Hytha et al., 2019).

An important consideration in this discussion is the feasibility of regulating online privacy due to the rapid and constantly evolving nature of electronic environments. The current landscape of the World Wide Web differs significantly from just 2 years ago, with a substantial increase in the number of web users. Industry proponents argue that self-regulation is better suited for rapidly changing industries like e-commerce. They assert that industry-led initiatives can anticipate future technologies, monitor business developments, and establish adaptable design standards. They contend that self-regulation systems remain more flexible than regulation measures, as they can readily adapt to unforeseen circumstances (Cusumano et al., 2021). This perspective is based on the dynamic interplay between technology and policy formation. Regardless of whether policymakers rely on courts, statutes, or moral persuasion to regulate or control technological development and usage, these regulation mechanisms interact with technology in complex ways, as technology itself continues to evolve. Consequently, privacy regulations may struggle to keep pace with these changes, quickly becoming outdated and ill-suited for their intended purpose (Cusumano et al., 2021). This could potentially mislead individuals into believing they are adequately protected when enforcement becomes challenging due to the dynamic nature of technology. Furthermore, proponents of self-regulation argue that it offers greater flexibility from a cultural standpoint, particularly when it is devised as a solution by the industry itself, allowing for regional and cultural variations to account for the diverse standards of different societies. In countries with a federal system governing different states and varying perspectives, self-regulation systems can yield clear benefits (Cusumano et al., 2021).

In conclusion, industry proponents argue that self-regulation systems circumvent bureaucratic constraints often associated with regulations and offer greater flexibility in adapting to the dynamic nature of technology, accommodating diverse cultures, and tailoring measures to suit different industries.

Flexibility in Regulation Systems Privacy regulations can indeed possess the necessary flexibility to achieve their intended objectives without conflicting with future changes or diverse industries. One approach to fostering flexibility in privacy regulations is using open wording. Instead of prescribing specific requirements for securing data, regulations can be designed with future considerations in mind by establishing a minimum-security baseline that data must adhere to (Stevens et al., 2022). This method promotes proactive measures by industries to secure their systems, prevent data breaches, and effectively report any mitigation failures. Each industry is responsible for preparing for and mitigating damages resulting from cyberattacks, to swiftly return to normal business operations.

In essence, privacy should be a fundamental aspect of any invention, even those currently unimaginable. Like the importance of safety and security for automobile manufacturers, industries that utilize electronic data have the right to pursue innovation, development, and inventions within their respective fields. However, these endeavors should be aligned with the principles of safety and security. It would be illogical and unacceptable for automakers to claim that safety regulations restrict their flexibility. Likewise, assertions that privacy regulations fail to differentiate between industries are unsubstantiated. Safety, security, and privacy are universal requirements applicable to all industries, whether automotive, smartphone-related, or any other sector.

A balanced approach to flexibility can be observed in the GDPR model. For example, when determining the necessary level of security under the GDPR, the regulation does not impose specific security measures that industries must adopt. Instead, it mandates that industries maintain a security level deemed “appropriate” to the risks associated with their data processing activities (Gonçalves-Ferreira et al., 2019). Industries must consider factors such as the current state of technology, implementation costs, as well as the nature, scope, context, and purpose of their data processing. This reflects the risk-based approach of the GDPR, recognizing that a one-size-fits-all solution for information security is inadequate. What constitutes an “appropriate” level of security will vary depending on the unique circumstances, processing activities, and associated risks within each industry. Before determining suitable measures, industries are expected to conduct assessments of their information risks. This involves evaluating the personal data they hold, its value, sensitivity, confidentiality, as well as potential damages or distress that may arise in the event of data breaches. While the GDPR cannot provide an exhaustive guide to security measures in all situations, it serves as a framework that highlights key considerations for industries to evaluate.

5.2 *Implementation*

One of the most important elements of this discussion is the extent to which privacy protection policies are complied with and implemented, whether through self-regulation systems or regulation systems.

Implementation in Self-Regulation Systems Advocates of self-regulation contend that the market can adhere to privacy policies without the necessity of binding regulation measures. Recent studies and reports indicate that industries are increasingly complying with privacy principles (Jiang & Syn, 2022). For instance, the IAPP-EY Annual Privacy Governance Report 2021 highlights that a significant number of organizations have adopted privacy frameworks and reported improvements in privacy governance practices. The report shows that 74% of organizations have implemented a formal privacy program, demonstrating the growing commitment to self-regulation in protecting privacy (IAPP, 2021). Additionally, self-regulation frameworks like the Network Advertising Initiative (NAI) have shown progress in ensuring that companies adhere to privacy guidelines, with annual compliance reports indicating a growing number of members and stricter adherence to their Code of Conduct (NAI, 2021).

Advocates of self-regulation systems posit that self-regulation fosters a higher likelihood of market participants complying with rules established and enforced by their peers. Industries that engage in voluntary programs are more inclined to demonstrate loyalty to these rules compared to regulations imposed by the government. Moreover, self-regulating industries develop a stronger sense of ownership over the rules they govern and are more readily agreeable to them. This ownership reduces delays and administrative costs associated with market challenges to regulations (Barkatullah, 2018). Furthermore, self-regulation is more politically feasible than direct government mandates (Lancieri, 2021).

Implementation in Regulation Systems *The Voluntary Nature of Market Compliance.* The primary challenge to achieving compliance and implementation lies in the voluntary nature of self-regulation systems. Industry participants lack the governmental authority to impose fines, punishments, or incentives to encourage their peers to adhere to market standards (Jiang & Syn, 2022). Considering that industries do not always prioritize individuals' best interests, it is more likely that business compliance will be driven by profit objectives. Even industries committed to protecting individuals' privacy may occasionally compromise privacy protection standards if it is deemed competitively necessary (McKinsey & Company, 2020).

Furthermore, certain industries engage in the collection and sale of information for profit, regardless of their connection to the Internet. Such industries are unaffected by the utilitarian momentum of self-regulation. Consequently, the voluntary nature of self-regulation systems would be ineffective in addressing such industries, necessitating regulatory intervention as the only viable solution (Kovács et al., 2018). In fact, in 2014, the Federal Trade Commission (FTC) called for additional guidelines for "data brokers" to safeguard individuals' privacy, citing insufficient resolution of regulatory concerns through monitoring and enforcement by self-regulation organizations (FTC, 2014).

Finally, the absence of sanctions within self-regulation systems for non-compliant industries results in many industries passively observing as their competitors voluntarily subject themselves to costly self-regulation standards, subsequently

benefiting from the improved market reputation associated with protecting individuals' privacy (IAPP, 2018).

Adverse Reports on Market Compliance Empirical evidence demonstrates that the market experience has failed to adhere to and implement privacy protection policies for industries' personal data, contrary to the assertions of proponents of self-regulation systems (Sabatino & Sapi, 2022). The Electronic Frontier Foundation (EFF) in its 2019 Privacy Report highlighted ongoing issues with transparency and accountability in self-regulated industries, noting that many companies still fail to adequately protect user data or provide clear privacy policies (EFF, 2019).

A subsequent study conducted in 2021 assessed the data protection policies of 600 companies, accounting for approximately 10% of all listed companies on the NYSE, Nasdaq, and AMEX stock markets. The study spanned various industries and found that between 20% and 50% of the companies did not have an online data protection policy on their websites (Zaeem & Suzanne Barber, 2017). Although nearly every company aggregated data, they claimed to use it solely for intended purposes. Furthermore, almost half of the companies provided collected information to law enforcement without requiring a warrant or subpoena (EFF, 2023).

These reports and studies collectively lead to the inevitable conclusion that when a particular industry experiences repeated violations that affect millions of innocent victims, regulatory intervention may be warranted. Without regulations in place to ensure fair and public usage, different entities will continue to operate at their discretion. Regulatory actions are typically implemented to benefit the public and safeguard their interests (Schomakers et al., 2020). Regulations can be found in various industrial sectors, whether they aim to prevent monopolies, provide free and equal access to information, guarantee professional freedom for all individuals, or ensure the overall safety of the public and workers (CNET, 2020).

The FTC recognized the significance of regulating individuals' personal data protection when it recommended a legislative response mandating websites to adhere to the Fair Information Practice Principles (FIPPs). However, the Commission also suggested that any legislative solution should be adaptable and encourage self-regulation, acknowledging the ever-evolving nature of the Internet (FTC, 2021).

6 Conclusion

This paper has delved into the evolving dynamics between digital advancement and privacy regulation, revealing that the rapid pace of technological change necessitates a robust and adaptive legal framework. Our comparative analysis underscores that while self-regulation offers initial flexibility and industry-specific customization, it falls short in providing consistent and enforceable privacy protections. This is in alignment with findings from Kugelmann & Kosin (2018) and Boerman et al. (2018), who also highlight the inadequacies of self-regulation in the face of complex digital transformations.

Further, our study suggests that regulatory systems like the GDPR provide a more reliable framework for privacy protection, as they incorporate enforceable standards and comprehensive rights for individuals. This supports the arguments made by Semerádová and Weinlich (2023), who note the significant impact of GDPR on setting a global precedent. However, our findings also reveal that even robust frameworks like the GDPR require continuous updates to cope with new technological challenges, echoing concerns about the adaptability of strict regulatory systems.

The unique contribution of this paper lies in proposing a hybrid regulatory approach that combines the adaptiveness of self-regulation with the enforceability of formal regulations. This model aims to leverage the strengths of both systems to address the rapidly evolving nature of digital technologies and the corresponding privacy concerns. By doing so, it adds a critical perspective to the ongoing discourse on privacy regulation, suggesting that neither regulatory extreme—complete self-regulation nor full governmental control—is sufficient on its own.

Our conclusions recommend that future legal reforms consider the flexibility of hybrid models to ensure that privacy protection evolves in tandem with technological advancements. This approach not only addresses the limitations identified in the existing literature but also proposes practical steps for enhancing the effectiveness of privacy laws in protecting individual rights in the digital age.

By integrating these insights and recommendations, this paper contributes to the broader understanding of privacy protection in the digital era and underscores the need for continuous legal adaptation to technological changes. Such contributions are vital for policymakers, industry leaders, and scholars as they navigate the complexities of digital privacy and strive to uphold fundamental human rights in an increasingly interconnected world.

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Perception of Omani Women on Exclusive Breastfeeding



Zalikhha Al-Marzouqi, Rebecca Smyth, Carol Bedwell, and Tina Lavender

Abstract Background: Exclusive Breastfeeding (EBF) signifies that the infants have acquired only breast milk from their mothers or expressed milk and no liquids or solids, excluding syrups such as mineral supplements, vitamins, or medications. The Ministry of Health statistical report registered that 92.1% of Omani mothers began EBF at birth but reduced significantly when the baby completed 6 months after birth to 10.2%. This drop indicates the necessity of examining Omani mothers' experience of EBF. **Aim:** This study aimed to investigate Omani mothers' experiences of EBF. **Methodology and Methods:** The study utilized a qualitative design (exploratory) using grounded theory approaches. The study included 11 postnatal women, 5 relatives of the mothers who participated, and 7 healthcare experts. Purposive and theoretical sampling was utilized, and 69 interviews (semi-structured) and 15 non-participant observations were conducted. A constant comparative analysis was performed. **Findings:** The theory "Resilience: The Power to Breastfeed" was developed, which indicates that the ability of Omani mothers to breastfeed capacity relies on their resilience. **Discussion and Conclusion:** The results revealed that mothers' capacity to breastfeed relies on their ability to adjust to challenges while breastfeeding. This study benefits in comprehending the social processes concerned with EBF. The results could inform plans or educational programs for enhancing the rate of breastfeeding in Oman, empowering healthcare professionals, researchers, policymakers, and educators involved in maternal and child health in Oman to take action based on these findings.

Keywords Breastfeeding · Exclusive · Women · Perception · Oman

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1 Introduction

Breastfeeding is essential for newborns' and mothers' health. The World Health Organization (WHO) provides global approaches to feeding for newborns and babies and advocates for breastfeeding. Exclusive Breastfeeding (EBF) means newborns receive only breast milk from their mothers and no liquid or solids, excluding syrups such as mineral supplements, vitamins, or medications. The WHO advised that mothers exclusively breastfeed their babies 6 months after birth to ensure the best health. Then, babies must be supplied with Supplementary feeding and resume lactation (WHO, 2019). EBF has been acknowledged as a practical path to acquiring health due to its advantages. Breast milk is comfortable during digestion, has plenty of minerals, vitamins, and proteins essential for the newborn's immunity, and contains a lower load of solute (Hay & Bærug, 2019). Breastfed babies have a reduced threat of encountering several diseases due to the fantastic immune-protective characteristics of breast milk (Scott et al., 2019). For instance, newborns are guarded against childhood disorders, such as diarrhea, gastrointestinal tract diseases, allergic conditions, diabetes, obesity, bowel disorders, leukemia and lymphoma, and inflammation when they exclusively breastfeed 6 months after birth (Scott et al., 2019). Breastfeeding is essential to the health of mothers who exclusively breastfeed. Mothers would recuperate from delivery quickly (Scott et al., 2019). Early breastfeeding initiation reduces postpartum hemorrhage risk (Scott et al., 2019). It has also been recognized that breastfeeding aids the uterus return to its place by producing the hormone oxytocin (Scott et al., 2019).

Despite applying in 1992 the Baby-Friendly Hospital Initiative (BFHI), Oman has many challenges keeping high and reasonable rates of EBF. EBF rate decreases noticeably, especially when newborns complete 6 months after delivery. In 2020, 92.1% of mothers began EBF, and just 10.2% exclusively breastfed at 6 months after delivery. Before the Renaissance in 1970, Omani women's functions were restricted to caring for their homes and families; thus, they could breastfeed their newborns exclusively. After the Renaissance, many Omani women worked out of their homes to help their families economically. The lower EBF rate indicates the necessity of investigating EBF in Oman. In addition, the factors that affect EBF among women are not yet known. In Oman, the low breastfeeding rate might be due to a lack of support for breastfeeding mothers, such as providing accurate information, practical support, and emotional encouragement (Al-Ghannami & Atwood, 2014). The expanded advertisement of artificial milk might be another factor. Thus, examining mothers' EBF experience and comprehending the causative factors that influence EBF from the perspectives of mothers, their relatives, and healthcare experts is crucial. Identifying the sociable processes underlying EBF acts within the Omani context is also noteworthy.

In 2020, it was alarming that the EBF rate had dropped from 92.1% at birth to 10.2% 6 months after delivery (MOH, 2021). This drop underscores the urgency of exploring EBF acts by delving into the mothers' EBF experiences. Notably, one research study about breastfeeding using a quantitative approach was conducted in

Oman (Al-Ghannami & Atwood, 2014). In 1992, a survey was performed to investigate the preponderance of breastfeeding in one region (Suliman et al., 1992). However, attempts have yet to examine mothers' EBF experience in Oman. This study, therefore, aims to fill the gaps about EBF from various social, cultural, health, and economic aspects. It will be the first qualitative study utilizing a constructivist grounded theory methodology to explore Omani women's experiences with EBF. By examining the perspectives of EBF among Omani mothers and different parties, this study promises to shed new light on EBF and the ways to improve it, investing hope for a better future of EBF acts in Oman. The current study is necessary for mothers and their relatives, healthcare experts, policymakers, and community, as it explains EBF. The MOH plays a crucial role in promoting and supporting EBF, and this research study will participate in the health benefits delivered by the MOH, such as determining unsuitable procedures or upgrading new services about EBF in health organizations. Comprehending EBF mothers' experience is paramount to developing a health education program that is established on mothers' demands and builds an EBF program based on Omani culture. The theory developed from this investigation will aid other investigators in studying various elements of EBF. Therefore, the current study will act as a foundation for coming studies.

2 Literature Review

After reading and synthesizing the studies, essential conceptions were grouped into the next themes:

- Breastfeeding motivators.
- Breastfeeding supports.
- Breastfeeding experience.

2.1 *Breastfeeding Motivators*

Many women described their passion for breastfeeding in words like "I desired to breastfeed" (Durmazoğlu et al., 2020, p. 27). It could be noticed that numerous motivators affected mothers' choice for breastfeeding, such as understanding that EBF is the soundest choice, the profound sense of accountability due to religious consequences on their determination to breastfeed, assuming EBF as a biological method, and connecting EBF with motherliness. One of the motivators for the mother's choice of EBF was to provide newborns with the most suitable nutrition (Brown et al., 2016). Evidence revealed that women recognized the advantages of EBF for their babies, which was the leading justification for EBF (Rabb et al., 2023). Mothers were encouraged to breastfeed because they understood that EBF supplies their newborns with vitamins, nutrition, and improved immunity (Rabb

et al., 2023). EBF enhances the emotional connection between mothers and newborns (Hawley et al., 2015).

Many women linked breastfeeding with being a mother and understood breastfeeding as their duty; thus, they wanted to breastfeed (Gyamfi et al., 2021). Mothers' capacity to breastfeed was connected with a good mother, and their families would be happy when mothers were breastfeeding (Brouwer et al., 2012). The women also assumed that if they did not breastfeed, relatives or friends would judge them negatively (Gyamfi et al., 2021). In addition, women were encouraged to breastfeed because they noticed EBF as a biological process (Wandel et al., 2016). They also thought breastfeeding would be direct, effortless, and without pain (Wandel et al., 2016). Moreover, mothers indicated they wanted to breastfeed as the Holy Quran recommended for 2 years or more (Dorri et al., 2022). This religious belief was a significant motivator for many women, as Gyamfi et al. (2021) found in their study involving Muslim and Christian women, who assumed that God constructed breasts to feed the babies; thus, they were inspired to breastfeed.

2.2 Breastfeeding Supports

Most mothers preferred receiving help when breastfeeding from their relatives, mates, and healthcare experts (Hawley et al., 2015). The function of healthcare experts such as midwives in this help network is particularly crucial, as they can provide medical advice, emotional support, and practical assistance. Mothers noticed help and support while breastfeeding as a vital factor in breastfeeding (Rabb et al., 2023) and the success of the breastfeeding process (Hawley et al., 2015). Gyamfi et al. (2021) described that mothers who obtained diverse levels of help while breastfeeding from their relatives, mates, and healthcare experts were significantly more likely to resume breastfeeding. This emphasizes the importance of the help provided by healthcare experts and the influence it can have on a mother's determination to resume breastfeeding. Many women felt worried when the people they trusted would not support them while breastfeeding (Gyamfi et al., 2021). Many mothers also valued support based on counseling, advice from others, learning from mothers who had breastfeeding experience, and acquiring praise when breastfeeding (Gyamfi et al., 2021).

