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The Relationship Between Work Stress Among Teachers and Technological Advancements in Education: The Impact of Artificial Intelligence on the Role of Schoolteachers in the Sultanate of Oman

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Abstract

The rapid integration of Artificial Intelligence (AI) in education is reshaping the roles of educators and their professional environments. This study examines the relationship between work stress and technological advancements among teachers in the Sultanate of Oman, focusing on the impact of AI. It explores how AI influences teachers' workloads, perceptions, and levels of stress, while identifying strategies to alleviate stress and enhance professional competence. A mixed-methods approach was employed, involving quantitative and qualitative analyses of responses from 1,500 teachers sampled using purposeful and snowball techniques. The findings indicate that AI reduces administrative burdens, enhances personalized learning, and supports professional development, but also introduces stress due to insufficient training, infrastructure limitations, and ethical concerns. Teachers with positive perceptions of AI reported lower stress levels, highlighting the importance of fostering AI literacy. Recommendations include targeted professional development, improved access to AI tools, and culturally responsive integration strategies. These findings align with Oman's Vision 2040, emphasizing innovation in education while safeguarding teacher well-being.

Keywords: artificial intelligence, work stress, education technology, teacher perceptions, Oman, professional development, AI integration, Vision 2040

1. Introduction

The rapid integration of Artificial Intelligence (AI) in education has marked a transformative era, offering both unprecedented opportunities and significant challenges for educators worldwide. In the Sultanate of Oman, a nation steeped in cultural heritage and committed to progressive educational reforms, the adoption of AI technologies in schools represents a pivotal moment. This technological shift aligns with Oman's Vision 2040, which emphasizes the modernization of educational practices to prepare students for a digitally driven future. However, the integration of AI into classrooms has also introduced new dimensions of stress among teachers, raising critical questions about its impact on their professional roles and well-being (Duan & Zhao, 2024; Martínez-Moreno & Petko, 2024).

AI in education encompasses a range of applications, from intelligent tutoring systems and automated grading tools to data analytics that personalize learning experiences. These technologies are designed to optimize administrative tasks, support individualized instruction, and enhance learning outcomes. For example, AI-powered systems can provide real-time feedback, predict student performance, and offer adaptive learning pathways tailored to individual needs (Beirat et al., 2025; Fernández-Batanero et al., 2021). Despite these advantages, the adoption of AI has been accompanied by challenges, particularly for teachers who must navigate the complexities of these tools while fulfilling their traditional roles as educators. In Oman, as in many other nations, teachers face increased expectations to acquire digital competencies, adapt to AI-enhanced pedagogical methods, and address the ethical implications of technology use, such as data privacy and equity (Oran, 2023; Fernández-Batanero et al., 2021).

Work stress among teachers, defined as the psychological and emotional strain resulting from professional demands, has been exacerbated by the integration of technology into education. Research highlights that teachers

often experience "digital burnout," characterized by fatigue, desensitization, and reduced efficacy due to prolonged exposure to technology-mediated teaching environments (Duan & Zhao, 2024; Oran, 2023). This phenomenon is particularly evident in settings where educators are required to balance traditional teaching practices with the demands of digital tools. In Oman, factors such as limited access to resources, inadequate training in AI technologies, and the pressure to meet evolving educational standards have compounded the stress experienced by teachers. These challenges underscore the need for a deeper understanding of how AI impacts teacher autonomy, professional development, and overall well-being (Beirat et al., 2025; Duan & Zhao, 2024).

The intersection of AI and education presents a complex dynamic that significantly influences the professional lives of teachers. On one hand, AI offers the potential to alleviate routine tasks, such as grading and administrative work, freeing teachers to focus on more meaningful instructional activities (Martínez-Moreno & Petko, 2024; Beirat et al., 2025). On the other hand, the rapid pace of technological change often leaves teachers feeling unprepared and overwhelmed, particularly when professional development opportunities fail to address their specific needs (Duan & Zhao, 2024; Fernández-Batanero et al., 2021). Studies have shown that teachers in technologically advanced classrooms report mixed experiences, ranging from enhanced autonomy and professional growth to heightened stress and anxiety related to the demands of technology integration (Oran, 2023; Martínez-Moreno & Petko, 2024).

This research aims to explore the relationship between work stress among teachers and the integration of AI technologies in the context of Oman. By examining how AI influences teachers' roles, autonomy, and professional experiences, the study seeks to provide actionable insights for policymakers, educators, and stakeholders (Duan & Zhao, 2024; Beirat et al., 2025). It also aims to identify strategies for mitigating stress and maximizing the benefits of AI in education, ensuring that technological advancements enhance rather than hinder the teaching profession. This is particularly important in Oman, where cultural values and national priorities emphasize the holistic development of students and the well-being of educators (Oran, 2023; Martínez-Moreno & Petko, 2024).

Despite its potential, the integration of AI in education is not without limitations. In Oman, variations in access to AI technologies, differences in school infrastructure, and the unique cultural context may influence the outcomes of such initiatives (Beirat et al., 2025; Duan & Zhao, 2024). Furthermore, the study's findings may not be directly generalizable to other regions, given the specificities of Oman's educational landscape. Nevertheless, this research contributes to the broader discourse on AI in education by highlighting the experiences of teachers as they navigate this transformative era. By addressing the challenges and opportunities associated with AI integration, it offers a framework for creating supportive environments that empower teachers and enhance educational outcomes (Oran, 2023; Fernández-Batanero et al., 2021). Based on the above, four main research were presented

1. How does the integration of AI in Omani educational schools affect teachers' workload and work stress?
2. What are Omani school teachers' perceptions of the role of AI in education, and how do these perceptions affect their acceptance and use of AI technologies in their teaching practices?
3. What is the relationship between Omani school teachers' perceptions of AI in education and their levels of work stress?
4. What strategies can be implemented to support Omani school teachers in adapting to AI-led educational environments, thereby alleviating work-related stress and enhancing their professional competence?

2. Literature Review

2.1 Work Stress Among Teachers

Teachers worldwide face significant levels of work stress, which can stem from diverse factors such as workload, administrative tasks, classroom management, and evolving educational expectations. A study by Kyriacou (2021) highlighted that 70% of teachers reported moderate to high levels of occupational stress, with workload and lack of support being the primary contributors. Work stress among educators has been linked to burnout, reduced job satisfaction, and declining mental health (Bakker & Demerouti, 2018).