2.3 Breastfeeding Experience

This review uncovers a rich tapestry of experiences among breastfeeding women, with a strong focus on the positive aspects. Some women found immense joy in breastfeeding, citing its numerous benefits (Dietrich-Leurer & Misskey, 2015). They spoke of the monetary godsend, such as saving money (Gyamfi et al., 2021), and expressed their pride and pleasure (Dietrich-Leurer & Misskey, 2015). These

women openly shared their sense of achievement in nourishing their newborns from their breasts, a profound aspect of motherliness (Hawley et al., 2015). Notably, these positive experiences fortified their confidence in breastfeeding (Dorri et al., 2022).

On the other hand, some mothers clarified their breastfeeding experiences as complex, stressful, effortful, and crushing (Hawley et al., 2015). Considerable studies determined biological discomforts during breastfeeding, such as nipples hurt, inverted, and sore (Hawley et al., 2015). These physical challenges prevented the baby from latching correctly to the breasts and led to a negative breastfeeding experience (Hawley et al., 2015). Another negative breastfeeding experience was mothers' thinking of believing in insufficient milk (Rabb et al., 2023). The mothers thought that the causes for inadequate milk were deficient nutrition and lacking rest, so the women provided artificial milk (Rabb et al., 2023). Breastfeeding in public was another unfavorable experience expressed by many mothers (Dorri et al., 2022). For instance, it is not allowed for Muslim mothers to breastfeed in front of men but their husbands (Dorri et al., 2022). Other mothers perceived breasts to be a sexual part; thus, they felt shy about breastfeeding in public (Hinsliff-Smith et al., 2014). The absence of confidential spaces in public areas is also one reason not to breastfeed (Hinsliff-Smith et al., 2014). Therefore, mothers supply bottle-feeding for their newborns (Hinsliff-Smith et al., 2014). Also, employment impacted mothers' experiences of breastfeeding. They discussed issues with the lack of workplace support, such as not having any personal spaces to extract milk (Rabb et al., 2023). Working mothers also encounter a conflict between duties and breastfeeding (Lee et al., 2013). After joining the occupation, many working mothers quit breastfeeding because they could not maintain harmony between work and breastfeeding (Rabb et al., 2023).

3 Methodology

3.1 Study Aims

This study aimed to explore Omani women's experiences of EBF. It also aimed to develop a theory built from women's experiences of EBF.

3.2 Study Objectives

- To study Omani women's perceptions and experience of EBF.
- To explore the obstacles and enablers related to EBF.
- To examine the views of relatives and healthcare experts on EBF and how they support women while breastfeeding.

4 Study Design

A qualitative design investigated participants' daily engagement, experiences, and connections (Charmaz, 2014). A grounded theory approach, a highly applicable method, was used to guide a study that aims to develop a theory explaining how individuals view and see their world and how they engage with it (Charmaz, 2014). Grounded theory also permits the life of individuals to be mainly noticed and from their stances (Charmaz, 2014). Grounded theory is a collection of procedures for describing and explaining sociable processes during individuals' interaction via methodical data accumulation and analysis (Charmaz, 2014). Grounded theory, known for its relevance in investigating social relationships and actions, was considered the most appropriate approach when there are narrow studies on the aspects that concern individuals' backgrounds (Charmaz, 2014). Grounded theory is a process for providing both a description and an explanation of an individual's life (Charmaz, 2014). In the current study, the researchers actively engaged in conversations with breastfeeding mothers, their families, and healthcare professionals to analyze their words concerning EBF.

5 Research Methods

5.1 Study Context

The current study was performed in one Governorate of Oman. Three healthcare institutions were selected to reach women planning exclusively breastfeeding, their relatives, and healthcare experts to examine the participants' points of view. The researchers chose one hospital and two primary healthcare organizations that deliver health services to mothers and their newborns.

5.2 Sampling

Purposive and theoretical sampling strategies were employed. Purposive sampling was used during the initial data gathering, which relied on inclusion standards. Inclusion criteria for postnatal mothers: adult, low-risk mothers who delivered a healthy newborn and exclusively breastfed their newborn after birth. Inclusion standards for relatives: relatives of the same mother who participated in this study, such as husbands, grandmothers, and mothers-in-law. The research also highly values the expertise of healthcare specialists like midwives or nurses. Purposive sampling helps to start data collection, while theoretical sampling aids in directing the research study (Charmaz, 2014).

5.3 Data Collection Methods

Interviews (semi-structured) and observations (non-participants) were utilized to accumulate the data. The interview is a suitable way to collect personal information. Accordingly, this method helped obtain helpful information about EBF from the participants. Interviews helped the researchers comprehend the participants' viewpoints on EBF from their experiences and terms. In addition, non-participant observation was utilized to discover how participants interact with their social events and to observe verbal and non-verbal interaction. Thus, non-participant observation was utilized to verify what mothers and healthcare experts had commented in the interviews.

5.4 Data Analysis

Data analysis is a methodical approach that starts immediately after the accumulation of data. The directions of constructivist grounded theory were used in this study, which contained coding of data (initial, focused, and theoretical), writing of memos, and constant comparison until saturation of data.

5.5 Management of Data

The researchers demonstrated their adaptability at the beginning of data analysis by using the NVivo software (version 11) for qualitative data to divide and organize the data based on codes formed. The software's ability to group all the code was a significant advantage. Coding utilizing NVivo software was an effortless and quicker process than coding manually. However, the researchers' resourcefulness was noticeable when they faced a challenge in handling a large volume of data. This led them to preserve all the data in Microsoft Word and then coding manually.

5.6 Ethical Approval

The approval of the proposed study was obtained from the ethical committee of the University of Manchester in the UK and the MOH Research and Ethical Review and Approval Committee in Oman. Written approval was acquired, and autonomy and privacy were ensured.

6 Results

6.1 Characteristics of Study Sample

Twenty-six mothers partook in this study (11 in semi-structured interviews and 15 in non-participant observations). Five relatives participated in semi-structured interviews. Also, 22 healthcare experts partook in this study (7 in semi-structured interviews and 15 in non-participant observations).

6.2 Presenting the Findings

Constant comparative analysis was utilized, and various categories emerged: Breastfeeding Expectations, Breastfeeding Support, and Breastfeeding Journey. The mothers' breastfeeding experiences began with their anticipations that they were obligated to breastfeed and that breastfeeding is a biological act till they found the truth.

6.2.1 Breastfeeding Expectations

This study delved into a crucial aspect of mothers' EBF perception. It explored how these perceptions were shaped before birth, shedding light on the anticipations of the mothers and their families. The study revealed how these anticipations influenced the mothers' willingness to breastfeed, a key factor in their postnatal journey.

The phrase "I understood that I would breastfeed" was a common expression among the women, reflecting their pre-birth anticipations. The data revealed that these anticipations were shaped by three significant factors: the societal norms in Oman, the Islamic perspectives on breastfeeding, and the associated health benefits. These cultural and religious influences shaped mothers' perceptions of breastfeeding, making it a widely expected act.

The women shared that their earliest exposure to lactation was from seeing their relatives and neighbors, a testament to the strong sense of community they lived in. They believed breastfeeding was not just a personal choice but a social standard that women should practice. They linked breastfeeding with women and said, "all mothers were breastfeeding their children." This communal breastfeeding experience and promotion directed them to anticipate breastfeeding in their destiny. This notion is illustrated in the coming statement

I understood that I will lactate my kinds also one day because I was lived in big family, with my uncles, grandmother and grandfather...I observe when I was small the mothers were lactating in my family. (Nada, 1st Interview)

The Holy Quran in Islam underlines the essence of lactation and suggests a suitable time (2 years) if the mothers are capable of breastfeeding. Islam is understanding and supporting, providing mothers with the flexibility and chance to decide on the lactation period. Importantly, Islam also shows compassion and understanding for mothers who cannot lactate for 2 years, relieving them of any pressure. The mothers in this study, all of whom are Muslims, intended to lactate before delivery due to the advice of the Holy Quran, as mentioned below,

Lactation is scripted in the Holy Quran, for the mothers who can breastfeed, Allah indorsed breastfeeding for two years; so I learned that before my delivery that I will lactate as well. **(Moon, 1st Interview)**

In their redefined functions, mothers were anticipated by society to breastfeed their newborns. This societal anticipation was often supported by their mothers' teachings during pregnancy, emphasizing the health advantages of breastfeeding for newborns. As a result, mothers perceived a sense of duty to breastfeed their newborns, confirming that their newborns could access these health advantages of breastfeeding. For example,

I learned from my older family especially my mom about the benefits breast-feeding... They told me about lactation and explained about the advantages of lactation for me and for my baby, my mother told me also the essence of yellow milk [colostrum]. **(Muluk, 1st Interview)**

"Lactation is a natural act" was another word used by many mothers to express their lactation anticipations before delivery. Mothers' breastfeeding anticipations were established on their mothers' belief that lactation is a natural act for them and their newborns, which is understood by the relatives. Most mothers explain this as a natural and innate process that will occur innately and is a straightforward mothering act. Therefore, many mothers are predicted to lactate. Before delivery, many mothers assumed lactation was a natural method that would occur directly after delivery. The mothers utilized expressions such as "routine process" to define the idea of the natural lactation act; accordingly, they predicted the lactation of their newborns. For example,

I anticipated lactating after delivery because I recognized from my mom that lactation is a natural and routine activity; I thought that my newborn would directly lactate because I realized that lactation would be innate. **(Moon, 1st Interview)**

Moreover, before birth, primigravida mothers had anticipated obtaining direction and help from their families during the lactation duration; nonetheless, they realized that their families' help was up to 6 weeks after delivery, as noted in the following quote:

I estimated my relative to help me during lactation after my delivery; only my mother helped me while lactation for forty days. **(Moon, 2nd Interview)**

Primigravida mothers also predicted help and guidance from healthcare experts during lactation duration. Then, they discovered that the healthcare experts were not supportive.

I assumed the nurses would help me during lactation after my labor ...I requested the help, and they did not do anything to me helpful; they did not teach me how to breastfeed. (**Moon, 2nd Interview**)

Multigravida mothers were familiar with the fact that help for lactation would be for 6 weeks only. They explained that they need to be self-dependent after this period for lactation. For instance,

I realized that help is for six weeks only because I need to rely on myself for breastfeeding. (**Sweet, 2nd Interview**)

Sweet answered a query about why she didn't prepare for breastfeeding during pregnancy. She assumed that she was ready to lactate because she had a prior background:

I know, I lactated my baby before, and I believed that I would lactate without problems this time. (**Sweet, 2nd Interview**)

Before birth, many mothers held the belief that they were capable of breastfeeding. They felt this way as they viewed breastfeeding as a natural act, expected to receive support when needed, believed they had sufficient knowledge, or had previous experience with breastfeeding. However, upon initiating breastfeeding, they often found themselves unprepared. This was primarily due to the healthcare professionals' failure to sufficiently train them during the antenatal period, which resulted in difficulties with breastfeeding postpartum.

6.2.2 Breastfeeding Support

The presence of older family members not only demonstrated their importance in helping breastfeeding women after birth but also highlighted the mutual benefits of their involvement. All the participants, including healthcare professionals, acknowledged the essential role of family members in this process.

The mothers believed that the presence of their mothers was essential, not only for advice on breastfeeding but also to tap into their wealth of experience and wisdom on this site, which they appreciated greatly.

After delivery, mothers should remain with their mothers to recover from delivery...I taught my girls about lactation and the benefits of breastfeeding... This is the practice in Oman..., this is my role as a mothers also. (**Grandmother 3**)

It is essential for me as a mother for the first time to stay with my mother after my delivery... she is educating me everything about breastfeeding. (**Moon, 1st Interview**)

When exploring about spouse's help, it was apparent the help was not decisive because of the following reason

My husband is far away and returns to house at holiday period. He advise me to lactate my baby and he is reassuring me but he is not really helping me. (**Moon, 4th Interview**)

The study also demonstrated that the healthcare experts assumed the essence grandmothers in instructing mothers about lactation.

It is vital for the relatives to be with their breastfeeding mothers after delivery to help them. **(Midwife 1)**

Many healthcare experts, considered that help up to 6 weeks after birth was not adequate.

Women required more help and encouragement to breastfeed, six weeks is not really enough to learn everything about breastfeeding. **(Midwife 5)**

In disparity, grandmothers considered that help for 6 weeks after delivery was adequate as they wanted mothers to rely on themselves for lactation and other responsibilities like caring for their children and house.

Helping for six weeks was adequate; they must rely on themselves to breastfeed and to take care of other things. **(Grandmother 1)**

Yet, many women considered that healthcare experts neglected supporting them while initiating lactation. They assumed that healthcare experts required sympathy, did not help, revealed uncooperative and hostile behavior.

Midwives were like a machine...They were in a rush to end their job... They were not helpful during breastfeeding at hospital. **(Moon, 1st Interview)**

The data also showed that healthcare experts did not help the mothers during lactation for diverse causes, such as believing breastfeeding was not their responsibility as it was written in their job description, the prior background of breastfeeding; a deficiency of human resources, especially nurses; work overload; absence of training; a short-stay at the hospital; and a lack of spaces for lactation in the health organizations.

Within the Omani culture, grandmas are assisting their offspring to breastfeeding...the work within hospital is hectic and nurses must perform many interferences for mothers and newborns, at hospital we don't have sufficient staff. **(Manager 1)**

I am not helping the multigravida mothers as they had earlier experience on breastfeeding and it is not stated in my job description to instruct them so I am not supporting. **(Midwife 5)**

Few healthcare experts, in contrast, supported mothers by speaking with mothers about their experience, assessing their requirements, providing feedback, and delivering practical guidance. Nevertheless, this practice depends on the time available and the overcrowded circumstances.

Sometimes, I deliver comment on breastfeeding positions and performances, but this depend on my time if I can. **(Nurse 3)**

I need to care enormous amount of mothers and their babies at hospital...., but I provide help sometimes when I have time to mothers while breastfeeding. **(Midwife 5)**

Breastfeeding Journey

This theme exhibits that initial breastfeeding was satisfying for only two multigravida mothers.

I am able to breastfed for one year all my kids...I was pleased and happy to do so. **(Star, 2nd Interview)**

For many mothers, initial experiences of lactation were difficult due to troubles with babies' attachment toward the breasts, breastfeeding being a new experience and physically discomfiting.

After delivery, I developed nipple sore and I did not understand what to do to solve my problem with breastfeeding. **(Moon, 2nd Interview)**

I did not understand in what way to grip my baby to breastfeed. It was first time for me to breastfeed. **(Anwar, 1st Interview)**

The mothers confounded their initial breastfeeding problems with their mothers guidance, therefore, were capable of breastfeeding up to 6 weeks after birth as the breastfeeding mothers lived with their mothers.

It was burning and my mother explained me how to do massage to the nipples before breast-feed my baby.... I had doubts if I will resume to breastfeed. **(Safi, 2nd Interview)**

Up to today my mother was with me instruction me and directing me on how to breastfeed my infant. **(Nada, 2nd Interview)**

Nevertheless, 6 weeks after birth, many mothers encountered problems with breastfeeding. These challenges were not only physical but also influenced by societal and cultural factors. For instance, some mothers faced pressure to return to work early, which made it difficult for them to establish a consistent breastfeeding routine. Others felt uncomfortable breastfeeding in public due to societal norms. As a result, they were unsure about their capability to resume breastfeeding. Many mothers had breastfeeding problems after 6 weeks because of contradictory demands, work responsibilities, lacking milk production, pain, and issues about breastfeeding in public. These problems influenced mothers' experience; thus, they ceased breastfeeding. Many mothers were not competent to adjust to breastfeeding problems because they did not understand how to handle the breastfeeding issues. They understood, at the same time, that they must breastfeed; therefore, to quit breastfeeding, they must discover acceptable reasons.

I need additional help because once I started my duty, I had lots to do and to take care of my house. I was exhausted from my job and from breastfeeding, so I quit breastfeeding. **(Somi, 4th Interview)**

This is haram, I could not breastfeed my baby in public, so I end breastfeeding. **(Somi, 4th Interview)**

I had severe nipples pain when breastfeeding so, I stopped breastfeeding. **(Rose, 3rd Interview)**

I am tired, I required sleep at least 2 hours thus, I stopped breastfeeding, I could not tolerate. **(Moon, 2nd Interview)**

My baby was crying for no reason. I was anxious that she was not receiving adequate milk ...I recognized she was upset to get milk. **(Sweet, 2nd Interview)**

Few mothers resumed breastfeeding because they had enforced adaptive techniques to confound their problems after birth (during and after the 6 weeks). These methods allowed the mothers to gain resilience.

I was asking help to breastfeed, My mother taught me, I also investigated on google to know more about my breast problem, and I acquired answers for the problem. (**Anwar, 4th Interview**)

My mother was with me, supervising me and advising me when I have difficulty. (**Nada, 5th Interview**)

7 Discussion

The findings reveal that mothers' choice to breastfeed exclusively was built from socio-cultural standards in Oman. This notion is highlighted by Aune et al. (2021), who referred to the role of breastfeeding in mothers' experiences and how it is linked with motherliness. Women believed they were mothers when lactating, as they linked lactation with motherliness (Van Esterik, 2018). Mothers wanted to give their babies the most helpful nutrition and correspond to social anticipations concerning breastfeeding. Mothers believed before birth that they were prepared according to specific knowledge provided by relatives, such as the advantages of breastfeeding for the newborn's health and the bonding experience it provides. They also drew from the experiences of other mothers they had witnessed breastfeeding, which they perceived as flourishing and natural. This opinion is seen in a study by DeLuca and Bustad (2023), in which mothers did not think of any choice other than breastfeeding due to sociable anticipations. The mothers did not regard feeding their babies as a skill to understand because they considered breastfeeding as a biological act and having a prior background. This mirrors the results of a study by Stuart-Macadam (2017), where the mothers assumed breastfeeding would happen directly. While mothers pushed through the lactation process, they realized that breastfeeding was not according to their anticipations.