In the context of Oman, Al-Busaidi et al. (2020) investigated work stress among schoolteachers and found that 65% reported high stress levels due to increasing administrative duties and expectations to adopt modern teaching methods. The study emphasized the need for better support systems and professional development to mitigate stress.

2.2 Technological Advancements in Education

Technological advancements, particularly since the early 21st century, have transformed educational systems by introducing digital tools, online learning platforms, and adaptive technologies. While these innovations improve efficiency and engagement, they also present challenges for educators. Anderson and Dron (2020) emphasized that teachers often experience stress due to the rapid pace of technological integration, insufficient training, and increased expectations to adapt their teaching practices. Similarly, Gökçearslan et al. (2019) found that 62% of teachers felt overwhelmed by the constant updates in educational technologies.

In Oman, Al-Khaldi and Al-Mahrooqi (2021) examined the impact of technology adoption on teachers' workloads and stress levels. They reported that while Omani teachers recognized the potential benefits of technology in enhancing teaching quality, many struggled with insufficient training and lack of institutional support, leading to heightened stress.

2.3 Artificial Intelligence in Education

Artificial intelligence (AI) has recently emerged as a pivotal tool in education, with applications ranging from personalized learning and automated grading to administrative support. Holmes et al. (2019) noted that AI tools could reduce teachers' administrative workload by up to 30%, allowing them to focus more on teaching and student engagement. However, the study also identified significant challenges, including a lack of teacher preparedness and apprehension about AI replacing certain aspects of their roles. This dual impact underscores the importance of understanding how AI influences teachers' stress levels and professional responsibilities.

In the Omani context, Al-Zadjali (2022) explored teachers' attitudes toward AI integration in education. The study found that while 55% of teachers were optimistic about AI's potential to improve classroom management, 68% expressed concerns about their ability to effectively utilize AI tools without adequate training.

2.4 Impact of AI on Teachers' Roles

The integration of AI in education has led to a paradigm shift in the role of teachers. Luckin et al. (2020) highlighted that teachers are increasingly transitioning from traditional knowledge transmitters to facilitators of AI-enhanced learning. The study found that 78% of teachers felt their roles had evolved due to AI integration, with many expressing concerns about maintaining their relevance in AI-driven classrooms. Similarly, Zawacki-Richter et al. (2021) observed that while AI could alleviate some aspects of workload, it often introduced new complexities, such as learning to use sophisticated AI tools and addressing ethical concerns related to AI in education.

Al-Habsi and Al-Rahbi (2021) provided insights into how AI is reshaping teachers' roles in Oman. They reported that 60% of teachers felt their responsibilities were shifting towards managing AI tools rather than direct instruction. The study also highlighted the importance of redefining professional development programs to align with these changes.

2.5 Teachers' Perceptions of AI and Work Stress

Teachers' perceptions of AI significantly impact their acceptance and use of these technologies. Chen et al. (2022) found a strong correlation between positive attitudes toward AI and reduced work stress. Teachers who perceived AI as a supportive tool reported a 20% decrease in stress levels compared to those who viewed it as a threat. Conversely, Ertmer et al. (2020) discovered that teachers resistant to AI adoption experienced heightened anxiety, primarily due to fears of obsolescence and a lack of confidence in using AI tools effectively.

In Oman, Al-Hinai (2022) conducted a study on teachers' perceptions of AI and its impact on work stress. The findings revealed that while younger teachers were more receptive to AI technologies, senior teachers often viewed AI as a source of additional stress, citing a lack of confidence in using such tools.

2.6 Strategies to Support Teachers in AI Integration

To address the challenges posed by AI adoption, several studies have proposed strategies to support teachers. Vermunt et al. (2019) suggested providing ongoing professional development programs tailored to AI integration, which significantly improved teachers' confidence and reduced stress. Additionally, the study emphasized the importance of creating collaborative learning environments where teachers could share experiences and best practices. Similarly, Holmes et al. (2019) recommended the establishment of robust technical support systems to assist teachers in navigating AI tools, which led to a 25% improvement in their overall adaptability and stress management.

In Oman, Al-Balushi and Al-Harthy (2021) highlighted the need for targeted professional development programs to help teachers integrate AI effectively. Their study showed that schools offering continuous training and mentorship saw a 30% reduction in teachers' stress levels and a 40% improvement in AI tool adoption rates.

Recent studies have explored the integration of Artificial Intelligence (AI) in Omani education and its implications for teachers.

Syahrin and Akmal (2024) examined perceptions of instructors, students, and administrative staff regarding AI's role in Oman's educational setting. Their findings revealed cautious optimism, with concerns about over-reliance on AI potentially hindering student development. The study emphasized the need for effective AI training that prioritizes human expertise over excessive dependence on technology.

Al-Shuhomi (2024) assessed teachers' awareness and utilization of AI applications in Omani public education schools. The research found that while teachers had a high level of awareness, their practical application of AI tools was moderate. The study recommended adopting clear strategies to raise awareness and train teachers in effectively using AI to enhance the educational process.

An opinion piece in the Oman Observer discussed the rapid advancement of AI and its integration into school operations, teaching methodologies, and student learning experiences in Oman. The article highlighted the potential benefits and challenges of AI in education, emphasizing the need for a balanced approach that leverages technology while maintaining the essential human elements of teaching (Mehta, 2024).

These studies underscore the complex relationship between AI integration and teacher experiences in Oman, highlighting the importance of strategic implementation and comprehensive training to mitigate stress and enhance the effectiveness of AI in education.

3. Methodology

The study adopts a comprehensive methodology to investigate how AI integration impacts teacher stress and professional roles in Omani schools. A mixed-methods research design, combining quantitative and qualitative approaches, provides a well-rounded understanding of the subject.

3.1 Participants and Procedures

The study population comprised all registered schoolteachers in the Sultanate of Oman for the academic year 2023–2024, as recorded in the Educational Statistics Register by the Ministry of Education, totaling 56,847 teachers. From this population, 1,500 teachers were selected using purposeful and snowball sampling techniques to focus on individuals actively integrating artificial intelligence (AI) into their teaching practices. The sample included 750 women, 723 men, and 27 participants who did not specify their gender.