One of the paramount results was the optimistic impact of grandmothers' role in the earlier breastfeeding step on mothers to resume breastfeeding regardless of problems. The significance of relatives' support in maintaining breastfeeding was compatible with a study that examined the physical and psychological reinforcement of mothers from their spouses and mates (Putra & Krianto, 2019). Six weeks after delivery, mothers go back to the house and do not receive help from their relatives, which influences the mothers' capacity to resume breastfeeding. This echoes a study that has discovered that breastfeeding mothers require support to persist in breastfeeding and when facing breastfeeding problems (Gyamfi et al., 2021). Moreover, many women were dissatisfied with the services delivered by healthcare experts because they did not guide and help them during hospitalization regarding breastfeeding. This unhelpful manner caused mothers' dissatisfaction with healthcare experts, as seen in a study by Quinn et al. (2019). The rationale for healthcare providers' negative attitude was that they conformed to societal perspectives. Socially, breastfeeding reinforcement was the function of grandmothers; as a result, healthcare experts were not assisting mothers while breastfeeding. This finding differed from the results of a study where maternity nurses believed their role in a

health organization was to sustain breastfeeding by helping women (Smyth & Hyde, 2020). Also, breastfeeding in public was a problematic mission for all the mothers due to their spouse's discouragement and the lack of personal space. Therefore, mothers selected bottle-feeding when they went out of their homes as they felt ashamed of revealing their breasts in front of others (Sheehan et al., 2019).

The data starkly revealed the absence of any guidelines or policies for breastfeeding working mothers in Oman's workplace. This glaring gap in support is a key element that significantly impacts mothers' experience who are also pursuing careers in this study. The influence of returning to work on a mother's capacity to continue breastfeeding was evident. The data showed that working mothers tend to have a shorter breastfeeding period, typically 6–9 weeks, than non-working mothers (Hornsby et al., 2019). This trend was further underscored in the current study's findings, where the mothers who could resume breastfeeding were those who were not working. These findings emphasize the urgent demand for supportive workplace policies that can assist working mothers resume breastfeeding.

Mothers in this study needed to understand the pragmatic elements of breastfeeding, such as positions and methods. It is alarming to note that breastfeeding is not regarded as a skill to be understood in Oman but as a natural act that will occur. This idea contradicts results from a study where participants expressed the importance of learning to breastfeed at the time of gestation (Cardoso et al., 2017). Also, mothers did not acquire knowledge regarding the most common problems, which influenced their capability to lactate, and consequently discontinued lactation. Delivering sufficient knowledge around breastfeeding barriers may enable mothers to cope with breastfeeding problems. This sort of knowledge is suggested in a study where the author highlighted the significance of giving mothers with sufficient facts around obstacles to allow them to resume breastfeeding (Mahurin-Smith, 2023).

In addition, it was reported that most of the mothers talked about their earlier experiences as problematic. Bodily distress and discomfort were aspects that influenced the mothers, which led to breastfeeding termination. This outcome is matched with a study about women's challenges of earlier breastfeeding, which led to ending lactation (Morrison et al., 2019). Furthermore, mothers were anxious when their babies screamed without noticeable explanation, which led mothers to suspect of having sufficient milk, and they even questioned their capacity to lactate. Insufficient milk production is believed to be the cause of breastfeeding termination (De Roza et al., 2019).

The core category was prominent in developing the theory "Navigating the Reality of Breastfeeding," which displayed that Omani mothers faced a stark fact when they pushed through the lactation process. This reality, often falling short of their anticipations, left them needing clarification about their lactation capability. Numerous mothers grappling with the challenges of breastfeeding stopped as they could not handle these difficulties. Nonetheless, three mothers, despite facing the same problems, persevered. The theory highlights resilience as a crucial role in women's breastfeeding capacity. Resilience is "the capacity to resist or successfully manage with difficulty" (Hussain, 2024, p. 83). Understanding resilience allows one to comprehend the reasons three women resumed breastfeeding. In contrast, most

eight women discontinue breastfeeding before their intention. The resiliency lens also aids in exploring aspects that encourage mothers to persist in breastfeeding despite their challenges and comprehend how Omani women handled those challenges. Resilience theory aids researchers in identifying the aspects that influence the breastfeeding period. It also aids the researchers in ascertaining how strategies like problem-solving helped a few mothers resume breastfeeding. Resilience theory concerns the impact of distressing circumstances on individuals and how they adapt to challenging occasions. Khanum (2023) investigated youths resilient to distressing circumstances and found that some did nicely despite their problems. Resilience involves the interchange between challenges and individuals' defensive aspects that permit people to solve problems (Tudor et al., 2020). According to Wilson et al. (2021), resilient individuals have a healthful emotion of self-regard. Thamarasseri (2023) confined protective aspects that aid individuals in conceiving resilience. Interior aspects contain intellect, the locus of control, and a sense of humor (Thamarasseri, 2023). Thamarasseri (2023) also determined external aspects, such as family connections and help, which enable individuals to be resilient.

8 Conclusion

The results showed a link between the emerged themes, which generated the core category, "Navigating the Reality of Breastfeeding." The study also revealed a connection between the themes and the core category and enabled the appearance of a theory, called "Resilience: The Power to Breastfeed." Mothers' capacity to breastfeed leaned on their adjustment to breastfeeding problems. Mothers' capacity to breastfeed was influenced by Oman's healthcare strategy and structure, which lacked the pragmatic and academic elements during the antenatal and postnatal durations and helping mothers while breastfeeding. Mothers' capability to breastfeed relied on resilience. Mothers were incompetent of breastfeeding because they did not understand how to handle the problems. Therefore, eight mothers discontinued breastfeeding before 4 months after birth. Just three mothers were able to breastfeed as they coped with the issues.

9 Recommendations

Breastfeeding guidelines and policies are required in health organizations, and all healthcare experts should be regularly told about them. The policy and the job description should also include the importance of women being offered breastfeeding reinforcement. Breastfeeding programs should be enforced to tell the whole community and improve two aspects: (1) the capacity to handle problems during lactation and (2) breastfeeding reinforcement. The involvement of relatives is critical to helping mothers.

10 Implication of the Study

Policymakers should improve functional breastfeeding support by enforcing regular and comprehensive breastfeeding lessons at least once a month during gestation. They should also allocate nurses and midwives to deliver breastfeeding counseling in health organizations. They should train mothers to breastfeed by offering knowledge and training during gestation. Midwives and nurses, in their role of helping mothers with breastfeeding, should seek to empower them. By teaching mothers about lactation methods and handling breastfeeding issues, they equip them with the tools and knowledge they need. This assignment is about identifying mothers' requirements, creating a trustful connection, offering help, and conveying worries. It's about decreasing women's hesitation and allowing them to be empowered to lactate and feel confident in their capacity to nourish their baby.

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Digital Addiction and Its Impact on Adolescents in UAE Society



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Abstract This study aims to define the impact of digital addiction on adolescents in Emirati society from cultural, behavioral, and social aspects. The studied sample consisted of parents who were members of the Parents Council in the Emirate of Sharjah. The sample comprised 50 people, and the data were collected from them via an online survey questionnaire featuring demographic questions. The study makes several findings. Specifically, the most commonly used modern technologies were mobile phones, and most adolescents reported using modern technologies for more than 4 h a day. The most important impacts on adolescents resulting from digital addiction were isolation, introversion, excessive nervousness, the emergence of cases of behavioral deviation, increased aggression, and rebellion against the societal system. This study thus reveals a statistically significant impact of digital addiction on the cultural, behavioral, and social aspects of adolescents.

Keywords Digital addiction · Adolescents · Behavioral impacts · Cultural impacts · Social impacts

1 Introduction

The early childhood stage is one of the most important stages of growth that a person goes through. It is the formative period in life, in which the first aspects of their personality are laid out and their features emerge. Paying attention to the adolescent's care, upbringing, and security is vital, as their future characteristics will be determined by these. This is why the state must spare no effort in providing

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adolescents with the basic needs. Paying attention to a child's upbringing, particularly in the early childhood stage, is considered a concern for the present and future of the entire nation. A sound upbringing ensures the necessary confrontation with the challenges of the future; the adolescents of today are the citizens of the future and their human power, if it is well developed and cared for, will contribute to achieving the comprehensive development of society (Bağcı, 2019).

The nature and extent of digital addiction is extremely important to know the steps that people must take to reduce the time that children and their families spend using smart phones, modern technologies, and social media (Allcott et al., 2022).

Internet addiction is an increasing problem. Some psychologists have indicated that there is one out of every 200 persons who uses the internet shows symptoms of addiction. In addition, there are people who spend 38 h per week on the Internet without working, which affects their daily job performance. The family is the first step in building a society, and it is the basic pillar of social construction. Several factors may hinder the process of bringing up adolescents. In light of the modern technological revolution and the lack of attention paid by both parents to their children, adolescents turn to technology and digital matters. Unfortunately, this approach can lead to addiction, serving as a warning bell of the danger looming around families. Despite the importance of the internet and social networks in daily life, and despite its usefulness in dating, education, and knowledge, it also leads to life in a vicious circle (Abo & Al Sayed, 2021).

The adolescent is naturally inclined to play; it is one of the important activities in their life, revealing their inner being, emotions, and hidden aspects. Through playing, the adolescent's personality is formed, and their intellectual, emotional, and social tendencies and inclinations appear. Psychologists confirm that playing develops an individual's personality, and it is one of the basic means of education. In the past, the concept of playing has been linked to physical or movement activity, but with the development of science and technology, the concept has changed. Video games appeared, quickly attracting the attention of all segments of society and achieving great success, shifting the concept of playing from education to entertainment (Al-Qasem, 2011).

Although there are many benefits and advantages of video games, they have many disadvantages, with impacts on the individual in particular and on society in general; on the personal level, they promote violence and a sense of crime in adolescents, because the majority of these games depend on the player's amusement and enjoyment of killing others. They also teach adolescents ways and methods of committing crimes. In addition, they foster violence and aggression in their minds when they play such games frequently, making the adolescents more violent and aggressive.

Despite modern technological progress, which affects all aspects of people's lives and, despite its many advantages, also has many disadvantages, especially at the level of society. Family relationships can lose their moral standards, leading to the spread of crime, an increase in suicides, and drug addiction. Therefore, in light of these changes, young Emirati men are becoming unable to find coping mechanisms that can help them preserve themselves. In his effort to satisfy his needs regarding

human relationships, he does not deviate from two directions in his movement toward others: Either he moves toward them and is driven by the need for autonomy, or he moves against them and is driven by the need for power and control. Hereby, he carries within him a threat to others. This is the aggressive behavior that has become widespread recently, particularly with the emergence of video gaming halls and internet spaces. These attract the majority of young people because of the self-gratification they provide, giving young people the space to release their fears and anxieties and make emotional connections with others. This creates a kind of false intimacy, so this new world, filled with harshness and cruelty, becomes a real world for them, which often turns into a nightmare that threatens their psychological and social lives. Accordingly, the question that this study seeks to answer is as follows:

What is the impact of digital addiction on adolescents in Emirati Society?

Hypotheses:

The study starts with the following main hypothesis:

There is no statistically significant impact of digital addiction on adolescents in Emirati society.

From this hypothesis, the following sub-hypotheses can be formulated to study the impacts of digital addiction on adolescents from the cultural, behavioral, and social aspects.

First Sub-hypothesis: There is no statistically significant impact of digital addiction on the cultural aspect of adolescents in Emirati Society.

Second Sub-hypothesis: There is no statistically significant impact of digital addiction on the behavioral aspect of adolescents in Emirati Society.

Third Sub-hypothesis: There is no statistically significant impact of digital addiction on the social aspect of adolescents in Emirati society.

2 Literature Review

Digital addiction has become an important field of research in recent years because of its many risks for adolescents. The prevalence of digital addiction varies globally, at 8–9% in Eastern countries and 4–6% in Western countries (Pan et al., 2020, pp. 612–622).

There is no consensus on how to define digital addiction, including what term should be used to define it. Hence, we use the term informally to refer to an excessive, impulsive, or obsessive style of technology use that is associated with harm, both to the user and to his or her social circle (Raian et al., 2015, p. 201).

3 What Is Digital Addiction?

Digital addiction is an emerging field of research exploring the problematic use of digital devices, including debates about whether this behavior can be recognized as a (formal) health or mental health disorder. If so, what diagnostic criteria should be based on? There is a discrepancy in the statistics related to the spread of digital addiction in different countries around the world. Current estimates range from 2.6% of the population in Northern and Western Europe to 10.9% in the Middle East (King et al., 2016).

The eleventh edition of the International Classification of Diseases, issued by the World Health Organization, includes gaming disorder, which relates to both online and offline gaming. There is also a lack of agreement on the terminology that should be used to define this phenomenon (Poli, 2017, pp. 4–8). Several suggestions have been made, including internet addiction, compulsive computer use, and problematic internet usage (PIU).

Ali et al. (2021) use the term digital addiction, which is based partly on the premise that an individual can use a digital device in a problematic way. In this case, the device does not necessarily have an active internet connection, based on the premise that this use is linked to the design of the digital media that facilitates it, or at least does not prevent it.

Santos et al. (2016) identified three models of digital addiction, which are considered prominent in the research literature. The first model is based on the fact that behavior is composed of specific elements; this is the case in the definition of “pathological gambling,” whether traditional or online gambling. Hereby, biopsychosocial elements participate in defining the behavior, including negative feelings when the behavior is not possible, preoccupation with it, tolerance with increased use, conflict between use and other life priorities, excessive reliance on the problematic behavior to improve mood, and relapse after making progress in quitting it.

Block (2008) suggests that for pathological internet use to be eligible for inclusion in psychiatric manuals, it must show similarities to established symptom criteria, such as those for substance use disorders (p. 306).

Kwee et al. (2010, pp. 8–10) believe that internet addiction may not have real diagnostic value, because the relationship between the classification of Internet addiction and its symptoms has not been proven through experimental evidence, unlike in the case of substance use disorders.

Kardefelt-Winther (2014) supports the point of view that describing someone as an internet addict may not indicate that the individual suffers from a mental disorder, but should be considered as using a strategy to adapt to or escape negative life experiences. As such, in some cases internet addiction may be a symptom of a deeper mental health problem rather than a condition in itself. This may cause further controversy over whether the same hypothesis can be applied to other addictive behaviors as well.

The second model defines internet addiction as the inability to control impulses when trying to resist addictive behavior, meaning that the person needs more internet access to reach greater levels of happiness and eliminate mood swings and negative emotions. Han et al. (2007) state that internet addiction is based on a person's desire to engage in an Internet-related activity despite the possibility of being exposed to certain risks.

The third model states that some symptoms must appear in the individual when he is addicted to the internet, including impaired feelings and behavior, constant preoccupation with what is happening on the internet, a lack of interest in what happens around him, the inclination to escape from real life toward virtual life, and a decline in his social, academic, and professional abilities (Lemmens et al., 2009). Allcott et al. (2022) affirmed that allowing people to set limits on their screen time in the future significantly reduces usage, indicating that they have problems with self-control. Evidence shows that people are uninterested in habit formation and partly unaware of self-control problems, with social media use found to increase self-control issues by 31%, according to the study by Oglu et al. (2022). To combat digital addiction, the main countermeasures can be categorized under four categories: Psychological, social, software, and pharmaceutical; in general, the proposed countermeasures are proven to be effective in reducing addictive digital use.

Boussaid and Awadi (2019) indicate that addiction to video games has negative impacts on an adolescent's physical, mental, and social development and that addiction to the excessive use of smart devices leads to a weakening of an adolescent's ability to imagine because this habit provides him with imagination and mental images automatically, regardless of the adolescent's desire. Thus, he becomes shy and introverted, and his social skills do not develop. Digital addiction leads to adolescents being exposed to health problems and disorders. Boussaid and Awadi (2019) state that students have a medium-level addiction to overuse, a lack of self-control, emotional state, and attachment sub-dimensions, meaning they have a low-level addiction to inhibiting the flow of life.

Based on the above, the excessive use of the internet or video games leads to many problems for the individual, including social, emotional, professional, academic, and other problems. He cannot control the period of use of these technologies despite his attempts to do so.

Psych Guides (2023) summarizes the factors leading to digital addiction as follows:

1. Digital media has a high impact on the brain, as the brain secretes dopamine, through which the person feels pleasure and happiness. After a period of time, this person begins to feel comfortable and satisfied only when using digital media; these media also stimulate the brain to produce more dopamine so that the person can continue using these media for longer periods.
2. Feeling anxious and depressed: Addicted users of digital media often feel more anxious and depressed than others.
3. Feeling stressed and unhappy.

4. Excessive shyness: The shy person tries to isolate himself and does not contact and communicate with others directly.

4 Signs of Digital Addiction

Some recent studies have shown that many daily internet users are digital addicts, with some signs indicating that they are addicted or not. The German researcher Hans Jerogen finds that more than half a million Germans suffer from internet addiction, whether it is related to video games, chatting online, or browsing and following social networks. Adolescents are the groups most vulnerable to addiction, as they spend long periods of time browsing the internet daily or playing video games. The study shows that there are many signs through which parents can know whether their children are addicted to the internet, as follows: (<https://www.aljazeera.net/health/2015>).

1. Frequent use of the internet for more than 4 hours a day, with the individual increasing the number of hours they spend on the internet to achieve satisfaction and happiness.
2. Some signs of withdrawal appear in adolescents, such as excessive nervousness, extreme sensitivity, and extreme discomfort when they are not connected to the internet.
3. The individual's inability to control themselves, as they cannot determine the times for accessing and exiting the internet without someone interfering or having something force them to leave.
4. Lack of interest in real social communication.

Signs of digital space addiction manifest in physical and emotional symptoms, whereby the emotional symptoms of digital addicts are anxiety, depression, and isolation (Petry et al., 2014). Physical symptoms include back pain, headache, and weight gain or loss (Zhang et al., 2019). Other symptoms include sleep disturbances, blurred vision, and tension (Kandasamy et al., 2019), whereby carpal tunnel syndrome is one of the most important symptoms of digital device addiction (Colucci, 2018).

Based on the above, it is clear that the harm resulting from digital addiction is multifaceted and includes health, psychological, social, cultural, educational, behavioral, and other impacts. Therefore, parents must take this into account and monitor their children's use of digital media and not allow them to use it repeatedly and for long periods.

5 Methodology

This study uses qualitative and quantitative approaches via a non-random sample.

6 Analysis

Table 1 shows the distribution of the participants according to personal variables.

Table 1 shows the following:

- Females are more frequent than males; the total frequency of females is 28, with a percentage of 56%, while the total frequency of males is 22, with a percentage of 44%. This can be explained by the fact that fathers often consult when the matter is related to male adolescents over the age of 12 years, while mothers consult schools or institutions related to providing support and care, especially when the matter is related to female adolescents or those under the age of 10 years.
- The working category is the most represented in the sample at 76%, while the non-working category is 24%.
- For the academic qualifications of the study sample, the majority have a bachelor’s degree (66%), followed by the lower than bachelor’s degree category (24%), and the postgraduate category (10%) (Table 2).

It is clear from the responses that the most used modern technologies by adolescents are mobile phones, at a rate of 54%, followed by video games at a rate of 28%, and finally the internet at a rate of 14% (Table 3).

Table 1 Distribution of sample members according to personal variables

Variable	Categories	Repetition	Percentage
Gender	Male	22	44
	Female	28	56
Working	Works	38	76
	Does not work	12	24
Academic Qualification	Lower than a bachelor’s degree	12	24
	Bachelor’s degree	33	66
	Postgraduate studies	5	10

Table 2 The study sample’s answers concerning most modern technologies used by adolescents

Type of used technology	Repetition	Percentage
Mobile phones	27	54%
Internet	9	18%
Video games	14	28%

Table 3 The study sample’s answers about the number of hours adolescents spend on modern technologies

Number of hours	Repetition	Percentage
Less than 2 h	5	10%
2–4 h	18	36%
More than 4 h	27	54%

Table 4 The study sample's answers about the most common symptoms that adolescents experience as a result of digital addiction

Most common symptoms appearing in adolescents	Repetition	Percentage
Isolation and introversion	33	66%
Health problems	14	28%
Excessive nervousness	32	64%
Decreased academic achievement	24	48%
Learning unacceptable behavior and language	21	42%
Disobedience and rebellion against parental decisions	20	40%

It is clear from the responses that the majority of adolescents spend more than 4 h a day using modern technologies (54%), followed by those who spend no more than 4 h a day (36%). These findings affirm that parents must monitor and control their children's use of these technologies so that it does not affect them negatively (Table 4).

It is clear from the responses that a high percentage of adolescents show symptoms of isolation, introversion, and excessive nervousness. This finding may appear in all those who use modern technologies for a period of 4 h or more, as this period is sufficient to make the adolescent isolated from the family and the family environment. Excessive nervousness is the result of his constant preoccupation with thinking about using modern technology and his unwillingness to perform any work or duties before his desire to use these technologies is satisfied.

7 Measuring Levels of Study Variables

The study variables and their aspects are measured using descriptive analysis, including the arithmetic mean and standard deviation, and the findings are shown in the following table (Table 5).

It is clear from the findings that the study sample's opinions about digital addiction have an arithmetic mean of 3.71. Accordingly, parents must consider applying methods to protect their children from the dangers and negative effects of digital technologies, determine the usage times for adolescents, and not allow them to reach the level of addiction.

Regarding the dependent variable (the impacts of digital addiction on adolescents), it is found that most of the impacts are on the cultural aspect, followed by the behavioral aspect. Specifically, addiction to these technologies leads to adolescents learning about and acquiring new cultures that may be negative or contrary to the values and traditions of their family and society. This impacts the adolescent's upbringing, meaning they learn new negative behaviors. These behaviors may be of a violent or degraded nature, and lead the adolescent to social isolation and the subjection to penalties by parents.

Table 5 Arithmetic mean and standard deviation of the study variables

#	Aspects	Arithmetic average	Standard deviation	Rank	Measurement level
1	Digital addiction	3.71	0.58	4	High
2	Cultural impacts	3.95	0.44	1	High
3	Behavioral impacts	3.73	0.52	2	High
4	Social impacts	3.72	0.55	3	High
Total		3.77	0.52		High

Presenting the Findings of the Study’s Hypotheses:

To achieve the requirements and conditions of the hypotheses examination, the necessary examinations are performed to ensure the suitability of the data for the assumptions of slope analysis. This refers to the inflation laboratory examination of the independent variable and the natural distribution of the dependent variable. Hereby, it is confirmed that there is no problem of multicollinearity for the independent variable measuring the Variance Inflation Factor (VIF) and examining the tolerable variance (Tolerance) for each of the independent study variables. We notice that the value of VIF reaches 1.000, and the value of the permissible variance (Tolerance) reaches 1.000. This is an indication that there is no high-level correlation between the independent study variables, and thus the conditions for conducting such an examination are met.

Findings of the multiple regression examining the impact of digital addiction on adolescents in terms of the cultural, behavioral, and social impacts (Table 6).

The findings are explained through the value of the coefficient of determination R^2 . Specifically, the independent variable as a whole (digital addiction) explains 69.3% of the variance occurring in the impact on adolescents. The rest of the percentage is explained by other variables that are not included in this study, as the value of the correlation coefficient R (0.833) shows a positive and high correlation between the digital addiction variable and the effects on adolescents.

The multiple linear regression model is used, and the findings in Table 7 indicate that the regression is significant. Specifically, the value of f (234.720) and the level of significance (0.000) is less than the level of significance (0.05). Accordingly, the main null hypothesis is rejected and the alternative hypothesis is accepted, which confirms the presence of a statistically significant impact ($0.05 \geq \alpha$) of digital addiction on adolescents in terms of the cultural, behavioral, and social aspects.

As evidenced by the statistical findings in Table 8, the independent variable (digital addiction) has an impact on adolescents’ behavioral aspects, based on the t value for digital addiction ($t = 8.694$). The value of the degree of impact B (0.395) shows that a one-unit increase in the impacts on adolescents requires an increase in digital addiction of 39.5. Accordingly, we reject the null hypothesis and accept the alternative hypothesis $H1$.

- First Sub-hypothesis Examination: There is no statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the cultural aspect of adolescents.

A simple regression analysis was performed to examine the impact of digital addiction on the cultural impact aspect.

Table 6 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the estimate
1	0.833 ^a	0.693	0.691	0.47012

^aPredictors: Digital Addiction (Constant)

Table 7 ANOVA^a

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	207.503	4	51.876	234.720	0.000 ^b
	Residual	91.720	415	0.221		
	Total	299.223	419			

^aDependent Variable: Effects on Adolescents

^bPredictors: Digital Addiction (Constant)

Table 8 Coefficients^a

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.298	0.095		13.705	0.000
	Digital addiction	0.395	0.045	0.515	8.694	0.000

^aDependent Variable: Impacts on Adolescents

Table 9 Model summary

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	0.705^a	0.498	0.492	0.626

^aPredictors: (Constant), Digital Addiction

Table 10 ANOVA^a

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	139.328	4	34.832	88.927	0.000^b
	Residual	140.618	359	0.392		
	Total	279.947	363			

^aDependent Variable: Cultural Impacts

^bPredictors: (Constant), Digital Addiction

The findings of Table 9 indicate that the correlation between the dependent variable (cultural impacts on adolescents) and the independent variable (digital addiction) reaches 705^a. There is a positive and high correlation between the digital addiction variable and the cultural impacts on adolescents. The R Square value reaches 498, indicating the percentage of variance in the dependent variable that can be predicted by the independent variable. This means that the independent variable explains 49.8% of the variance in the dependent variable.

The findings of Table 10 show the significance of this impact, as the calculated F value reaches 88.927 and the significance level is 0.000, which is significant

Table 11 Coefficients^a

Model	Unstandardized coefficients		Standardized coefficients	<i>t</i>	Sig.
	B	Std. Error	Beta		
(Constant)	1.790	0.136		13.210	0.000
Digital addiction	0.460	0.064	0.318	4.008	0.000

^aDependent Variable: Cultural Impacts

Table 12 Model summary

Model	<i>R</i>	<i>R</i> square	Adjusted <i>R</i> square	Std. Error of the Estimate
1	0.783 ^a	0.614	0.609	0.571

^aPredictors: (Constant), Digital Addiction

($\alpha \leq 0.05$). This shows the invalidity of the first sub-hypothesis, which states that there is no statistically significant impact at ≤ 0.05 level of digital addiction on the cultural aspect of adolescents”. Accordingly, we reject the null hypothesis and accept the alternative hypothesis H1.

It is also clear from the statistical findings in Table 11 that the independent variable (digital addiction) has an impact on the aspects of cultural influences that adolescents are exposed to as one of the aspects of the dependent variable, based on the examination of the first sub-hypothesis. There is a statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the cultural aspect of adolescents, where the calculated *t* values for digital addiction reaches 4.008, and the level of significance reaches 0.000. These are significant values at the level of the study ($\alpha \leq 0.05$), and the value of the degree of the impact B (460) shows that an increase of one unit in the cultural effects requires an increase of 46.0 in digital addiction. Accordingly, we reject the null hypothesis and accept the alternative hypothesis.

Examining the Second Sub-hypothesis: There is no statistically significant impact at the study’s level of significance ($\alpha \leq 0.05$) of digital addiction on the behavioral aspect of adolescents.

A simple regression analysis was performed to examine the impact of digital addiction on the behavioral aspect.

The findings of Table 12 show that the correlation between the dependent variable (behavioral impacts on adolescents) and the independent variable (digital addiction) reaches 783^a. There is thus a high correlation between the digital addiction variable and the behavioral impacts on adolescents. The *R* Square value reaches 614, indicating the percentage of variance in the dependent variable that can be predicted by the independent variable. This means that the independent variable explains 61.4% of the variance in the dependent variable.

The findings in Table 13 show the significance of this impact, where the calculated *F* value reaches 142.615 and the significance level is 0.000, which is significant ($\alpha \leq 0.05$). This shows the invalidity of the second sub-hypothesis, which states that there is no statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the

Table 13 ANOVA^a

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	185.820	4	46.455	142.615	0.000 ^b
	Residual	116.939	359	0.326		
	Total	302.759	363			

^aDependent Variable: Behavioral Impacts

^bPredictors: (Constant), Digital Addiction

Table 14 Coefficients^a

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error			
(Constant)	1.386	0.124		11.213	0.000
Electronic_government	0.306	0.058	0.365	5.247	0.000

^aDependent Variable: Behavioral Impacts

Table 15 Model summary

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	0.654 ^a	0.427	0.421	0.738

^aPredictors: (Constant), Digital Addiction

cultural aspect of adolescents. Accordingly, we reject the null hypothesis and accept the alternative hypothesis H1.

The statistical findings in Table 14 indicate that the independent variable (digital addiction) has an impact on the behavioral aspect in terms of what adolescents are exposed to. This is one of the aspects of the dependent variable, as the calculated t value for digital addiction reaches 4.008, and the significance level reaches 0.000; these are significant values at the significance level of this study ($\alpha \leq 0.05$). Examining the second sub-hypothesis indicates that there is a statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the behavioral aspect of adolescents. The value of the degree of the impact B (0.306) shows that an increase of one unit in cultural effects requires an increase of 30.6 in digital addiction. Accordingly, we reject the null hypothesis and accept the alternative hypothesis.

Examining the Third Sub-hypothesis: There is no statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the behavioral aspect of adolescents.

Findings of a simple regression analysis to examine the impact of digital addiction on the social impacts aspect.

The findings in Table 15 show that the correlation between the dependent variable (social impacts on adolescents) and the independent variable (digital addiction) reaches 654^a. There is a high correlation between the digital addiction variable and the social impacts on adolescents. The R Square value reaches 427, indicating the percentage of variance in the dependent variable that can be predicted by the

Table 16 ANOVA^a

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	145.901	4	36.475	66.917	0.000 ^b
	Residual	195.683	359	0.545		
	Total	341.583	363			

^aDependent Variable: Social Impacts

^bPredictors: (Constant), Digital Addiction

Table 17 Coefficients^a

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	1.167	0.160		7.299	0.000
Digital addiction	0.501	0.075	0.563	6.648	0.000

^aDependent Variable: Social Impacts

independent variable. This means that the independent variable explains 42.7% of the variance in the dependent variable.

The findings in Table 16 indicate that the *F* value reaches 66.917, and the significance level is 0.00; these are significant at the study’s level of significance ($\alpha \leq 0.05$). This shows the invalidity of the third sub-hypothesis, which states that there is no statistically significant impact ($\alpha \leq 0.05$) of digital addiction on the social aspect of adolescents. Accordingly, we reject the null hypothesis and accept the alternative hypothesis H1.

The statistical findings in Table 17 indicate that the independent variable (digital addiction) has an impact on the aspect of the social impacts that adolescents are exposed to as one of the aspects of the dependent variable. Hereby, the calculated (*t*) value for digital addiction reaches 6.648, and the significance level reaches 0.000. These are significant values at the study’s level of significance (≤ 0.05). This means that there is a statistically significant impact (≤ 0.05) of digital addiction on the social aspect of adolescents, and the value of the impact score B is 0.501. Accordingly, we reject the null hypothesis and accept the alternative hypothesis.

8 Discussion

The findings indicate that there has been an increase in adolescents’ use of modern technologies, which leads to addiction. They also show that the majority of them use these technologies for more than 4 h a day, placing them within the category of digital addiction. The findings also show that the most widely used technology is mobile phones, followed by video games, and here the role of the family emerges in allowing adolescents to use these technologies without specifying the appropriate

duration of use. An adolescent who uses a mobile phone to play often uses his father's or mother's phone, so parents must control the use process and set the duration.

The findings show that there are many impacts of digital addiction on adolescents in Emirati society, some of which are positive and some are negative. Some of the positive impacts include the development of the adolescent's computer skills, in addition to making friendships outside the framework of the local community. On the negative side, there are symptoms of isolation, introversion, and excessive nervousness, in addition to some health problems for adolescents, such as the impact on vision, pain in the neck and back, and weight gain. Moreover, such adolescents may learn some negative behaviors that do not occur within the family environment, including disobedience to parents. This finding is consistent with previous studies that confirm that digital addiction leads to the appearance of certain health symptoms. These negative psychological, social, cultural, and behavioral effects on adolescents were also found by Allcott et al. (2022), who confirmed that controlling the time spent using technology contributes to self-control and stress reduction. On the positive side, these findings agree with those of Ali et al. (2021), which stated that technology attracts adolescents' attention and encourages positivity, increases their level of well-being, and reduces their stress and confusion. We can confirm this finding, taking into account that it is necessary to control the duration of use and the type of programs that adolescents use so that the positives do not turn into negatives.

The findings from examining the hypotheses also reveal a clear impact of digital addiction on the cultural aspect of adolescents. Most notably, they may acquire different cultures that may not be compatible with the culture of the society in which the individual lives. Furthermore, the adolescent is separated from the cultural environment surrounding him and does not accept the prevailing family culture, becoming indifferent to the cultural heritage in society. These findings are considered a real threat to the culture and societal values prevailing in society in the future, as these values would come to mean nothing to future generations. Parents and official authorities must pay attention to the dissemination of cultural awareness among adolescents, enhancing citizenship values, and ensuring young people's adherence to their culture and societal values.

For the behavioral aspect, the findings show that digital addiction leads to the learning of inappropriate behaviors and words. This can cause the prevalence of new behavioral patterns among adolescents that are not compatible with society's values, such as excessive nervousness and a tendency toward violence. In addition, there may be the emergence of cases of behavioral deviation among adolescents, and increased aggression among adolescents.

The findings also show that there is a statistically significant impact of digital addiction on the social aspect of adolescents. Specifically, it contributes to increased introversion and social isolation, the emergence of patterns of violence within the family and rebellion against the societal system, as well as the destruction of societal values and the disintegration of the family.

These findings are consistent with previous studies that confirm that digital addiction has many negative effects. The study of Boussaid and Awadi (2019) confirms that digital addiction has negative effects on an adolescent's physical, emotional, and social development, and it increases shyness, isolation, and introversion. However, the study of Cham et al. (2019) asserts that the moderate use of modern technologies reduces the damage resulting from them. Finally, the study by Oglu et al. (2022) showed that taking the right measures effectively contributes to reducing digital addiction and avoiding its negative impacts.

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Faculty Satisfaction and Perception of Online Teaching



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Abstract Introduction: With the advent of digital technology and the unprecedented challenges posed by the COVID-19 pandemic, online instruction has become a vital component of contemporary pedagogy. How faculty perceive online teaching and their satisfaction levels are essential for effective online instruction. This study investigates the satisfaction level among faculty members and their perceptions regarding online teaching in Oman’s healthcare education context.

Methodology: A cross-sectional survey design was used. One hundred and ten healthcare faculty members, representing a 70% response rate selected through convenience sampling, responded to the Online Instructor Satisfaction Measure (OISM) questionnaire and perception scale developed by the investigators used for the study. Descriptive statistics was used to explain the categorical variables, while Karl Pearson’s correlation was used to explain the relationship between faculty perception and satisfaction with online teaching. Furthermore, t-tests and ANOVA were computed to establish any significant differences in satisfaction levels and perceptions based on demographic profiles.

Results: The OCHS faculty had moderate satisfactory scores ($M = 3.12$, $SD = 0.470$) and favorable perceptions ($M = 3.24$, $SD = 0.538$) toward online teaching. Faculty were more satisfied with the “affordance” component of the OISM and least satisfied with “institutional support.” Faculty perceived that ongoing training, preparing teaching materials before teaching, and ensuring a reliable internet connection are crucial for successful online teaching. Further, a statistically significant positive correlation ($p < 0.001$) was observed between faculty members’ perception and their level of satisfaction with online teaching.

Conclusion: Faculty at OCHS with positive perceptions of online teaching will likely be more satisfied. This indicates that positive experiences with online teach-

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ing can enhance their level of satisfaction. So, the institutional support to enhance their level of satisfaction should be meticulously planned.

Keywords Faculty · Satisfaction · Perception · Online teaching · Healthcare education, Oman

1 Introduction

Digital technology plays an essential role in daily life, and its significance was further realized during the COVID-19 pandemic, causing substantial challenges for healthcare and education. During this crisis, distance learning emerged as a critical lifeline for students in universities and educational settings (Elshami et al., 2021; Kerr-Sims & Baker, 2021). It necessitated integrating technology-related pedagogical knowledge into academic materials to ensure adaptability. While established universities were well-versed in distance learning, some colleges and institutions grappled with meeting academic requirements (Thomas & Foster, 2020). Online learning, also referred to as e-learning, ushered in a paradigm shift in pedagogy, with educators assuming the role of facilitators and learners engaging in collaborative endeavors (Kessler, 2018). Research has demonstrated that online education is as effective as conventional classroom instruction (Berestova et al., 2022), with widespread utilization in higher education (Shreaves et al., 2020). Online learning emerged as a secure and viable means of sustaining educational continuity during the COVID-19 pandemic (Stack, 2015).