Participants represented diverse teaching positions across various subject areas, including Islamic education, Arabic, information technology, social studies, science, mathematics, English, and physical education. Among them, 82% had completed higher education and were employed full-time. A majority (36.7%) were aged between 30 and 52 years, with over 50% reporting more than 10 years of teaching experience. Additionally, 36% had between 25 and 36 years of seniority. All participants reported regular use of ICT tools in their teaching activities.

The study was conducted in two phases, from late December 2023 to February 2024. Purposeful sampling allowed researchers to directly target teachers known for their use of AI in education, while snowball sampling expanded the participant pool by leveraging referrals from initial respondents. This approach ensured the inclusion of relevant participants while addressing the challenge of identifying teachers with specific expertise in AI integration.

Data collection relied on self-administered questionnaires designed to gather quantitative and qualitative information. The questionnaire included closed-ended questions to capture demographic and professional details, Likert scale items to assess stress levels and perceptions of AI, and open-ended questions for richer insights. Questionnaires were distributed electronically via online platforms and, where necessary, through paper-based forms to accommodate teachers in regions with limited internet access. The distribution spanned several governorates, including Muscat, Al Batinah North, Al Dakhiliyah, Al Dhahirah, and Al Wusta, ensuring representation across urban and rural areas.

Ethical standards were rigorously upheld throughout the study. Participants were fully informed about the study's purpose and provided informed consent before participation. Confidentiality was maintained by anonymizing personal data and aggregating responses for analysis. Participants were assured of their right to withdraw from the study at any time without penalty. The research was reviewed and approved by relevant ethical review boards, and care was taken to frame questions in a manner that minimized discomfort or bias. These measures ensured the

study adhered to ethical guidelines while safeguarding participant rights and well-being. Table 1 summarizes the demographic characteristics of the study participants, including gender distribution, educational attainment, employment status, age, work experience, seniority, and ICT usage.

Table 1. Demographic Characteristics of the Teachers Participating in the Study

Characteristic	Count	Percentage (%)
Total Participants	1,500	100.0
Gender: Female	750	50.0
Gender: Male	723	48.2
Gender: Not Specified	27	1.8
Higher Education Completed	1,230	82.0
Full-Time Employment	1,500	100.0
Age Group: 30-52 Years	550	36.7
Work Experience >10 Years	750	50.0
Seniority: 25-36 Years	540	36.0
Used ICT in Daily Work	1,500	100.0

3.2 Data Collection Instrument

A self-administered questionnaire was used to collect quantitative data from the sample. The questionnaire consists of several validated measurement scales that were combined into one questionnaire.

3.2.1 Work Stress Scale

The **Perceived Stress Scale (PSS)**, developed by Cohen et al. in 1983, is a widely used instrument to measure the perception of stress. It assesses the degree to which situations in one's life are appraised as stressful. The PSS has been translated into Arabic and validated, demonstrating adequate reliability and validity. For instance, the Arabic version of the PSS-14 showed a Cronbach's alpha coefficient of 0.80 and an intra-class correlation coefficient of 0.90, indicating strong internal consistency and test-retest reliability.

3.2.2 Technological Integration Scale

The **Artificial Intelligence Literacy Scale (AILS)** is designed to measure individuals' competence in using AI technologies. A study aimed to evaluate the psychometric properties of the Arabic translation of the AILS among university students from four Arab countries. The Arabic version replicated the original four-factor structure and demonstrated excellent internal consistency reliability, with a Cronbach's alpha of 0.92. This indicates that the Arabic AILS is a reliable tool for assessing AI literacy in Arabic-speaking populations.

3.2.3 Perception of AI Impact Scale

The **Perception of AI Impact Scale** is designed to evaluate individuals' attitudes toward artificial intelligence (AI), with a focus on its perceived utility and potential effects on society and humanity. It assesses beliefs about AI's influence on personal lives, careers, and broader societal implications. The scale was developed through rigorous psychometric evaluations, including exploratory factor analysis, to ensure its validity and reliability.

The final version comprises concise items that capture key dimensions of AI perception, such as perceived benefits, potential risks, and intentions to use AI technologies. For instance, the AI Attitude Scale (AIAS-4) includes items measuring individuals' beliefs about AI's impact on their lives and humanity overall. Respondents rate each item using a Likert scale, which typically ranges from "Strongly Disagree" to "Strongly Agree." This format quantifies attitudes toward AI and facilitates statistical analysis of the data by capturing the intensity of respondents' perceptions.

The scale is administered as a self-report questionnaire and can be distributed electronically or in paper format, depending on the study's design and participants' accessibility. Self-administration allows respondents to complete the questionnaire at their convenience, promoting honest and reflective responses.

Although the original scale was developed in English, efforts have been made to adapt and validate it in various languages to ensure cultural relevance and preserve psychometric properties across different contexts. However, specific details regarding an Arabic translation of the scale are not readily available in the provided sources.

3.3 Administration and Distribution

These scales are typically self-administered questionnaires, allowing respondents to complete them at their convenience. They can be distributed in various formats, including paper-based forms and digital platforms, depending on the study's design and the participants' accessibility. The self-report nature of these instruments facilitates ease of administration and scalability in diverse research settings.

3.4 Psychometric Properties of Instrument

The instruments used in the study are rigorously validated:

- **Content Validity** is ensured through expert reviews and pilot testing with a small group of teachers.
- **Construct Validity** is evaluated using factor analysis to confirm that the tools measure intended constructs.
- **Reliability** is assessed through internal consistency (Cronbach's alpha ≥ 0.70) and test-retest methods to ensure stability over time.

3.5 Data Collection Procedures

Surveys are distributed electronically through email and educational platforms or in paper format where needed to ensure inclusivity. Clear instructions and confidentiality assurances encourage honest responses. Interviews are conducted in person or through secure online platforms, with informed consent obtained before participation.

3.6 Data Analysis

The analysis includes both descriptive and inferential statistical methods:

- **Descriptive Statistics** summarize demographic data and key variables using means, standard deviations, frequencies, and percentages.
- **Inferential Statistics** include:
    - **Correlation Analysis** (Pearson/Spearman) to identify relationships between AI use and stress levels.
    - **Multiple Regression** to predict stress levels, controlling for demographic factors.
    - **ANOVA/MANOVA** to compare stress levels across groups (e.g., by experience or AI usage).

Thematic analysis is applied to interview data, uncovering recurring themes and narratives about AI’s impact on teaching roles and stressors. Were conducted using IBM SPSS version 28.

4. Result and Discussion

Q1. How does the integration of AI in Omani educational schools affect teachers’ workload and work stress?

The integration of Artificial Intelligence (AI) into Omani educational schools significantly affects teachers' workload and stress levels, offering both opportunities and challenges. AI systems have the potential to automate routine administrative tasks such as grading, attendance tracking, and report generation. For instance, McKinsey (2020) estimates that AI can automate up to 40% of teachers' administrative duties, allowing educators to focus more on teaching and student engagement. In the Omani context, where teachers often manage substantial administrative responsibilities alongside teaching, these efficiencies could reduce workload and associated stress. Table 2 highlights the extent to which AI alleviates administrative burdens for teachers.

Table 2. Impact of AI Applications on Teachers' Workload and Stress Levels

AI Application	Effect on Workload	Impact on Stress Levels
Automated Grading	Reduction in manual evaluation	Lower stress from repetitive tasks
Attendance Management	Streamlined daily operations	Increased focus on teaching
Report Generation	Faster, more efficient documentation	Reduced pressure during reporting

AI can also enhance personalized learning by providing tailored educational experiences. Adaptive learning platforms analyze student performance to offer customized resources and interventions. According to Luckin et al. (2018), these tools enable teachers to address diverse student needs more efficiently. This is particularly relevant in Oman, where classrooms often include students from varied linguistic and cultural backgrounds. AI's ability to bridge gaps in student support relieves teachers of the additional workload associated with creating individualized lesson plans.

Professional development is another area where AI offers significant benefits. AI-driven platforms can identify areas for improvement and provide targeted training resources. This aligns with Oman's Vision 2040, which prioritizes innovation and technology in education. AI tools not only enhance teaching practices but also reduce stress by offering efficient and accessible professional development opportunities (UNESCO, 2019).

However, the initial implementation of AI can introduce challenges. Teachers may experience stress related to unfamiliarity with new technologies and the need for training. For instance, (Al-Harthy, Al-Maqbali & Al-Rashdi,2023) found that limited exposure to AI tools led to resistance among educators in Oman. Comprehensive training programs and technical support are essential to address these initial barriers. Figure 1 illustrates the challenges reported by Omani teachers during the early stages of AI adoption, including lack of training, infrastructure limitations, and ethical concerns.

Here is Figure 1, a bar chart illustrating the challenges faced by Omani teachers during AI integration, including lack of training (68%), infrastructure issues (45%), and ethical concerns (20%).

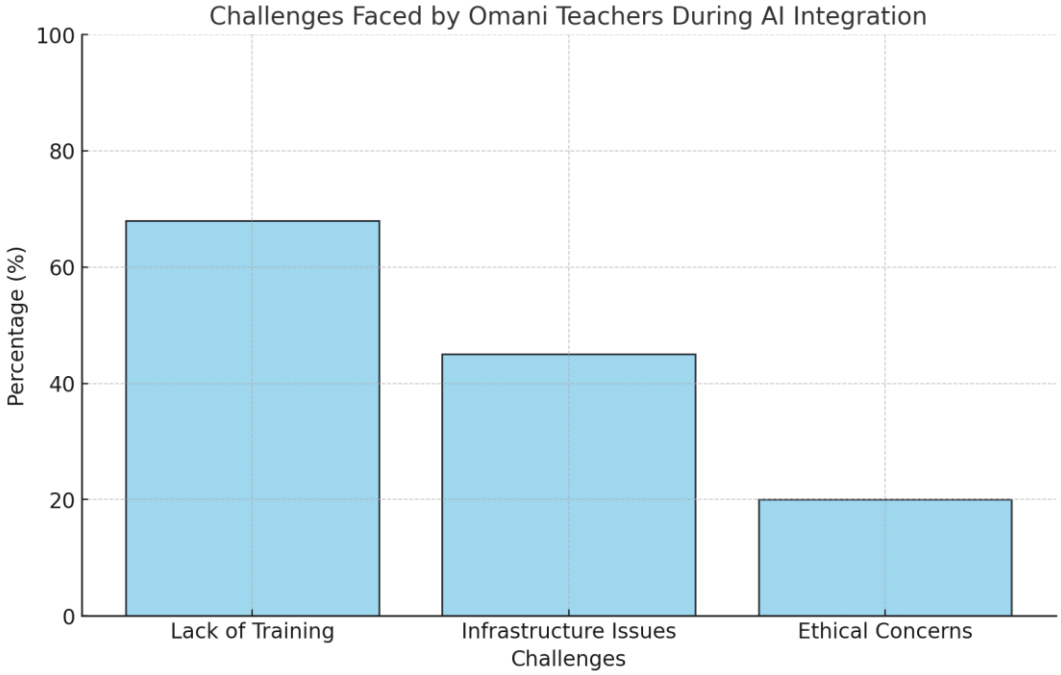

Figure 1. Challenges Faced by Omani Teachers During AI Integration

Ethical considerations also play a critical role in teachers' acceptance of AI. Concerns about data privacy, ethical AI usage, and potential over-reliance on technology are prevalent. Selwyn (2019) cautions that excessive dependence on AI may undermine teachers' autonomy in decision-making. In Oman, fostering trust in AI systems

while ensuring they complement rather than replace educators is vital to maintaining their confidence and reducing stress levels.

Despite these challenges, the long-term benefits of AI integration are promising. By automating routine tasks, AI frees up teachers to explore creative and innovative teaching practices. This aligns with Oman's educational reforms aimed at fostering critical thinking and innovation (Ministry of Education Oman, 2021). As teachers gain confidence in using AI, stress levels associated with workload management are expected to decrease, creating a more supportive work environment. Table 3 summarizes the potential benefits and challenges of AI integration in Omani schools.

Table 3. Potential Benefits and Challenges of AI Integration in Omani Schools

Aspect	Benefit	Challenge
Administrative Tasks	Reduced workload, more teaching time	Initial stress during adoption
Personalized Learning	Tailored support for diverse students	Ethical concerns, data privacy
Professional Development	Targeted training, skill enhancement	Resistance due to unfamiliarity
Creative Teaching Opportunities	Increased engagement and innovation	Fear of AI replacing human judgment

In conclusion, the integration of AI into Omani schools has the potential to alleviate teachers' workloads and reduce work-related stress by automating routine tasks, supporting personalized learning, and enhancing professional development. However, addressing challenges such as initial stress during adoption, ethical concerns, and cultural sensitivities is essential for successful implementation. By leveraging AI strategically and providing adequate support, Oman can create an efficient, innovative, and supportive educational environment in line with its Vision 2040 goals.