Online education presents numerous benefits in contrast to conventional instructional approaches. These advantages encompass convenient information accessibility, effective material dissemination, adaptable learning pace, improved distant engagement, cost-effectiveness, convenience for educators and learners (Elshami et al., 2021), and help alleviate participant apprehension (Singh & Hurley, 2017). Furthermore, online learning eliminates constraints related to time and location by facilitating the information and thoughts exchange between students and instructors in a non-judgmental environment, fostering effective communication, task submission, and participation in virtual forums (Sher, 2009). Nevertheless, it is essential to acknowledge that online learning may have certain limits in terms of individual involvement, interpersonal interactions, and overall efficacy compared to the conventional method of classroom-based training (Perrin et al., 2015).

The COVID-19 pandemic accelerated the transition to online instruction, presenting educators with several obstacles that necessitated their adjustment to novel pedagogical approaches and technological tools (Jarab et al., 2022). Among the foremost concerns of faculty members were the financial implications associated with the development and maintenance of online platforms, technological

prerequisites, and their confidence and willingness to engage in online teaching. Consequently, it becomes crucial to investigate faculty contentment and perceptions of online teaching, particularly in light of its advantages (Elshami et al., 2021). This study is novel as its significance rests in its capacity to provide valuable insights and guidance for improving faculty satisfaction, perception, and efficacy in online teaching, and policy recommendations. Ultimately, this will improve outcomes for students and instructors in online education.

2 Review of Literature

2.1 Faculty Satisfaction with Online Teaching

Online teaching and learning have gained prominence in higher education, particularly after the COVID-19 pandemic. Faculty satisfaction with online instruction is a multifaceted issue that significantly impacts the success of online education programs (Song & Bosselman, 2011; Wasilik & Bolliger, 2009). Faculty perform a facilitating role in online learning settings, and their familiarity and proficiency with technology tools significantly influence their satisfaction and effectiveness in online teaching. However, a “digital divide” among faculty members, stemming from their lack of experience with online learning, can present a hurdle (Bolliger & Wasilik, 2009; Dame et al., 2021).

According to Bolliger and Wasilik (2009), the three attributable essentials that entail faculty satisfaction are student-associated, instructor-associated, and institution-associated. Student engagement, adequate participation, and open communication with instructors are key student-related factors that impact faculty satisfaction (Bolliger & Wasilik, 2009). A study at a Midsized liberal Arts University reported that teachers believed that their students profited more from online instruction (Shreaves et al., 2020).

The second critical element is instructor-associated factors (Bolliger & Wasilik, 2009), such as comfort with technology use and training in online teaching, which play a significant role in faculty satisfaction (Al-Zahrani, 2015; Friedman et al., 2017). Online teaching requires the teachers to be equipped with computer skills to produce multimedia presentations, with complex notations and visuals, in online classes to be effective. Online instructions demand heavy work and less pay for the excessive workload (Shea, 2007). A study that surveyed 286 educators from various disciplines about how they felt about teaching distantly during the COVID-19 pandemic revealed that teachers who have attended online teaching workshops or conferences or taken online courses as students reported higher satisfaction with their distant learning experiences emphasizing having intensive training courses for online teaching to boost instructors’ satisfaction of online teaching (Jarab et al., 2022). Besides that, it is vital to understand faculty attitudes about online education

to ensure teachers' competency and preparedness in the classroom. Gay's (2016) study at Carrabian University revealed that among 208 online professors, 90.6% of the teachers were e-ready; however, only 72.6% of individuals regularly communicated with the group via electronic means, were enthusiastic and self-directed learners and had a propensity to embrace and use new technologies. On the contrary, inexperience in distance learning and the "digital divide" among the faculty can resist the transition to online teaching (Al-Zahrani, 2015; Avgerinou, 2010; Friedman et al., 2017; Govindarajan & Srivastava, 2020).

Institutional-related factors are the third and most central element in faculty contentment of online teaching (Bolliger & Wasilik, 2009). Institutional support, technical infrastructure, and recognition of faculty accomplishments are vital institution-related factors that enhance faculty satisfaction (Fisher, 2020; Kerr-Sims & Baker, 2021). Therefore, thriving in electronic learning systems needs support from educational institutions and policymakers (Al-Zahrani, 2015).

Bolliger et al. (2014) devised a 27-item "Online Instructor Satisfaction Measure (OISM)" to assess faculty contentment with online teaching. The measure encompasses five distinct factors: instructor-to-student interaction, student-to-student interaction, affordances, institutional support, and course design and development. Numerous academic investigations have employed the OISM instrument to gauge faculty satisfaction with online instructional practices (Al-Zahrani, 2015; Dame et al., 2021).

Several studies on faculty satisfaction with online teaching have yielded varying results (Fisher, 2020; Friedman et al., 2017; Marasi et al., 2022; Stickney et al., 2019). Factors influencing faculty satisfaction include comprehensive training, flexibility in work hours, institutional support, and rules implemented to promote online teaching (Stickney et al., 2019). Marasi et al. (2022) stated that various aspects of academic work significantly influence teachers' satisfaction levels across the United States. Furthermore, the faculty's work nature, motivation, and prior experience in similar positions contribute to faculty satisfaction (Friedman et al., 2017; Hixson, 2021). Lim (2023) surveyed 213 instructors from South Korea, exploring readiness, satisfaction, and confidence in online teaching, revealing that the appropriate choice of an instructional strategy and the preparedness to teach online significantly influenced the satisfaction and confidence among the instructors. However, faculty pressure to transition to online instruction due to the sharp rise in educational technology use and high demand for flexible educational programs can resist adopting online teaching (Friedman et al., 2017). According to Ahmed et al. (2023), the most difficult calling for the 51 faculty members who participated in the survey and the semi-structured interviews ($n = 15$) was ensuring students' active engagement and effective interface with each other in class. Besides that, shifting to digital learning is challenging because it also warrants assistance from educational institutions and leaders (Misiejuk et al., 2023).

2.2 Faculty Perception of Online Teaching

The advent of digital technology is constantly changing the educational landscape and how knowledge is imparted and acquired. Several factors related to the instructors and students influence faculty perception of online teachings, such as the capability of the teacher to deliver online instructions effectively, the use of technology, the training required, the effectiveness of the time spent online teaching and preparing interpersonal communication, and addressing student issues such as plagiarism and other academic dishonesty (Ahmed et al., 2023; Akour et al., 2020; Ali et al., 2018; Alvarez, 2020; Hietanen & Svedholm-Häkkinen, 2023; Gonzalez & Moore, 2020; Martin et al., 2019; Magd & Jonathan, 2023; Perrin et al., 2015). Besides that, student engagement, education standards, faculty preparation for online instruction, and instructor qualification to teach the course influence faculty perception (Akour et al., 2020; Alvarez, 2020; Martin et al., 2019; Perrin et al., 2015). Furthermore, the degree to which faculty embrace online learning determines such programs' success. Alsuelmi (2021) conducted a study in Saudi Arabia to investigate how Qassim University and Princess Nourah University teachers feel about distance education. The quantitative data obtained from 122 academics through an online survey provided promising evidence that instructors have a positive impression of online courses. However, teachers' positive outlook towards online teaching was purely attributed to the institutional support they received. Another study to examine the preparedness of medical faculty for e-learning using a technological pedagogical content knowledge model revealed mixed perceptions of competence in using online teaching despite faculty members' high pedagogical subject, and pedagogical knowledge levels (Houshmandi et al., 2019). A mixed-method study identified five primary categories of faculty concerns with online teaching: social, emotional, cognitive, pedagogical, and system support. Among these categories, pedagogy and emotions were the most prominent, indicating their significance in teachers' experiences. However, the quantitative data analysis revealed that self-efficacy and teachers' attitudes toward technology integration in teaching were the two main variables that predicted positive and negative experiences of online teaching. The findings of this study indicated the importance of the formulation of guidelines to promote positive experiences of online teaching (Sidi et al., 2023).

Effective teaching online was perceived to have several challenges. Today's common barriers educators uncovered are technology, instruction, class size, technical support, employer assistance, and teamwork (Alvarez, 2020; Hietanen & Svedholm-Häkkinen, 2023). In addition, managing disengaged students, addressing procrastination and entitlement attitudes among students, promoting critical thinking skills, ensuring fair and unbiased grading, meeting students' expectations of educator availability, facing inadequate compensation, and managing a high workload hinder the pursuit of scholarly activities (Ali et al., 2018). Besides that, the faculty's confidence to use technology in the classroom is directly proportional to the years the instructor has spent teaching online, the number of online courses taught previously, and the number of online students she has had in those courses (Cherry, 2015).

Faculty satisfaction with online teaching is a multifaceted issue influenced by various factors related to students, instructors, and institutions. During the pandemic, a compulsion to shift from traditional teaching to distance mode posed significant challenges and advantages, impacting students and faculty alike (Kumar & Fernandez, 2022; Mohamed et al., 2022; Al Hadhrami & Al Saadi, 2021). However, the specific concerns and challenges faced by the faculty at OCHS, Oman, still need to be studied. Hence, further investigation is warranted to address specific challenges and satisfaction to ensure effective online education delivery.

3 Methodology

The primary objective of this study was to assess faculty satisfaction and perspectives on online teaching within the Oman College of Health Sciences (OCHS) context. A quantitative approach was employed, utilizing a descriptive cross-sectional survey design. Descriptive cross-sectional studies are useful for gaining timely and cost-efficient insights into teacher satisfaction and views regarding online instruction in one single point of time despite its potential biases such as nonresponse bias and recall bias (Wang & Cheng, 2020).

3.1 Participants

The study's target population comprised all faculty members employed at OCHS across various branches, each offering diverse health professions programs. A convenience sampling technique was adopted for the study. The inclusion criteria were restricted to full-time faculty members responsible for foundation and healthcare faculty who had delivered at least one online course in the previous academic year. Part-time faculty members engaged in foundation or health professional courses were excluded. Ultimately, 110 faculty members participated in the study, representing a 70% response rate.

3.2 Data Collection Instrument and Procedure

Data Collection Instrument The study incorporated two key instruments: the "Online Instructor Satisfaction Measure (OISM)" and a 14-item perception tool specifically designed for this research. *OISM* is a pre-validated and widely acknowledged tool for measuring online faculty satisfaction with 27 items (Bolliger et al., 2014). It featured five distinct components, each exhibiting acceptable Cronbach's

reliability scores: Instructor-student Interaction (ISI) at 0.82, Affordance at 0.80, Student-to-Student Interaction SSI at 0.77, and Course Design/Development Teaching (CDD) at 0.64 for each component. The overall scale reliability score was an impressive 0.87, exceeding the acceptable threshold of 0.70 (Singh et al., 2021). No modifications were made to the OISM tool, and prior permission was sought to utilize it in the study. The faculty perception of online teaching was assessed through the perception tool that employed a 5-point Likert scale, ranging from “*Strongly Agree (5)*” to “*Strongly Disagree (1)*.” The initial draft of the perception scale had 24 items prepared based on the previous literature.

Five nursing experts with expertise in quantitative research validated the perception tool for its content relevancy and appropriateness. There was complete agreement on all the items; however, some items needed to be more varied, and the tool seemed lengthy. Hence, as per the experts’ suggestions and comments, the redundant items were deleted, and the final draft of the tool had 14 items. The tool was piloted with 17 participants from one of the branches of OCHS. The pilot study participants were not included in the main study. No changes were made to the tool. The study was found to be feasible. The pilot study data established the instrument’s internal consistency reliability coefficient. The Cronbach’s alpha coefficient of 0.768 indicates an acceptable reliability score (Singh et al., 2021).

Data Collection Procedure After obtaining ethical approval from the Research Ethics Review and Approval Committee, the study participants were invited to participate through their respective Associate Deans and Research Focal Points associated with different programs and branches. The data collection process was done using Google Forms, which included the “Participant Information Sheet” and a consent form. An email communication, initiated through the Associate Dean of OCHS-North Batinah Branch (where the principal investigator was based), was dispatched to the Dean and Associate Deans of the various branches and programs. Research focal points in each branch of OCHS disseminated the survey link via official social media platforms. Additionally, three reminder communications were made at 2-week intervals, encouraging faculty participation to enhance the response rate. Data gathering occurred between November 2022 and January 2023, covering all branches and programs within OCHS.

Data Analysis Data was processed and analyzed following the data collection phase. The raw data collected through the online survey was coded and organized into a Microsoft Excel spreadsheet. Subsequently, the data was imported into SPSS version 23.0 for comprehensive analysis. Descriptive statistics such as frequency, percentage, mean, and standard deviation were employed to evaluate faculty satisfaction levels and their perspectives on online teaching. Karl Pearson’s Correlation Coefficient score was utilized to explore the relationship between faculty satisfaction levels and their perceptions of online teaching. Furthermore, t-tests and ANOVA were computed to establish any significant differences in satisfaction levels and perceptions based on demographic profiles.

4 Results

The first section of the results is the sample distribution based on their demographic profile. Most faculty were 45 and below 62 (56.3%), and 87 (79.1%) were females. Omani participants, 58 (52.7%), outnumbered than non-Omani 52 (47.3%). Most participants with a Master's Degree in their discipline 67 (60.9%). Most of the faculty who participated in the study taught nursing programs 83 (75.5%) were teaching undergraduates 90 (81.8%), having 14–21 years of teaching experience 71 (64.5%). More than half of the participants, 51 (46.4%), were teaching three or more credits. An equal number of faculty, 68 (61.8%) each, responded that they were responsible for teaching and clinical supervision and received some training but had yet to gain any previous online teaching experience. In addition, most faculty members had intermediate levels of expertise in internet use, while 48 (43.6%) were satisfied with internet sources at their colleges (Table 1).

Faculty satisfaction was measured through OISM, which had 5 components and 27 items. The overall satisfaction of the online teaching faculty was higher, $M = 3.13$ ($SD = 0.470$), indicating that the faculty of OCHS was satisfied with the online teaching mode. Furthermore, the faculty expressed higher satisfaction with the “affordances” components of the OISM, with a mean of 3.63 ($SD = 0.785$). In contrast, the “Institutional support” component was least appreciated, with a mean of 2.8 ($SD = 0.806$) (Fig. 1).

Data in Table 2 shows that the overall perception of the faculty towards online teaching was favorable, with a mean of 3.24 ($SD = 0.0538$), indicating that the faculty responded favorably to the perception scale. Faculty strongly agreed that effective online teaching delivery depends on robust internet connectivity ($M = 4.5$; $SD = 0.763$). In addition, the faculty responded favorably equally to items 8 and 13 regarding the ongoing training for the faculty and faculty preparation of the teaching resources before delivering the online teaching ($M = 3.927$; $SD = 0.843$). However, item 7 had a low mean score ($M = 2.173$; $SD = 0.975$) of all the perception statements, indicating most faculty disagree that online teaching promotes screen engagement of the students during online teaching. Besides, item 3, “Online teaching enables the learner to stay focused throughout the session,” also had a low mean value ($M = 2.445$; $SD = 1.001$).

Data in Table 3 show a significant moderately positive correlation between faculty perception and their satisfaction with online teaching ($r = 0.561$, $p < 0.001$). This indicates that faculty's favorable perception of online teaching will significantly increase their satisfaction. This discovery implies that the contentment of faculty members with online teaching is influenced by their perceptions of it, the backing they receive from their institutions, and their confidence in the worth of online teaching methods. It highlights the significance of

Table 1 Demographic characteristics of the subjects

Demographic profile	n	%
<i>Age</i>		
45 and below	62	56.3
46 and above	48	43.6
<i>Gender</i>		
Female	87	79.1
Male	23	20.9
<i>Nationality</i>		
Omani	58	52.7
Non-Omani	52	47.3
<i>Highest academic qualification</i>		
Doctorate	24	21.8
Master's	67	60.9
Baccalaureate	19	17.3
<i>The program of the course taught</i>		
Nursing	83	75.5
Non-nursing courses (pharmacy, radiology, physiotherapy, specialized training, health management system, medical laboratory technology)	27	24.5
<i>Teaching program</i>		
Undergraduate	90	81.8
Graduate	13	11.8
Both (undergraduate and graduate)	7	6.4
<i>Number of the credit hours of the course taught online</i>		
Two credits and less	17	15.4
Three credit hours	51	46.4
Four credit hours	9	8.2
Five or more credit hours	33	30
<i>Number of students enrolled in the course</i>		
Less than 25	7	6.4
26–50	56	50.9
51–75	34	30.9
75–100	6	5.5
101 and above	7	6.4
<i>Years of teaching experience</i>		
Less than one	7	6.4
01-July	10	9.1
Aug-14	22	20
14–21	71	64.5
22 and above	–	–
<i>Training on online teaching received</i>		
No	42	38.2
Yes	68	61.8
<i>Previous experience with online teaching</i>		

(continued)

Table 1 (continued)

Demographic profile	n	%
Yes	42	38.2
No	68	61.8
<i>Workload</i>		
Teaching only	16	14.5
Teaching and clinical	68	61.8
Teaching and administrative	26	23.6
<i>Level of experience with internet use</i>		
Novice	5	4.5
Intermediate	77	70
Expert	28	25.5
<i>Level of satisfaction with available internet speed</i>		
Satisfied	48	43.6
Neutral	27	24.5
Dissatisfied	35	21.8

Note. N = 110

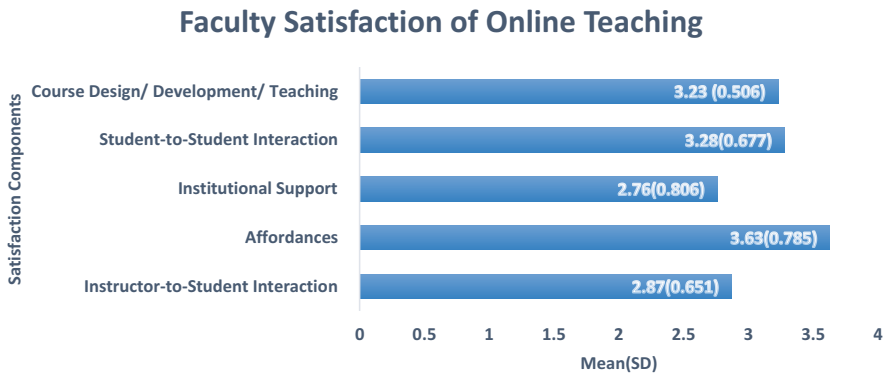


Fig. 1 Mean and standard deviation of faculty satisfaction scores

promoting positive attitudes among faculty towards online teaching, offering continuous institutional support, and ensuring that faculty members view online teaching as effective to enhance overall satisfaction with the online teaching experience.