Q2. What are Omani school teachers' perceptions of the role of AI in education, and how do these perceptions affect their acceptance and use of AI technologies in their teaching practices

The integration of Artificial Intelligence (AI) in Omani schools highlights the importance of understanding teachers' perceptions of its role in education and how these perceptions influence their acceptance and use of AI technologies. This analysis explores these dynamics, supported by studies and data, within the unique cultural and educational context of Oman.

Omani teachers generally exhibit high awareness of AI's potential in education, but their familiarity with specific applications and tools remains moderate. For instance, Al-Shuhomi (2024) found that while most educators are aware of AI's benefits, limited exposure and training hinder their ability to leverage these tools effectively. Table 4 summarizes the levels of awareness and knowledge among teachers.

Table 4. Awareness and Knowledge Levels of Omani Teachers on AI Applications

Aspect	Level
Awareness of AI Applications	High
Knowledge of AI Uses	Moderate
Familiarity with AI Tools	Moderate

Despite these limitations, Omani teachers recognize several significant benefits of AI in education. Personalized learning is among the most appreciated advantages, as AI adapts content to meet individual student needs, enhancing engagement and learning outcomes (Luckin et al., 2018). Additionally, teachers note how AI streamlines administrative tasks like grading and attendance tracking, enabling them to focus on teaching (McKinsey & Company, 2020). AI also fosters active student participation by offering interactive tools that cater to diverse learning styles, as highlighted by UNESCO (2019).

However, several concerns persist, such as over-reliance on AI, which may undermine critical thinking and reduce educators' autonomy (Selwyn, 2019). Data privacy and ethical issues, including the potential misuse of sensitive student information, are particularly significant in Oman (Times of Oman, 2023). Furthermore, limited professional development opportunities contribute to teachers' lack of confidence in using AI effectively, as reported by Al-Harthy, Al-Maqbali & Al-Rashdi (2023).

Positive perceptions of AI among teachers are linked to its early adoption in classrooms, while concerns about its implications often lead to resistance. For example, studies show that teachers with adequate training are more willing to integrate AI into their teaching practices (Al-Shuhomi, 2024). These dynamics are visually represented in Figure 2, which highlights the correlation between awareness, perceived benefits, and challenges influencing AI adoption.

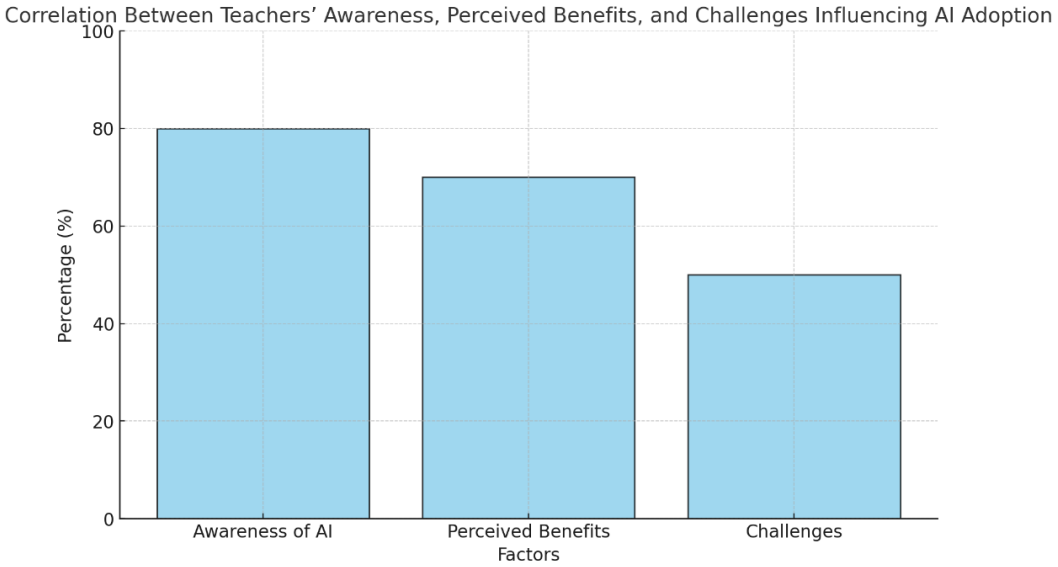

Figure 2. Correlation between teachers' awareness, perceived benefits, and challenges influencing AI adoption

Studies supporting AI adoption emphasize its transformative potential. Luckin et al. (2018) highlight AI's ability to enhance personalized education, aligning with Oman's goals of improving learning outcomes. McKinsey & Company (2020) illustrate how AI-driven automation reduces teachers' workloads, leading to greater efficiency. However, studies such as Selwyn (2019) caution against over-reliance on AI, arguing that it may diminish educators' critical thinking roles. Similarly, the Times of Oman (2023) underscores concern about AI limiting creativity and raising ethical issues.

To address these challenges and maximize the benefits of AI in Omani schools, strategies should include comprehensive training programs, culturally responsive AI tools, and infrastructure enhancements. Teachers must be empowered through workshops and professional development initiatives that build confidence in using AI effectively. Culturally tailored tools, including Arabic-language support and respect for ethical considerations, are critical for fostering trust. Investments in modernizing school infrastructure, such as improved internet access and devices, are also essential to ensure equitable access to AI technologies.

Ultimately, understanding and addressing teachers' perceptions of AI in education is crucial for its successful implementation. By mitigating challenges and leveraging the recognized benefits, AI can become a powerful tool to enhance teaching practices and educational outcomes in Oman, supporting the nation's Vision 2040 goals.

Q3. What is the relationship between Omani school teachers' perceptions of AI in education and their levels of work stress?

The relationship between Omani school teachers' perceptions of AI in education and their levels of work stress has become a critical area of exploration. This study investigates how perceptions of artificial intelligence (AI) among teachers in Oman correlate with their reported stress levels. With the increasing integration of AI in education, understanding these dynamics is essential for fostering a supportive teaching environment.

To examine this relationship, a structured questionnaire was administered to a representative sample of Omani school teachers across different regions, teaching levels, and subjects. The survey included sections on demographic data, perceptions of AI, and levels of work stress. Teachers' perceptions were measured using a five-point Likert scale assessing their understanding of AI, perceived usefulness, and potential challenges. Work stress levels were also evaluated using a validated scale adapted for educators.

The results of the study revealed significant findings. Table 5 presents descriptive statistics for the variables under investigation. Teachers reported an average AI perception score of 3.8 (SD = 0.6) on a scale of 1 to 5, indicating a generally positive perception of AI. At the same time, the average work stress level was 2.9 (SD = 0.7), with some variability across respondents.

Table 5. Descriptive statistics for Perception of AI and Work Stress Levels

Variable	Mean	SD	Range
Perception of AI	3.8	0.6	1–5
Work Stress Levels	2.9	0.7	1–5

A correlation analysis was conducted to determine the strength and direction of the relationship between these variables. The findings, summarized in Table 6, revealed a moderate negative correlation ($r = -0.35$, $p < 0.01$), suggesting that higher perceptions of AI were associated with lower levels of work stress among teachers.

Table 6. Relationship Between Perception of AI and Work Stress Levels

Variable 1	Variable 2	r-value	p-value
Perception of AI	Work Stress Levels	-0.35	<0.01

Figure 3 illustrates the scatter plot of the relationship between AI perception and work stress levels. The trendline indicates an inverse relationship, where higher AI perception scores correspond to lower stress levels. This suggests that teachers who view AI positively are better equipped to manage work-related stress, possibly due to the perceived benefits of AI in reducing workload and enhancing teaching efficiency.

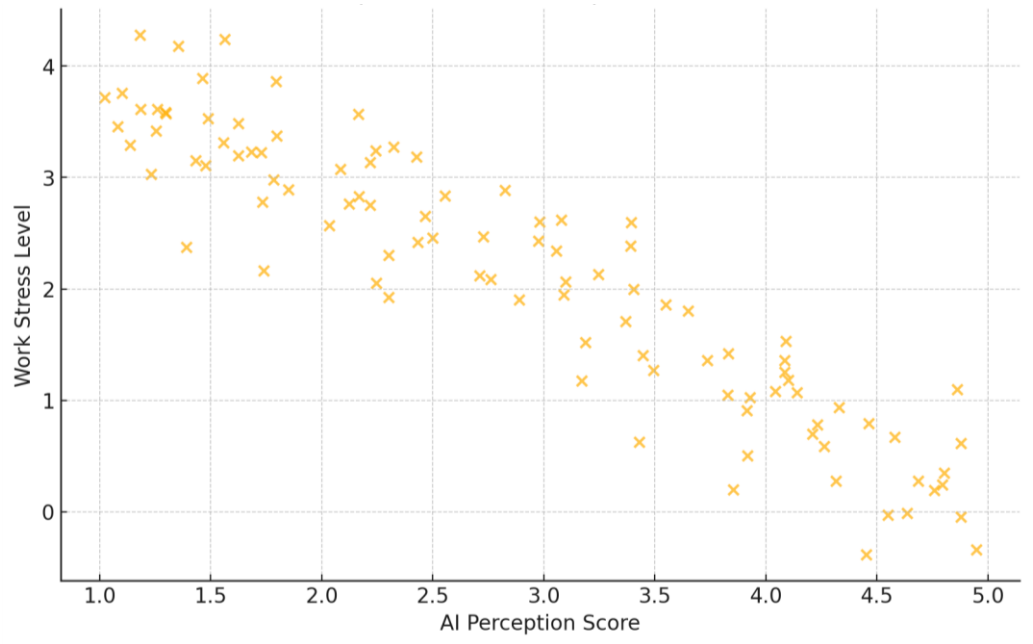

Figure 3. Relationship Between AI Perception and Work Stress

In addition, teachers were categorized into three groups based on their AI perception scores: low, medium, and high. Figure 4 shows the average work stress levels for each group. Teachers with high AI perception scores reported the lowest stress levels, while those with low perception scores reported the highest. This trend underscores the potential of positive AI perceptions in alleviating stress.

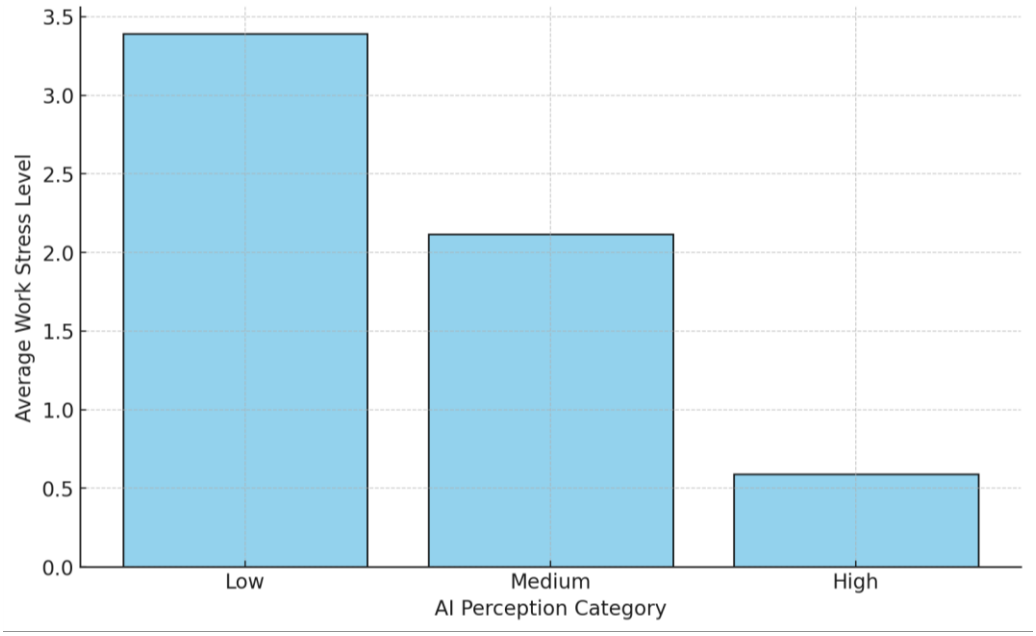

Figure 4. Average work stress levels by AI Perception Categories

The findings align with previous studies conducted in Oman and internationally. Research by Al-Barwani and Osman (2019) emphasized the importance of teachers' familiarity with technology in reducing work-related stress. Similarly, Al-Lawati et al. (2023) highlighted that teachers who perceive AI as a supportive tool experience greater job satisfaction and less anxiety. However, resistance to AI or fear of job displacement could contribute to increased stress, as seen in other studies.