Table 4 shows that the faculty satisfaction and perception scores of online teaching scores showed no statistically significant differences based on the demographic variables except nationality and training received. The level of satisfaction was significantly higher ($M = 3.339, SD = 0.412$) among those who received training on

Table 2 Mean and SD of perception score of faculty regarding online teaching

Perception statements on online teaching	<i>M</i>	<i>SD</i>
Online teaching makes learning more enjoyable for students	2.99	0.981
Online teaching fosters critical thinking in students	2.86	0.953
Online teaching enables the learner to stay focused throughout the session	2.45	1.001
Online teaching lets the students ask their questions in class without being embarrassed	3.32	1.024
Online teaching allows the teacher and the student to determine their own pace of learning	3.35	1.027
Online teaching enables the teacher to receive quick verbal and nonverbal feedback from students	2.86	1.121
Online teaching exposes to excessive screen time ^a	2.17	0.975
Online teaching needs ongoing training	3.92	0.896
Online teaching requires stable internet connectivity	4.5	0.763
Online teaching allows the instructor to act more as a facilitator than an information provider	3.48	1.020
Online teaching promotes social interaction between the faculty and students	2.83	1.169
Online teaching keeps students engaged in continuous learning	2.86	1.000
Online teaching requires faculty preparation of the teaching resources	3.92	0.843
Online teaching makes it possible to engage many students at once	3.76	1.049
Overall	3.24	0.5376

Note. *N* = 110

^aReversely coded item

Table 3 Correlation coefficient score between the faculty perceptions and satisfaction with online teaching

<i>N</i> = 110				
Variable	<i>M</i>	<i>SD</i>	<i>r value</i>	<i>p-value</i>
1. Satisfaction with online teaching	3.13	0.470	0.561	<i>p</i> < 0.001**
2. Perception of online teaching	3.24	0.538		

Note. *N* = 110

***p* < 0.001

online teaching than those who did not receive (*M* = 3.004, *SD* = 0.464), indicating ongoing training on online teaching, making a significant difference in their level of satisfaction, *t* (108) = 3.724, *p* = <0.001. In addition, the satisfaction level was significantly higher (*M* = 3.261, *SD* = 0.386) among the Non Omani faculty compared to Omani (*M* = 3.008, *SD* = 0.509), indicating Omani faculty less satisfied with online teaching, *t* (108) = 2.912, *p* = 0.004.

Table 4 One-way ANOVA/t- -test values showing significant difference in faculty satisfaction and perception of online teaching scores with demographic variables

Demographic profile	Satisfaction	<i>p-value</i>	Perception	<i>p-value</i>
	ANOVA/T test			
Age	0.542	0.865	0.411	0.682
45 and below				
46 and above				
Gender	0.745	0.458	0.938	0.351
Female				
Male				
Nationality	2.912	0.004*	0.175	0.861
Omani				
Non-Omani				
Highest academic qualification	1.677	0.192	0.226	0.798
Doctorate				
Master's				
Baccalaureate				
The program of the course taught	0.695	0.484	0.587	0.559
Nursing				
Non-nursing courses				
Teaching program	2.970	0.056	0.334	0.709
Diploma				
Undergraduate				
Graduate				
Both (undergraduate and graduate)				
Number of the credit hours of the course taught online	0.676	0.569	0.248	0.863
Two credits and less				
Three credit hours				
Four credit hours				
Five or more credit hours				
Number of students enrolled in the course	1.047	0.387	2.154	0.064
Less than 25				
26–50				
51–75				
75–100				
101 and above				
Years of teaching experience	0.504	0.680	0.474	0.701
Less than one				
01-July				
Aug-14				
14–21				
22 and above				

(continued)

Table 4 (continued)

Demographic profile	Satisfaction	<i>p</i> -value	Perception	<i>p</i> -value
	ANOVA/T test			
Training on online teaching received	3.724	0.001**	1.955	0.053
No				
Yes				
Previous experience with online teaching	1.729	0.087	1.656	0.101
Yes				
No				
Workload	0.415	0.661	0.147	0.864
Teaching only				
Teaching and clinical				
Teaching and administrative				
Level of experience with internet use	0.961	0.386	0.169	0.854
Novice				
Intermediate				
Expert				
Level of satisfaction with available internet speed	2.189	0.117	0.474	0.624
Satisfied				
Neutral				
Dissatisfied				

Note. *N* = 110. ANOVA -analysis of variance

p* < 0.05. *p* < 0.001

5 Discussion

The present study examined the faculty satisfaction levels and their perception of online teaching while determining the correlation between the two variables. OISM measured the faculty satisfaction with online teaching, while the investigators' perception tool elicited the faculty's perceptions of online teaching. The survey indicated that OCHS instructors had moderate satisfaction with their online teaching experiences. Interestingly, the study identified differences in satisfaction levels concerning various aspects of online teaching, reporting greater satisfaction regarding online education's "affordances" than "institutional support." Instructors found online instruction rewarding, stimulating, and accommodating to their needs. The study findings are consistent with other research conducted by Al-Zahrani (2015) and Bolliger et al. (2014), who also observed substantial levels of satisfaction with online training, particularly regarding student-instructor interactions and course design. Nevertheless, a discrepancy between policy and practice was emphasized, specifically in technology support.

In contrast, several authors' study findings contradicted our findings (Aydin, 2021; Blundell et al., 2020; Elshami et al., 2021; Thomas & Foster, 2020; Walters et al., 2017) by reporting that online learning was significantly impacted by

student-instructor and student-content interactions technological proficiency, and institutional support in terms of technological resources and professional assistance and communication tools. These findings imply that the factors affecting faculty satisfaction are inconsistent across educational institutions, further requiring a need to look into the potential influencing variables on faculty satisfaction using in-depth qualitative data to understand the specific reasons for these satisfaction levels. It also stresses the importance of examining the level of support provided by OCHS despite its efforts to mitigate the consequences of COVID-19 affecting educational settings across all branches in Oman. Besides, it highlights the necessity to address instructors' psychological and professional needs to enhance faculty satisfaction with online teaching, focusing on easy access, instruction, and support. Future research should correlate faculty satisfaction with student performance and outcomes.

In terms of faculty perceptions, the study found that, overall, the faculty at OCHS viewed online teaching as a favorable teaching mode. These findings are consistent with several previous studies (Castro et al., 2022; Cherry, 2015; McQuiggan, 2012; Özkara, 2021; Priyadarshani & Jesuiya, 2021; Venkataramanan, 2020). The significance of continuous training and professional development for faculty members to remain up-to-date with educational technology advancements and correctly deliver online instruction was emphasized in the study. Faculty members strongly perceived faculty preparation of teaching resources and a robust internet connection as crucial for successful online teaching. These findings of our study align with several study findings (Fisher, 2020; McQuiggan, 2012; Priyadarshani & Jesuiya, 2021). Fisher's (2020) findings support the results of this study, where a lack of faculty training was perceived as a barrier to online teaching. According to McQuiggan (2012), there is substantial evidence for the importance of faculty development practices focusing on content issues, technology, and pedagogy for online education programs. Priyadarshani and Jesuiya's (2021) study revealed that technological and network issues were the most significant challenges experienced by faculty. Therefore, the study emphasizes the importance of faculty being well-versed in technology integration in teaching, embracing new online-based pedagogical strategies, and becoming familiar with the learning management system provided by educational organizations.

Consistent with previous studies (Cherry, 2015; Kerr-Sims & Baker, 2021; Özkara, 2021; Walters et al., 2017; Wasilik & Bolliger, 2009), the current study is convincing that faculty valued online teaching for making learning more enjoyable and productive, fostering critical thinking, and enhancing flexibility, however showing limited scope for student engagement in continuous learning. It is crucial to note that the study acknowledged a potential disparity between faculty perceptions and classroom experiences. Since there is a lack of data on how these aspects are integrated into online courses and on the strategies used to promote interaction and engagement in online teaching, future studies are necessary to measure the current level of social interaction and engagement in online courses and existing implement strategies to enhance online teaching interaction and engagement. The study also highlighted the challenges associated with students staying focused during lessons

and excessive screen time. As self-reported perceptions may not always align with classroom experiences, the study calls for a more in-depth exploration of faculty challenges when teaching online. It suggests developing appropriate solutions for IT-related issues.

Furthermore, the researchers recommend that universities/educational institutions collaborate with internet service providers and IT departments to improve internet connectivity and other resources for online teaching. Future researchers should consider conducting classroom observations to validate faculty perceptions and collect data on the duration and depth of faculty experience with online teaching. Furthermore, it is recommended that future research endeavors focus on establishing a connection between faculty contentment and student academic achievements and overall outcomes. This will contribute to the advancement of our comprehension regarding the influence of online instruction. Additionally, it is imperative to build and execute customized training initiatives that cater to the specific requirements of faculty members.

Research findings also demonstrated a significant positive relationship between faculty perceptions and their satisfaction with online teaching. This finding suggests that their perceptions of it influence faculty satisfaction with online teaching, the support they receive from their institutions, and their belief in the effectiveness of online teaching methods. It emphasizes the importance of fostering positive attitudes towards online teaching, providing ongoing institutional support, and ensuring that faculty members perceive online teaching as effective in enhancing overall satisfaction with the online teaching experience. These findings are consistent with the study results of Alsuelmi (2021) and Misiejuk et al. (2023), demonstrating that continuous institutional support likely increases faculty satisfaction. Positive perceptions are also directly related to satisfaction with effective online teaching. The implications of this finding underscore the importance of creating a supportive and conducive environment for online teaching within educational institutions. By prioritizing faculty satisfaction and providing the necessary support and resources, institutions can enhance the quality of online education and ultimately contribute to the success of their online learning initiatives.

An analysis of the demographic profile provided additional insights into the characteristics of faculty members involved in the study. It was observed that most faculty members who participated in the study were Omani females in their middle age, holding a Master's degree, and possessing over 14–21 years of teaching experience. Nursing faculty teaching undergraduate programs participated the most in the study. In the study, many subjects were teaching three or more credits, few reported receiving training, and the majority needed to gain online teaching experience. Notably, there was no significant statistical difference in satisfaction and perception scores with any demographic variables except nationality and training received on online teaching. In contrast to the findings of several previous studies (Cherry, 2015; Walters et al., 2017), the present study found no correlation between faculty members' years of teaching online classes, their total number of online courses taught in the past 5 years, or their confidence in their technological abilities and their assessment of the effectiveness of online courses. Faculty satisfaction with student

interaction in online courses rises with the years the instructor has spent teaching online, suggesting that new instructors may need a different approach to faculty development.

6 Implication for Policy

Policy implications are substantial, focusing on enhancing faculty support, training, and resources to elevate the quality of online teaching and deliver an exceptional educational experience. Policies should adopt a proactive, flexible, and responsive approach to meet the articulated requirements of faculty and students. Prioritizing and strengthening the support structures for online instruction is essential, and one effective strategy is the establishment of dedicated departments or external support networks specializing in online education. These entities can provide faculty members with tailored guidance and resources, ensuring that the training programs effectively address individual needs and promote proficient use of online teaching methods. Additionally, policies should encourage faculty members to allocate specific office hours to design online courses, aiding in workload management and maintaining course quality.

To address student engagement and screen time concerns, educational institutions should implement policies that promote practical approaches in the design of online courses, focusing on fostering student attentiveness and participation during virtual instructional sessions. Quality assurance policies for online courses should be in place, encompassing systematic evaluations and opportunities for faculty members to provide feedback and improvement recommendations while integrating student input into the ongoing learning experience. These policies must align with the institutional goals and strategic plans of OCHS, ensuring the delivery of high-quality education that meets the demands of the contemporary era.

While this study has contributed valuable insights into faculty satisfaction and perceptions of online teaching at OCHS, it is essential to acknowledge its limitations. Firstly, the data analyzed in this study relies on self-reported responses, which may be subject to various biases and limitations associated with self-report measures. Secondly, the limited sample size may only partially represent part of the faculty population at OCHS, potentially leading to results that are influenced by contextual factors specific to the sample. As a result, it is essential to exercise caution when generalizing the results to other contexts or populations. Finally, the investigator's perception tool for this study should undergo further validation in different settings to ensure its reliability on a large population.

7 Conclusion

The survey results indicate that faculty members at OCHS express overall satisfaction with their experiences in online teaching. Their contentment is notably higher regarding online education's advantages than the institutional support they receive. Faculty members find online instruction rewarding, intellectually stimulating, and flexible to their individual needs. A positive observation is that ongoing training, adequate resources for faculty preparation, organizational support, and addressing professional and psychological needs can significantly create a positive experience, enhancing their satisfaction with online teaching. Therefore, it is recommended that institutions meticulously plan strategies to provide faculty members with access to external support networks, subject matter experts, peer mentors, and opportunities for continuous professional development. These entities can advocate for resources and offer wide-ranging support for creating and delivering online courses. Faculty involvement and satisfaction can be further improved through strategic resource allocation and practical measures for online instruction, which are particularly vital in the post-COVID-19 times.

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Ethical Consideration The Health Research and Review Ethical Committee (OCHS/REC/PROPOSAL-APPROVED/7/2022) approved the study.

Authors' Contributions MPD designed the study, collected data, analyzed and interpreted it, wrote the manuscript, and critically revised it. FHM supported the topic, conducted literature research, prepared a proposal draft, collected data, drafted the methodology part, and revised the manuscript. MA wrote the introduction, collected data, and revised the manuscript critically. All authors critically reviewed and approved the final draft. KM contributed to proposal preparation, literature review, data collection, discussion, conclusion, recommendation, and implication for the policy of the manuscript, and revised the final draft. All the authors are accountable for the paper's content and similarity index.

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“Let the Walls Do the Talking!” The Communicative Functions of Graffiti in Jordan



Rafat Al Rousan

Abstract Graffiti is any graphic or written inscriptions often inscribed by unidentified individuals on a public or private wall. Despite its ubiquity in Jordan, graffiti has not been given enough attention by scholars, especially in the Jordanian context. The primary objective of this study is to investigate the communicative functions of graffiti in Jordan. The study attempts to answer one straightforward question: What are the communicative functions of graffiti in Jordan? To this end, 1187 graffiti were collected from the major cities, villages, and camps in Jordan. This draws upon Van Dijk’s (Handbook of discourse analysis, 1–2, 2016) socio-cognitive approach and Content Analysis. The findings reveal that graffiti in Jordan serves a host of important communicative functions, including expressing feelings and emotions, advertising, recording wisdom, seeking fame, expressing loyalty and belonging, expressing propaganda, admiring, presenting political content, tagging, expressing humor, degrading and defaming, marking territory, challenging, complaining, instigating, giving instructions, presenting religious content, warning, commemorating, and showing social etiquette. The function of expressing feelings and emotions is the most frequent one, whereas the function of showing social etiquette is the least frequent one. This study also reveals that graffiti has become a common feature of Jordan’s streets, villages, and cities. Additionally, this study concludes that graffiti in Jordan has a strong relationship with the location in which it appears. Hopefully, this study will trigger new research in the same field to enhance our understanding of the nature of the human language in relation to culture.

Keywords Graffiti · Wall-Writing · Communicative functions · Jordan

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1 Introduction

Graffiti, or writing on walls, is any form of graphic or written inscriptions that are often inscribed by unidentified individuals on a public wall (Blume, 1987). Graffiti may include textual and visual genres (Karlandar, 2023). It is a global phenomenon that encompasses human society and abounds in the world around us. Graffiti is so ubiquitous that it might be considered a human characteristic (Casino, 2019). It can be seen on almost every imaginable surface, becoming an indispensable part of people's cultures. An ingrained art style in human culture, graffiti dates back to prehistoric wall drawings as a record of the human need for communication (Dennant, 1997). The Sumerians, Egyptians, and Romans wrote on the buildings they constructed and conquered (Dennant, 1997). Graffiti has been found at ancient sites in Iraq, Egypt, Pompeii, Rome, Athens, and South America (Casino, 2019). At present, graffiti, manifests as inscriptions, drawings, and writings that are scratched, scribbled, or painted on public or private surfaces. Karlandar (2023, p. 279) states that "graffiti is an integral part of the fabric of late-modern cities."

Graffiti artists are primarily impoverished, angry young males between the ages of twelve and twenty, who are members of the underclass and/or other social-political movements (Bushnell, 1990; Bartolomeo, 2001; Muhammad & Muhammad, 2004; MacDowall & De Souza, 2018). MacDowall and De Souza (2018) point out that graffiti is unique since it is practiced by young, marginalized people who wish to be heard and recognized. Graffiti artists usually have something worth saying but do not possess the funds or power to express it legally (Scheepers, 2004). Graffiti constitutes a means of free expression where the writer, who is frequently anonymous, is not constrained by social conventions or personal inhibitions to express themselves (Tracy, 2005). Tucker (2001) demonstrates that much can be learnt about any culture from the graffiti it leaves on its walls. Besides conveying personal messages, graffiti artists often tend to send messages that are social, political, and religious. As a medium, graffiti helps people express their needs, desires, disappointments, hostility, and socially unacceptable viewpoints on various topics, such as philosophy, politics, humor, religion, drugs, and sports (Dickinson, 2008).

Graffiti has become a distinctive feature of the streets of Jordanian cities, towns, and districts. Jordanian graffiti artists prefer public spaces, such as schools, bridges, freeway signs, public gardens and parks, sports clubs, and toilets of schools and mosques, because they frequently draw large crowds and are easily accessible. Graffiti is an important linguistic event that serves different communicative functions (Gadsby, 1995). However, this topic has not been given enough attention by scholars, specifically in a Jordanian context. The primary objective of this study is to investigate the communicative functions of graffiti in Jordan. The study of graffiti helps discover the creativity and depth of history, nature, and culture of people (Bartolomeo, 2001). Throughout this study, the terms "graffiti" and "wall-writing" will be used interchangeably.