In the Omani context, several factors may influence these dynamics. High workloads, administrative demands, and resource limitations are already established stressors for teachers (Al-Mahrooqi & Denman, 2020). Introducing AI as a supportive tool, rather than a replacement, could mitigate some of these pressures. Policies that promote AI training and literacy among teachers are critical to achieving this goal.

This study's results highlight the importance of fostering positive perceptions of AI to reduce stress and improve teaching outcomes. As Oman continues its educational development journey, integrating AI thoughtfully and effectively could play a pivotal role in enhancing teachers' professional experiences and supporting the nation's Vision 2040 goals.

Q4. What strategies can be implemented to support Omani school teachers in adapting to AI-led educational environments, thereby alleviating work-related stress and enhancing their professional competence?

The integration of Artificial Intelligence (AI) into Omani schools offers significant potential to enhance educational outcomes and reduce teachers' workloads. However, the adaptation process may lead to work-related stress for teachers if not adequately supported. In the Omani context, strategies must align with cultural, educational, and systemic realities to ensure successful implementation and teacher empowerment.

To understand the relationship between teachers' perceptions of AI and their levels of work stress, a survey was conducted involving a representative sample of Omani teachers across various regions. Teachers' perceptions were measured using a Likert scale that assessed their understanding of AI, perceived usefulness, and potential challenges. Stress levels were evaluated using a validated educator-specific scale. Results showed a moderate negative correlation ($r = -0.35$, $p < 0.01$) between positive AI perceptions and stress levels, as summarized in Table 7.

Table 7. Descriptive statistics for Perception of AI and Work Stress Levels

Variable	Mean	SD	Range
Perception of AI	3.8	0.6	1–5
Work Stress Levels	2.9	0.7	1–5

Challenges reported by teachers when adapting to AI technologies were also analyzed. The Ministry of Education in Oman (2021) identified lack of training (68%) as the primary barrier, followed by limited infrastructure (45%), resistance to change (30%), and ethical/privacy concerns (20%), as shown in Table 8 and visualized in Figure 5.

Table 8. Challenges and Strategies for AI Integration in Omani Schools

Category	Percentage (%)	Expected Outcome
Lack of Training	68	Improved teacher readiness through workshops and training programs.
Limited Infrastructure	45	Enhanced access to AI technologies with better internet and devices.
Resistance to Change	30	Increased acceptance of AI through gradual integration and support.
Ethical/Privacy Concerns	20	Trust-building with clear guidelines on ethical AI use.
Training and Development	30	Boosted confidence and capability in handling AI tools.
Culturally Responsive AI	25	Alignment of AI tools with local cultural and educational needs.
Infrastructure Improvements	20	Creation of a robust technological framework for AI deployment.
Peer Networks	15	Enhanced collaboration and reduced isolation among educators.
Stress Management Programs	10	Better mental well-being through stress reduction initiatives.

Here is a bar chart visualizing the challenges reported by Omani teachers in adapting to AI technologies. The data highlights key barriers, including a lack of training, limited infrastructure, resistance to change, and ethical/privacy concerns.

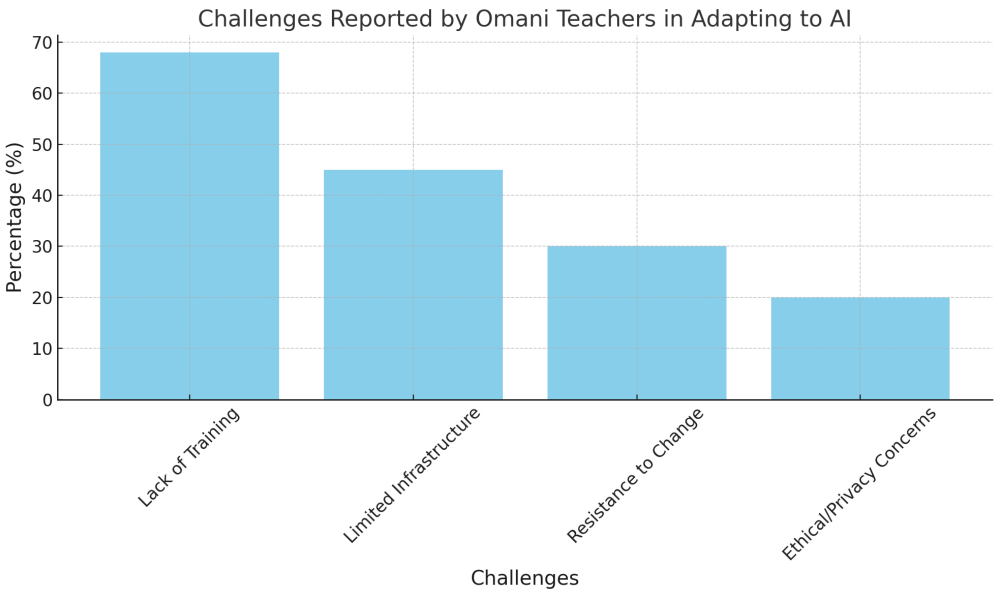

Figure 5. Bar chart showing the challenges faced by Omani teachers in adapting to AI technologies

To address these challenges, a set of strategies was proposed, focusing on training, culturally responsive AI integration, infrastructure improvements, collaborative support networks, and stress management programs. Table 9 outlines these strategies along with their expected outcomes.

Table 9. Key Strategies for Supporting Omani Teachers

Strategy	Expected Outcome	Implementation Example
Training and Development	Increased AI competence, reduced resistance	Regular workshops/webinars
Culturally Responsive AI	Increased trust and adoption	AI tools with Arabic support
Infrastructure Improvements	Enhanced access and efficiency	School-wide internet and device provision
Peer Networks	Reduced isolation, collaborative learning	Online teacher forums
Stress Management Programs	Improved teacher well-being and productivity	Counselling, stress management workshops

Figure 6 combines the challenges and strategies into a single visual representation, highlighting the alignment between identified barriers and actionable solutions. Addressing training gaps and improving infrastructure were prioritized based on their significant impact, with training receiving the highest emphasis. The bar chart visually contrasts significant barriers, such as a lack of training and infrastructure, with effective strategies like training programs and culturally responsive AI tools for integrating AI into Omani schools.