Literature Review

Graffiti has drawn the attention of many scholars, particularly in Western settings. It has been studied in a western setting (e.g., Bushnell, 1990; Gadsby, 1995;

Abel & Buckley, 1977; Bartolomeo, 2001; Tucker, 2001). These studies discussed the importance, roles, types, functions, and legality of graffiti. Graffiti has been also explored in an Arab setting (Steinberg & Oliver, 1990; Peteet, 1996; Khalil 1979), and most of these studies focused on the role of graffiti in the first Palestinian *Intifada* “uprising” (1987–1993) and the second *Intifada* (2000–2005). As per Peteet (1996), one of the most evident aspects of the cultural landscape in the occupied West Bank during the peak of the *Intifada* (late 1980s and early 1990s) was the prevalence of graffiti. Graffiti appeared in that specific period as a means of resistance, contest, and defiance (Peteet, 1996; Muhammad & Muhammad, 2004). Palestinians also relied on graffiti to evade Israelis during the *intifada* (Bishara, 2009). For Israelis, graffiti constituted a serious threat and concern; for Palestinians, it was “intervention in a relationship of power” (Peteet, 140). Overall, graffiti during the *Intifada* was a powerful means of communication, resistance, cultural expression, and historical documentation.

Graffiti has been classified into different categories by a number of scholars (Gadsby, 1995; Dennant, 1997; Stowers, 1997; Bartolomeo, 2001; Emmison & Smith, 2002). Emmison and Smith (2002) categorize graffiti into two general types: public and private graffiti, whereas Gadsby (1995) classifies it into eight types: latrinalia (graffiti found on walls of restrooms), public (graffiti written on exterior walls of buildings and subway cars), folk epigraphy (the carvings of the common people found on rocks, trees, and disks), historical (graffiti investigated by someone not contemporary to the writings), tags or artistic graffiti (a form of public graffiti meant for people living in a certain community), humorous (graffiti written for entertainment), conversational (a type of graffiti soliciting a written response from other people), and declarative (a type of graffiti stating a certain viewpoint). Bartolomeo (2001) also divides graffiti into: popular graffiti, community-based graffiti, gay graffiti, and hip-hop graffiti. Furthermore, Stowers (1997) identifies different manifestations of graffiti on exterior walls of buildings and subways, such as slurs, slogans, or political statements; and tags which are “fancy scribble-like writings,” such as names or nicknames. On the other hand, Khalil (1979) classifies graffiti in Lebanon into three categories: public writings (performed by the public to express feelings and emotions), writings of leftism (performed by political parties that are against the government), and writings of rightism (performed by parties supporting the government).

Previous research indicates that graffiti serves several different functions. For example:

- Self-expression (Khalil, 1979; Steinberg & Oliver, 1990; Abel & Buckley, 1977; Stowers, 1997; Bartolomeo, 2001; Neelon, 2001; Christen, 2003; Scheepers, 2004; Gonzalez, 2015; MacDowall & De Souza, 2018).
- Politico-Social content (Khalil, 1979; Bushnell, 1990; Bartolomeo, 2001; Muhammad & Muhammad, 2004; Lennon, 2014).
- Pleasure (Tucker, 2001; Christen, 2003).
- Resistance (Peteet, 1996; Dennant, 1997; Khalil, 1979; Steinberg & Oliver, 1990; Brewer, 1992; Tucker, 2001; Muhammad & Muhammad, 2004; Lennon, 2014).

- Gaining power and recognition (Steinberg & Oliver, 1990; Dennant, 1997; Stowers, 1997; Neelon, 2001; Christen, 2003)
- Advertising (Neelon, 2001; Ong, 2021).
- Art (Dennant, 1997; Stowers, 1997; Muhammad & Muhammad, 2004)
- Education (Christen, 2003).
- Commemoration (Steinberg & Oliver, 1990; Peteet, 1996).

The literature shows that graffiti is primarily practiced by young, poor, and marginalized people with little institutional power (Abel & Buckley, 1977; Bartolomeo, 2001; Neelon, 2001; Christen, 2003; Scheepers, 2004; Lennon, 2014; MacDowall & De Souza, 2018). This particular demographic uses graffiti to express worries and concerns, seek power and recognition, rebel against the world, make their voices heard, and have fun.

Conflicting views about graffiti were also reported in the literature. Some view graffiti as an artistic, aesthetic, and functional practice (Gadsby, 1995; Abel & Buckley, 1977; Dennant, 1997; Stowers, 1997; Tucker, 2001; Muhammad & Muhammad, 2004), whereas others regard it as vandalism that destroys property (Al Rousan & Al-Harahsheh, 2019; Kramer, 2010). Some people view graffiti as art or vandalism depending on the place on which it appears. For example, if it is under a bridge, it can be beautifying; if it is on a building, it can be damaging and destructive. Many cities in the USA, UK, Australia, and the Netherlands took some preventive measures to eliminate graffiti as they consider it a form of vandalism punishable with jail time. In contrast, other cities, including New York and Jakarta, use graffiti to beautify city spaces as a means to attract tourists (Vanderveen & Van Eijk, 2015). Kramer (2010) argues that graffiti is a violation of law, just like theft and trespassing. In contrast, Gonzalez (2015) contends that graffiti is an art that can raise the energy of the community and a tool for mass communication. Although it is regarded as a destructive activity, there is no doubt that graffiti has important messages to communicate.

New forms of graffiti, such as digital graffiti, have recently emerged. Digital graffiti is a form of graffiti that combines both traditional graffiti methods and digital technology. Using augmented and virtual reality, digital graffiti allows graffiti artists to create and share their works in virtual spaces in real-world space without the physical and legal restrictions of traditional graffiti (Quintero, 2007; MacDowall & De Souza, 2018; Pratama et al., 2019). Digital graffiti helps graffiti artists to reach a wider audience, extending beyond those who happen to be passing around their work (MacDowall & De Souza, 2018; Pratama et al., 2019). Digital graffiti is also durable and may have more influence on its audience (Pratama et al., 2019), because digital platforms serve as repositories, allowing the audience to access graffiti after it has been deleted (Karlandar, 2023). Moreover, digital graffiti “organizes space and turns street wall data and structure into a flâneur-user experience” (Quintero, 2007, p. 1).

In the Arab setting, several scholars have examined graffiti from different perspectives (Steinberg, & Oliver, 1990; Peteet, 1996; Muhammad & Muhammad, 2004; Lennon, 2014; Al Rousan & Al-Harahsheh 2019; Ta'amneh, 2021). Studying

the graffiti of the intifada, Peteet (1996, p. 155) concludes that "graffiti did more than signify and or reflect, they also intervene in dominant-subordinate relations." Similarly, Muhammad and Muhammad (2004), who investigate the slogans of the *intifada*, conclude that graffiti reflects the writer's mental state. In a Jordanian context, Al Rousan and Al-Harabsheh (2019) reveal gender differences in the thematic content of bathroom graffiti in Jordanian universities. Ta'amneh (2021), who studies the graffiti found at secondary public schools in Irbid, Jordan, argues that students use graffiti to convey different types of messages. Studying car inscriptions in Jordan, a form of graffiti, Darwish and Al Rousan (2019) show that car inscriptions in Jordan fall under twelve major themes, including: philosophy, advertisement, tagging, and patriotism. The literature review shows a paucity of research examining the communicative functions of graffiti in Jordan. Thus, this study comes to fill in a gap in the literature.

2 Methods

This study is a mixed method research, which combines elements from quantitative and qualitative approaches. A total of 1187 pieces of writing were gathered in person from the major cities, villages, and camps in Jordan. The data collection process took around 5 months to complete. photography was used in the data collection to ensure the validity of the data. Before taking photographs of graffiti written on a private property, its owner's oral consent was obtained. Furthermore, a pen and a notebook were used in the data collection. Two graffiti writers were interviewed for clarification purposes regarding specific graffiti practices. In light of the research scope, this study limits itself to only spray-paint graffiti found on exterior walls in Jordan. Therefore, spray written graffiti was gathered from the walls of houses, buildings, schools, playgrounds, sidewalks, underpasses, and camps' walls. According to Qunitero (2007, p. 2), spray-can art is regarded as "true graffiti." It is strongly associated with the origins of modern graffiti or hip-hop culture (Brewer, 1992).

This study employed Van Dijk's (2016) socio-cognitive approach and Content Analysis (CA) to analyze the data. These approaches enabled us to conduct an in-depth examination and fully understand the communicative functions of the graffiti under investigation as they provided insights into the graffiti's hidden meanings and ideologies. Van Dijk's socio-cognitive approach combines cognitive processes (personal experience and knowledge) and social contexts to interpret discourse. It highlights the impact of mental models and social contexts on the production and comprehension of discourse. This approach also focuses on how ideologies are reproduced and contested through discourse. On the other hand, CA is a systematic research method used to examine and draw conclusions from qualitative data. For Gheyle and Jacobs (2017, p. 2), "Content analysis (CA) is a research methodology to make sense of the (often unstructured) content of messages – be they texts, images, symbols or audio data." Krippendorff (2004) posits that CA is used to

analyze texts within the contexts of their use. CA views data as representations of texts, images, and expressions, meant to be viewed, read, interpreted, and understood.

The data classification was conducted by the author and a colleague who has a PhD in linguistics. They classified the data individually. The agreement between them was very high (96%), and issues of disagreement were revisited and resolved. Disagreements between the author and his colleague were resolved by meeting together and discussing their evaluations and judgments. When disagreements persisted, a third referee, who is also a linguist from the Department of Arabic at Yarmouk University, was consulted. For discussion purposes and due to word limit constraints, only one relevant example was randomly selected from each category. The graffiti collected was written in standard and substandard Arabic. However, some of them were written in English (=68), and very few in French (=5).

3 Findings

The data analysis shows that graffiti in Jordan serves different communicative functions. The functions, their frequencies, and percentages are summarized in Table 1 .

Table 1 Frequency and percentage of graffiti communicative functions

	Function	Frequency	Percentage
1	Expressing feelings and emotions	142	12%
2	Advertising	116	9.8%
3	Recording wisdom	104	8.8%
4	Seeking fame	96	8%
5	Expressing loyalty and belonging	92	7.8%
6	Expressing propaganda	83	7%
7	Admiring	63	5.3%
8	Presenting political content	56	4.7%
9	Tagging	52	4.4%
10	Expressing humor	49	4.1%
11	Degrading and defaming	41	3.4%
12	Marking territory	41	3.4%
13	Challenging	38	3.2%
14	Complaining	35	3%
15	Instigating	34	2.9%
16	Giving instructions	32	2.7%
17	Expressing religious content	32	2.7%
18	Warning	30	2.5%
19	Commemorating	28	2.4%
20	Showing social etiquette	23	1.9%
Total		1187	100%

3.1 *Expressing Feelings and Emotions*

This function represents 12% of the total amount of graffiti collected, occupying the first place in the list. The samples collected invoke a range of often contrasting expressions such as love and hate, jealousy and joy, happiness and sorrow. Love, perhaps the strongest of human emotions, is expressed differently from person to person, sometimes explicitly, other times cryptically. Social norms may also restrict expressions of love. The sensitive nature of love in Jordanian culture may lead individuals unburden themselves of these specific emotions through graffiti. Thus, a considerable number of love expressions are found on walls.

(1) **BaHibbak Hatta I-mawt ? al-mu9aDDab“S”**

I +love +you until the- death the- tormented“S”

“I love you to death! The tormented ‘S’.”

In this example, the writer uses graffiti to express their pure love through commitment and sincerity. The writer assures their lover that only death can part them. This expression may be interpreted as a promise from the writer to their lover. Some graffiti artists draw to express their feelings rather than write them, perhaps because these feelings are challenging to convey openly. This difficulty may be what causes such people pain and suffering. That is why one artist refers to themselves as? *al-mu9aDDab* “the tormented.” The signature ‘S,’ in this example, is a symbol meant to be understood by both lovers.

3.2 *Advertising*

Advertising is a marketing communication message that involves promoting a product or service through various media channels to reach and influence potential customers. Advertisements can take many forms, such as print ads, television and radio commercials, billboards, online ads; social media promotions, or even graffiti. Some graffiti in Jordan serves as an advertisement for goods and businesses. A total of 9.8% of the data serves this function.

(2) **Sharaap laafi ... nakhat l-burtuqaal wa-l-mangah**

Juice lafi ... flavor the-orange and-the-mango

wa-l-faraawlah ... sharikat ja9far wa-?awlaaduh

and the strawberry... company ja'far and-his sons

“Lafi juice...Orange, mango and strawberry flavors...Ja'far and Sons company.”

Marketing experts and producers understand the importance of a strong and competitive advertising to attract customers’ attention towards their commodity. As a result, they utilize every possible means to promote their products including walls, one of the cheapest and most widespread means of advertising. The advertisement

above is for a beverage called “Lafi.” It comes in different flavors and is manufactured by Ja’far and Sons Company.

3.3 *Recording Wisdom*

Wisdom is a brief rhetorical saying of people whose life experience has taught them rich lessons and experience. Wisdom is frequently passed down orally or graphically from one generation to another. Because collective wisdom is vital to many cultures, people believe it should be admired, preserved, and shared as widely as possible. People use wisdom to remind, advise, and guide others to perform good deeds. Wisdom was the third most frequent function of Jordanian graffiti, accounting for 8.8% of the study sample.

(3) **9aynu l-Hasuud laa tasuud**

Eye the- envious no prevail

“The eye of the envious never prevails.”

This example represents envy as a harmful act that should be stopped. Envy is the “painful or resentful awareness of an advantage enjoyed by another joined with a desire to possess the same advantage” (Meriam Webster Dictionary). It expresses someone’s wish and hope that blessings bestowed by God to certain other people disappear. Such envious expressions are considered disgraceful and forbidden by all religions, particularly Islam, which calls to eradicate envy. In the Jordanian Culture, eyes are believed to be the first spark of jealousy, so the wisdom mentioned above starts with “eyes.” The consequences of envy are so harmful to both the envious person and the society in which he/she lives in as well. This graffiti strongly urges its audience to reject envy.

3.4 *Seeking Fame*

Some people find wall-writing a suitable means of seeking personal fame, the fourth most frequent function of graffiti in this study (8%). With fame comes increased attention, admiration, and influence. Some people desire to be famous in their communities and may resort to graffiti to increase their recognition and status. Thus, they resort to certain ways that help them print their pictures in the minds of others to become famous.

(4) **?abu shadiid ... ?imxaawi l-Dalmah**

father Shadid ... companion the-darkness

“Abu- shadid ‘the companion of darkness’.”

Darkness is associated with fear, horror, and apprehension. A person who can rebel against these ideas is distinguished as brave and courageous. Such individuals find it very thrilling to be characterized by expressions, such as? abu l-leil “father of

night,” Dab9i i-leil “hyena of night,” 9aashiq? Id-Dalaam “the lover of darkness,” and any other expressions denoting power, control, toughness, and notoriety. Writings that contain such terms indicate the artist’s desire for social ranks, great power, and fame. Nicknames are commonly found in these expressions.

3.5 *Expressing Loyalty and Belonging*

This function represents 7.8% of the total amount of the collected graffiti. Societies are usually based on sets of norms and principles, which may include feelings of loyalty and belonging to a nation, leadership, or group. Members of society often feel obliged to preserve and transfer these norms and principles from one generation to another. Loyalty refers to a firm support for someone or some group. It is a high moral good that helps one find unity and serenity in one’s life. On the other hand, belonging refers to a sense of connection with a group and/or a community. The data shows that Jordanian people often express their loyalty to their God, nation, king, tribe, group, or team, etc.

(5) **man kaana ma9aaniyyan fal-yaftaXir... wa-man**

who was ma’ani so-be proud and-who

kaana Gayra Daalika fal-yantaHir

was otherwise that so-commit suicide

“He who is ma’aani should be proud of himself; otherwise, he should commit suicide.”

This graffiti shows how a Jordanian man can be very loyal to his tribe, which is part of his identity. He is always willing and ready to sacrifice his life to protect it. Jordanians also tend to feel an attachment to the place in which they were born and raised, be it a village, a town or a city, regarding it as the best place on earth. The writer of the above graffiti is endlessly proud of their city, Ma’aan. Being proud of one’s city creates a good feeling of loyalty and respect for oneself and others. This feeling of pride, loyalty, and respect distinguishes the artist’s belief in their communities as the best and others as not worth living in it. This figurative exaggeration is not meant to be taken literally.

3.6 *Propaganda*

Propaganda spread messages that serve a specific agenda and manipulate public opinion whether political, social, or religious. It can take many forms, including mass media, speeches, rallies, or social media campaigns. Graffiti in Jordan also serves this function, which makes up 7% of our data.

(6) **?al-muHaami haani l-maSaalHih: “kuntum ma9i**

the-lawyer Hani the-Massalheh were you with-me

wa-sawfa ?akuunu ma9akum daa?iman”

and-will be-me with-you always

Attorney Hani Al-Massalheh “You were with me, so I will always be with you.”

Democracy in Jordan extends to the elections of parliament, professional unions, student unions of colleges and universities, city councils, and other offices. Those who find themselves competent and qualified for such elections compete in a democratic atmosphere. Candidates inform voters of their platforms, occasionally relying on emotional appeals, such as fear, patriotism, or loyalty, to sway people’s opinions and votes. The graffiti above was found on a school wall. The candidate, attorney Hani Al- Massalheh, uses graffiti to promote his election campaign. His campaign slogan promises voters that he will always be at their sides because they always stood by him. Finally, he uses the expression “The Candidate of the District” as a signature for his slogan.

3.7 *Admiring*

Admiring is the feeling of respect, approval, and high regard for an individual, group, or an idea. Expressions of admiration constitute 5.3% of Jordanian graffiti functions. The data show that some graffiti artists have strong feelings of admiration towards people whom they look up to, such as leaders, singers, or actors.

(7) **9aasha jivara**

Lived Jivara

“Long - live Jivara”

Che Guevara, a well-known figure for the Cuban Revolution alongside Fidel Castro, is idolized by other revolutionaries across the globe. Known for his resistance to poverty, colonialism, and illiteracy, alongside his support for justice, freedom, and fraternity, Guevara is widely respected by Jordanians, who invoke his name and ideals in their graffiti. Using the past tense 9aasha, meaning “long-live,” the writer believes that Guevara’s glorious deeds and achievements are alive and will never die.

3.8 *Presenting Political Content*

Grffiti has been used for political expression for many years (Bartolomeo, 2001). Some of the most iconic and influential graffiti artworks have been created to make political statements or to raise awareness about social and political issues (Bartolomeo, 2001). Politics preoccupies the thinking of a significant number of Arabs in general and Jordanians in particular. Having witnessed so many political changes and developments, Jordanians are no exceptions. Political graffiti is a

powerful tool for raising awareness and promoting change, representing 4.7% of the data collected for the study.

(8) Bilaadu l-9urbi ?awTaani... mina sh-aami li-baGdaani

countries the-Arabs homelands from the-Sham to- Baghdad

"All Arab countries are my homeland...from Al Sham to Baghdad"

This graffiti, a line of poetry written in beautiful calligraphy, was expressed by Al-Baroudy, a Syrian nationalist. The image of an Arab homeland is a source of strength, dignity, and pride for many Arabs. It reminds them of the common language, history, blood, culture, and ties they have with all other Arab people and of the fact that they are one nation which has been divided by greedy colonists. It expresses a desire to realize the unity of Arab countries and regain Arabs' great status.

3.9 Tagging

Tagging is the act of writing, engraving, or spray painting one's name, nickname, or pseudonym in a public space. It is seen as a means to gain recognition and establish a presence in a particular area. People also tend tag to leave their memoirs in places they live, visit, or pass through. These reminiscences are left on walls, mountains, deserts, riversides, trade roads, etc. This function represents 4.4% of the overall data.

(9) ?ahmad ?al-jarrah....27/10/2001

Ahmad the-Jarrah.... 27/10/2001

"Ahmad Al- Jarrah.... 27/10/2001"

This expression was spray-painted on a wall in a crowded neighborhood in the city of Zarqa. The same expression with the same spray-painting was also found on a mosque wall in Jerash city but with a different date (13/11/2001). Presumably, these tags were written by the same person. The writer tries to tell the reader that he was present at these specific locations on the given dates, and that he wishes to be recognized and remembered.

3.10 Expressing Humor

Graffitiists use humor as a tool to convey a message or express a sentiment. They use it to make a statement, poke fun at authority or entertain the audience through parody and/ or sarcastic comments. These types of messages often catch the attention of people and can be effective in creating social commentary. Humor can also be viewed as a means to achieve maximum relaxation and vent negative feelings. Humor accounts for 4.1% of the data.

(10) **Kulha ?ayyam ya Gaali wi-tnaam baHDaani... ?altawgii9
“?al-magbarah”**

All-it days O' dear and-sleep in-arms-me... the-signature the- graveyard
“O' dear! It is only a matter of days and you will sleep in my arms” signed
by “graveyard”

This graffiti, discovered on a cemetery fence, teases the reader by making them believe that he is being called by a lady who wants to hug him very soon. The artist then shocks the reader by using the “graveyard” signature after having lulled the reader into complacency. The writer compares the graveyard to a lady who can feel, love, and give hugs, which is the source of the graffiti’s humor.

3.11 *Degrading and Defaming*

Degradation is used to undermine the quality of a person, organization, or object. It can strip individuals of their honor and dignity and attack their social status. Similarly, defamation brings ill-notoriety, shame, and disgrace to the intended target (The Oxford English Dictionary). Defamation can be either slander (spoken form) or libel (written form). Graffiti can use offensive and derogatory language to harm or disrespect the target, leading to negative consequences. This function which accounts for 3.4% of the data is best depicted in the following example

(11) **bush ?il-Haqiir**

Bush the-despicable
“Bush, the despicable”

The name of the former American presidents George H. W. Bush and George W. Bush have ugly associations in the minds of Arabs and Muslims. The Bushes are despised for their support of Israel against neighboring Arab countries and for the unjust enmity they held against Arabs and Muslims. As a result, many Jordanians declare their hatred of these odious figures. Since most Arab governments forbid their people from expressing such feelings through authorized means of communication, such as newspapers and magazines, people turn to graffiti to express their antipathy and spite toward such enemies.

3.12 *Marking Territory*

The data show that this function represents 3.4% of the overall functions. This function includes graffiti marking different quarters, districts, and neighborhoods. They may sometimes refer to the tribes, groups, or individuals inhabiting these quarters and provide information about their social status. Other times, they indicate the boundaries of these locations.

(12) **Hay bani Kreishaan**

district sons Kreishan
 “The quarter of Kreishan Tribe”

In this example, the graffitist is trying to mark his neighborhood, which is a group of neighboring houses or rather families found in a prominent location. Sometimes, families of a certain neighborhood as a whole are given the name of this tribe or family, as in the above example “Bani-Kreishan.” This piece of writing reflects the pride of the people who live there. This example may also serve the functions of expressing loyalty and giving instruction or directions.

3.13 *Challenging*

A challenge is an act of defiance regarded as a psychological reaction against specific actions and events that face the challenger. Man, as an individual or a group, has been and is still in real challenge with what life imposes upon him. This kind of challenge may develop to become realized as a man to man challenge because of the growing human interests and goals in this life. People’s reactions to challenges and defiance are clearly different. That is, there are various ways of expressing challenging reactions, one of which is graffiti. Notably, 3.2% of the data represents this function.

(13) **lan narka9 ya quds**

Never kneel -down-we O’ Jerusalem
 “O’ Jerusalem! We will never kneel.”

Palestinians constantly fight against Israeli occupiers, rejecting all forms of invasion, subservience, and resignation. This readiness to resist is vividly expressed in this example, as the author announces a steady attitude of challenged resistance. The author of this expression commits themselves to standing firm in the face of their occupiers, promising Al Quds “Jerusalem” that they will never give up the fight. The graffiti artist also combines challenge with their commitment and promise to Palestine.

3.14 *Complaining*

Complaining represents 3% of the data. It is the act of expressing dissatisfaction, rejection, or resentment towards a state of affairs. One who complains usually voices objections about something that one feels unfair or unsatisfactory. Complaints may emerge due to some political and economic situations, or other social and material condition. Thus, some people turn to graffiti to vent these negative feelings and make themselves heard to a broader audience.

(14) **?aah ya zaman maa ?aGdarak**

Oh O' time how perfidious
 "Oh time! How perfidious you are!"

In this example, the writer tries to register his dissatisfaction about life in general, calling it a "traitor." The particle 'oh' is usually used with expressions of complaint, suffering, and pain. Most pessimistic people claim that "time," equivalent to "life," is always unjust to them, forcing them to lose loved ones or suffer unexpected calamities. All these undesirable situations push people to blame "time" for their misery and unhappiness. Although "time" and "life" refer to two different concepts, people view them as identical.

3.15 Instigating

Instigating may be defined as urging, inciting, or encouraging someone to do something. Graffiti can be used as a form of instigation by encouraging others to take action or participate in an event. For example, a graffitiist may write a message encouraging people to protest against a particular existing condition. Instigation makes up 2.9% of the overall functions in the sample.

(15) **9ish Hurran wala taqbal bi-Dulli wa-l-hawaan**

live free and-not accept in-ctinge and-the degradation
 "Live free and reject cringe and degradation."

Typically, this statement is used to instigate others to stand against and reject all kind of oppression, humiliation, and injustice. In this example, the writer attempts to address the severe reality of Arabs and Muslims who accept living in the present conditions imposed by Western nations. It expresses the tough situation through which the Arabs are going because of the arrogance and tyranny of the west. This graffiti functions to instigate Arab and Muslim people to reject all forms of humiliation and disgrace and to strive for their freedom.

3.16 Giving Instructions

Giving instructions refers to the process of providing someone with information and guidance on how to perform a task or reach a specific destination. Directions guide others to navigate a physical space or reach a particular location. Particularly, 2.7% of the overall functions in this study represent this function.

(16) **Mamnuu9 ?alwuquuf liman 9indahu ?adab madXal karaaj**

Prohibited the-parking for-whoever has-he politeness entrance garage
 "Parking is prohibited! For polite people! This is a garage entrance."

The above piece of graffiti was found on a garage entrance in Irbid city. The writer asks people not to block his garage entrance, a common practice in Jordanian cities. This action enrages some property owners, who sometimes regard it as an act of aggression and lack of respect. The writer of the above graffiti seems very annoyed, but they express restraint using the phrase “for polite people.” Expressions written on these specific spots vary according to the writer’s educational and cultural background.

3.17 Expressing Religious Content

Religion is considered one of the essential pillars of Arab society, dictating humanity’s relationship with Almighty Allah and the rest of the mankind. As such, many religious expressions are found on walls in Jordan. They include Quranic

verses, Hadith (Prophet’s Muhammad Instructions), and some other religious content for the purpose of advising, reminding, teaching, and warning people. Religious expressions constitute 2.7% of the overall functions in our study.

(17) wa-fi ssmaa?i rizqum wama tuu9aduun

and-in the-sky sustenance-your and-what promise-you

“And in the sky is your sustenance and what you are promised.”

This expression is a reminder of a very important pillar in Islam, to believe in fate and divine decree. Believing in fate and divine decree is regarded as one pillar of Mankind’s faith. According to this Quranic verse taken from (Sura 22, alDaaryiat, verse51), Muslims must be sure that Allah is the only entity capable of deciding their affairs and living. Thus, they write this religious expression on their houses and businesses to remind themselves and others that whatever man owns is given to him by the will of Allah.

3.18 Warning

The primary purpose of warning is to prevent harm by providing advance notice of a potential risk or danger. Good people always alert others against potential danger and warn them to prevent accidents, promote safety, and comply with rules and regulations. Such people use graffiti to appeal to others, a function that accounts 2.5% of the data.

(18) laa li-l-muxadaraat

No for-the-drugs

“No for drugs!”

Nations are faced with suffering, often because of drug abuse. This graffiti was found on a house in a conspicuous area along the highway between Irbid and

Amman. The artist warns others of the danger of drug abuse and other harmful substances. Thus, wall-writings have become an effective way for awakening people and enlightening them about potential dangers and risks.

3.19 *Commemorating*

This function represents 2.4% of the graffiti functions identified in this study. The act of commemorating is defined as a celebration designed to honor the memory of some person or event (Oxford English Dictionary). These events and/or personalities are admired and celebrated by many people because of their lasting impact. The Arab nation is rich in great personalities and events; Jordanians, who are no exception, commemorate their outstanding figures and glorious events through different means of expression, one of which is graffiti.

- (19) **Yawmu il-shahiid muHammad ?ad-durrah**
 day-his the-martyer Muhammad the-Durrah
 "The day of the martyr Muhammad Al-Durrah."

The shahid "martyr" holds a high and honorable place in Islam as one who gives his life in the Jihad (Steinberg & Oliver, 1990, p. 18). The tale of the martyr boy Muhammad Al-Duraah is very popular as a great story of sacrifice, resistance, and challenge. He is hailed as one of the martyr boys, who was murdered by the Israelis in the second Intifada (uprising). Muhammad and his father were savagely shot and killed on 30 September 2000 by the Israeli army despite their helpless call to be saved. This tragic story exposes the cruelty and wildness of the Israeli army. Jewish extorters against the real and true owners of the land. The writer views this memory as a great event worthy of commemorating in any possible way even if it is wall-writing.

3.20 *Showing Social Etiquette*

Social etiquette refers to interactions between family members, friends and co-workers, and even strangers. Jordanian people are closely attached to one another by a code that constitutes a very important part of their life-style. These relations have existed for generations and constitute a rich source of solidarity, intimacy, and reverence among people. In fact, some of these expressions are utterances used in daily conversations. This function is the least frequent one, representing 1.9% of the total data set.

- (20) **Mabruuk li-l-9irsaan**
 congratulations to-the-newly-weds
 "Congratulations to the newly- weds."

Weddings are important social occasions that attract the attention and care of Jordanians. They are usually colored with deep happiness, pleasure, and joy. In Jordan, places of weddings are often decorated with different things that express joy and pleasure. Wall-writing is one of these ways. Congratulations on marriage is an expressive illocutionary act in the sense that it is convivial and therefore intrinsically polite. Its goal is to establish and maintain good relations among people (Leech, 1983, p. 104). The writer of this graffiti is appealing to God to bless this occasion by keeping the newly-wed families joyful and surrounded by love and passion.

4 Discussion

Although graffiti is often viewed as a destructive practice, it undoubtedly has some substantial functions that reflect an important side of people's lives. Graffiti in Jordan reflects some psychological motivations that drive people to express themselves. It is mainly used as a means of venting and self-expression. Thus, many individuals resort to using walls as a canvas to defy oppression and injustice, to look for fame and superiority, to rebel against some unsatisfactory political, economic or social issue, to fight boredom, and to vent out anger or hatred, and so on.

This research further indicates that Jordanian graffiti, in general, is closely associated with the place in which they were found. For example, writings on the walls of camps are often different from those on a school wall. Most of the writings found in the camps are political and primarily concerned with resisting the Israeli occupation, returning to Palestine, uniting the Palestinian people, and commemorating Palestinian martyrs. In his answer to the question: “Why are the walls of this Camp full of graffiti?” Mr. XXX (anonymized) (Interview, Jan 17, 2004), a man in his forties and a resident of the camp, emotionally stated that “We Palestinians are full of suffering and bitterness; these feelings just pour out of us into the walls of our camps.” On the other hand, graffiti expressing feelings and emotions is mostly found on school walls and playgrounds. Graffiti aiming at advertising, warning, and instigating is always seen on the most visible walls in densely populated areas the writer wants them to be read by as many people as possible. Moreover, most of the graffiti found in Aqaba and Petra, for example, serves the function of “tagging” because the writers of these expressions are visitors of the cities who try to remind others of their presence. If compared to the graffiti in the West which is often complicated though more beautiful and organized (Scheepers, 2004), Jordanian graffiti is simple, brief, and mostly rhetorical, and lacks an aesthetic touch.

This study agrees with the studies of Gadsby (1995), Abel and Buckley (1977), Dennant (1997), Stowers (1997), Bartolomeo (2001), and Tucker (2001) with respect to the function of feelings and emotions. Concerning the function of loyalty and belonging, this study also supports Abel and Buckley's (1977) and Bartolomeo's (2001) findings that graffiti is a unique method of expressing loyalty and solidarity. Similarly, the function of seeking fame lends support to Brewer

(1992), who holds that fame is one of the most significant functions expressed in American graffiti. It also agrees with the findings of Bushnell (1990), Brewer (1992), Gadsby (1995), Abel and Buckley (1977), Scheepers (2004), Tucker (2001), and Darwish and Al Rousan (2019), which reported the same functions. Furthermore, expressing humor is evident in the findings of Gadsby (1995), Tucker (2001), and the present study. Similarly, the finding regarding the function of challenge is consistent with the findings of Christen (2003) and Tucker (2001). Finally, the findings of this study agree with those of Bushnell (1990), and Bartolomeo (2001) regarding political content. However, graffiti expressing political content is far more widely used in Jordan than in Western settings. One reason behind this difference may be because people in the West can use the press more freely to express their political beliefs and criticism. According to Bartolomeo (2001, p. 26), "Wall-writing has been used as a form of political resistance in the third world nations."

However, some functions identified in the present study are not in harmony with those arrived at by Western studies. Firstly, this study does not agree with the studies of Brewer (1992), Dennant (1997), who maintain that graffiti serves an aesthetic function. Generally, graffiti in Jordan is chaotic and lacks an aesthetic touch. Unlike graffiti in the West, graffiti in Jordan is performed by individuals lacking organization and experience.

Secondly, this study's findings are not in accord with Bartolomeo's (2001), Austin's (2002), and Christen's (2003), concerning the fact that graffiti is gang related. Evidently, graffiti in Jordan is done by individuals lacking any organized ties and leadership. No evidence of gang-related graffiti was found in our data. Thirdly, another difference is that graffiti in foreign studies lacks religious content, advertisement, and propaganda functions. These three functions are distinguishing features of graffiti in Jordan. Finally, this study indicates that the functions of recording wisdom and social etiquette were not found in Western studies. I suggest that the reasons for this could be attributed to the frail relationships between people in the West. Relationships among people living in Jordan, especially in small villages and towns are more close than among people in Western countries. Therefore, they care about the well-being of one another, help one another, and protect one another.

To compare the findings of this study with those of the non-western studies, I believe that they have much in common. The present study supports Khalil (1979), Steinberg and Oliver (1990), Peteet (1996), Muhammad and Muhammad (2004), and Al Rousan and Al-Harabsheh (2019) findings. All of these studies reveal that wall-writing can be used as a means of self-expression, mass media, resistance, challenging, feelings and emotions, political and social agendas, commemoration, and attitudes and beliefs. The similarity between these studies and the present one is due to the common, culture, religion, destiny, politics, and social situations among the Arab countries. In sum, this study shows that the functions expressed in graffiti in Jordan are far more comprehensive than those expressed in graffiti in other settings.

5 Conclusions

Based on the analysis and discussion, the following conclusions have been drawn. This study has shown that graffiti in Jordan expresses a host of impactful communicative functions. Jordanian graffiti is rhetorical rather than aesthetic and predominantly expresses the writer's feelings and attitudes. This study has also concluded that graffiti has become a common feature in Jordan. It allows individuals to express themselves, to voice their concerns, worries, and demands, and to resist injustice and oppression. Furthermore, Jordanian graffiti has a strong relationship with the surrounding location. Unlike graffiti in the Western context, graffiti in Jordan is not gang-related, and it lacks the artistic touch.

Despite the functionality and popularity of graffiti, the potentiality to cause property damage suggests that graffitiists should abandon this practice and look for appropriate alternative medium. It is advisable that people abandon this practice and look for an alternative to serve the same functions more appropriately. Here, the responsibility lies on the shoulders of the governments, which should guide people through various convenient means to preserve all public and private properties. For example, disciplinary and educational conventions should be organized regularly. Additionally, specialized agencies should be formed to educate people about the negative impact of graffiti. Effective law should be put into action to help fight graffiti. Private locations should be allocated for those who practice graffiti as a hobby away from the eyes of the censor. Finally, constructive digital graffiti offers a suitable alternative for those who cannot give up graffiti. Special websites are established online for graffiti artists to perform their writings and drawings. Those insisting on committing such an act of defacing and causing damage to private and public property action should be penalized.

In light of the previous discussion and conclusions, this study recommends that a contrastive analysis of graffiti in Jordan and graffiti in other Arab and foreign countries be conducted. Such a study may reveal similarities and differences across countries regarding their cultural, political, social, economic, and educational contexts. This study also recommends that gender differences in graffiti in Jordan be investigated to highlight variations between Jordanian males and females regarding their concerns, interests, way of thinking, language style, and communication. Furthermore, studying digital graffiti in Jordan is advised because it is significant for understanding the relationships between technology, culture, art, and social engagement.

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