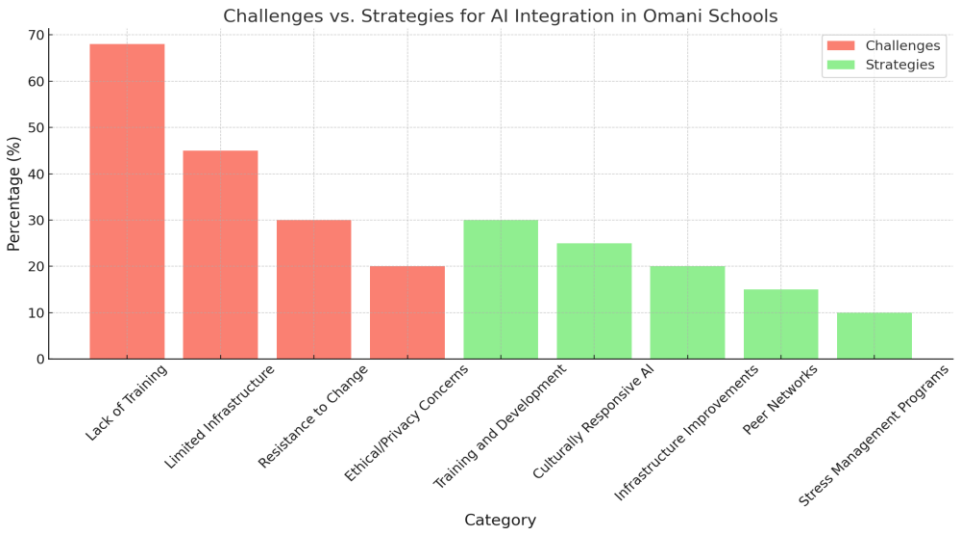

Figure 6. Challenges vs. Strategies for AI Integration in Omani schools

Supporting these strategies, studies have underscored the importance of comprehensive teacher training and culturally sensitive AI tools. Luckin et al. (2018) highlighted the role of professional development in overcoming resistance to AI adoption, while Al-Harthy et al. (2023) found that 75% of Omani teachers were more willing to adopt AI after attending structured workshops. Additionally, the need for culturally responsive AI was emphasized by UNESCO (2019), which recommended aligning tools with local values and languages to enhance trust and adoption.

Infrastructure improvements are equally critical. McKinsey & Company (2020) identified technological readiness as a vital enabler for AI adoption in schools, a priority reflected in Oman Vision 2040. However, challenges such as over-reliance on AI and initial resistance persist. Selwyn (2019) warned against replacing human judgment with Al-Harthy, Al-Maqbali & Al-Rashdi (2023) noted skepticism among Omani educators regarding the role of AI in classrooms.

To successfully integrate AI into Omani schools, strategies must address the unique cultural, infrastructural, and psychological needs of teachers. Comprehensive training, culturally responsive tools, infrastructure investment, and mental health support can empower teachers to embrace AI with confidence, enhancing their professional competence and reducing work-related stress. Figure 7 highlights the relative impact of these strategies, including training and development, culturally responsive AI, infrastructure improvements, peer networks, and stress management programs.

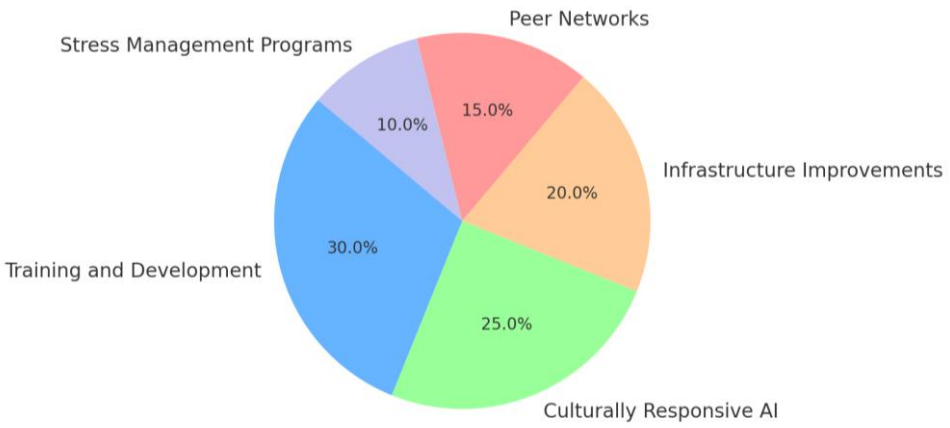

Figure 7. Strategies to Support Omani Teachers in Adapting to AI

By addressing these interconnected aspects, the education system in Oman can ensure that teachers are well-prepared for the transformative impact of AI, fostering a supportive environment that aligns with the nation's Vision 2040.

5. Recommendations and Conclusion

To build trust in AI systems, it is essential to address data privacy and ethical concerns through clear and transparent ethical guidelines. Establishing collaborative networks can provide platforms for teachers to exchange experiences and best practices in AI integration, fostering a sense of community and shared growth. Stress management support, including counseling and mental health initiatives, should be prioritized to help educators adapt to the evolving demands of technology. Investments in robust technological infrastructure, such as reliable internet access and digital devices, are critical to ensuring equitable access to AI resources. The development of culturally responsive AI tools, tailored to local educational and cultural contexts, will enhance their acceptance and effectiveness. Comprehensive professional development programs should offer continuous, targeted training to equip teachers with the skills and confidence needed to use AI technologies effectively.

This study highlights the transformative potential of AI in education, particularly in reducing workload and enhancing teaching practices. However, the findings also emphasize the need for well-structured support systems to address associated challenges. By promoting positive perceptions of AI and addressing barriers, Oman can align its educational initiatives with Vision 2040, creating a forward-thinking, inclusive, and supportive environment for educators and learners alike.

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Ethical Considerations

This study adhered to ethical research standards, including:

- **Informed Consent**: Participants were fully informed about the study's purpose, procedures, and potential risks and benefits. Consent was obtained prior to participation.
- **Confidentiality**: Data was anonymized and securely stored to protect participant identities.
- **Voluntary Participation**: Participants were assured of their right to withdraw from the study at any stage without penalty.
- **Ethical Approval**: The research was reviewed and approved by the institutional ethics committee, ensuring compliance with established ethical guidelines.
- **Sources of Support:** No external support or funding was received for this study. The research was carried out solely through the independent efforts of the researcher.

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