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Pre-service Teachers' Experiences and Perceptions of the Use of Artificial Intelligence in Teaching and Learning in Oman

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ABSTRACT

As advancements in artificial intelligence (AI) continue to reshape various sectors, including education, understanding pre-service teachers' experiences and perceptions of the use of AI in teaching and learning becomes imperative. Multiple teacher preparation programs in Oman are interested in integrating AI-related teaching and learning practice into their courses. However, pre-service teachers' experiences and perceptions of the use of AI in teaching and learning have not yet been investigated in the Omani context. Therefore, this research paper aims to investigate pre-service teachers' experiences and perceptions of the use of AI in educational settings in Oman. This descriptive study employed a quantitative approach. Quantitative data were collected through a structured questionnaire distributed among pre-service teachers in

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different teacher preparation programs at an Omani university. The questionnaire assessed participants' familiarity with AI technologies, perceived benefits, and concerns. The findings highlighted the positive intentions that pre-service teachers have toward integrating AI into education. However, results showed that pre-service teachers are not getting adequate training in the integration of AI in teaching and learning, although they showed frequent use of AI in their daily tasks. The findings of this research are expected to contribute to the existing literature on AI in education by shedding light on pre-service teachers' experiences and perceptions, particularly within the Omani context. Furthermore, the results are expected to inform educational policymakers and teacher training programs on strategies to integrate AI technologies into teacher education curricula effectively, ensuring future educators are equipped with the necessary skills and mindset to leverage AI for enhanced teaching and learning experiences.

Introduction

Nowadays, artificial intelligence (AI) reshapes the way we live, work, learn, and communicate with each other. It affects every aspect of human life, and education is no exception. Integrating AI in teaching and learning practices becomes necessary for the new generation who is immersed in technology in every aspect of their life. As a result, an effort should be made to equip pre-service teachers with the knowledge and skills of AI integration into the school curriculum. Consequently, AI should be integrated into the curriculum of the teacher preparation programs and teachers' professional development and training. However, it is equally important to pay attention to the perceptions of pre-service and in-service teachers' acceptance of any technology for the success of technology integration (Sun et al., 2024). Many researchers studied the perceptions of pre-service teachers towards the use of AI in teaching and learning (Galindo-Domínguez et al., 2023; Uyanik Aktulun et al., 2024; Zhang et al., 2024). Similarly, pre-service teachers' perceptions about the use of AI in teaching and learning are expected to impact the adoption of AI in Omani schools. Moreover, there has been a growing interest in Oman for integrating AI into different sectors, reflecting the country's commitment to innovation and technological advancement. The current study aims to investigate pre-service teachers' experiences and perceptions of the use of AI in

educational settings in Oman. More specifically, this study aims to answer the following questions: to what extent are pre-service teachers at an Omani university familiar with AI technologies? How do pre-service teachers perceive the potential benefits of AI applications in educational settings? What concerns do pre-service teachers have regarding the integration of AI technologies in their future teaching practices?

The findings of this research are expected to contribute to the existing literature on AI in education by shedding light on pre-service teachers' experiences and perceptions, particularly within the Omani context and other countries in the region. Furthermore, the results are expected to inform educational policymakers and teacher training programs on strategies to integrate AI technologies into teacher education curricula effectively, ensuring future educators are equipped with the necessary skills and mindset to leverage AI for enhanced teaching and learning experiences.

Literature Review

Much of the current literature on AI technology pays particular attention to pre-service teachers' attitudes and perspectives toward AI, factors affecting the promotion of AI in teacher preparation programs, and readiness and willingness to integrate AI in teaching.

Attempts have been made to understand pre-service teachers' attitudes toward AI. For example, a recent study by Galindo-Domínguez et al. (2023) surveyed (N=445) teachers from different educational levels, k-12 and higher education, to understand their attitudes toward the utilization of AI tools in the classroom. Results showed that the majority of teachers have a positive attitude towards the use of AI in education, but only 25% of them have integrated AI tools into their teaching practices. It was reported that the most common tools used by teachers were ChatGPT, Dall-E, and Midjourney. The results showed that teachers in k-12 used these tools for content generation, such as presentations, texts, or videos, without engaging students with the AI tools. In contrast, teachers in higher education utilized AI for data analysis, translation, and searching for information. This study suggested designing training programs for educators to help them integrate a variety of AI tools for different purposes.

In addition, Aktulun et al. (2024) compared attitudes and anxiety toward AI among pre-service STEM and non-STEM teachers in public universities in Turkey. The study involved (N=520) pre-service teachers, (51.5%) were pre-service non-STEM teachers, and (48.5%) were pre-service STEM teachers. Data were collected using “the General Attitudes Toward Artificial Intelligence Scale” and “the Artificial Intelligence Anxiety Scale.” This comparative study found that the STEM pre-service teachers constructed higher positive attitudes towards AI than non-STEM student teachers. On the other hand, non-STEM student teachers were more anxious about AI than STEM student teachers. As a result, the study suggests preparing teachers for integrating AI in classrooms by redesigning the curricula for non-STEM teachers.

Regarding the teachers’ acceptance of AI, Zhang et al. (2024) investigated how AI trust and perceived risk influence pre-service teachers’ AI acceptance? And to what extent does pre-service teachers’ geographic origin influence AI acceptance? A survey was used to measure both dimensions of this study. Several (N=432) pre-service teachers at a Chinese university responded to the online survey. Data was then analyzed using Confirmatory Factor Analysis (CFA) and structural equation modeling (SEM). Results revealed that there is no significant difference between pre-service teachers from rural areas and those from urban areas in the level of AI acceptance. Additionally, Perceived Usefulness and Perceived

Ease of Use have more impact on AI acceptance among pre-service teachers than AI trust. On the other hand, Perceived Privacy Risk is found to be negatively affecting AI Trust by preservice teachers, while Perceived Security Risk does not.

According to the factors that affect promoting AI in teacher preparation programs, Sun et al. (2024) examined the factors influencing pre-service STEM teachers' willingness to integrate AI in education. Specifically, teachers' attitudes toward applying AI in teaching practices. A survey was administered to (N=239). Specifically, this study examined the interconnectedness of Technological Pedagogical Content Knowledge (TPACK) with the factors of Perceived Usefulness (PU), Perceived Ease of Use (PE), and Self-Efficacy (SE). The study found that TPACK, PU, PE, and SE influenced STEM pre-service teachers' willingness to integrate AI into their teaching practices. The study recommended offering courses on AI applications in education within teacher training programs. Furthermore, pre-service teachers' perspectives toward generative AI technologies have been examined by Thararattanasuwan et al. (2024). The study investigated the correlation between components of AI technology and their perspectives with (N=45) teachers at Mahasarakham University in Thailand. The findings of this study revealed that teachers' perspective towards generative AI technology was at a slightly accepted level, teachers' willingness to use generative AI technology at moderately and very much accepted levels, and their concerns about AI technology at moderately accepted and slightly accepted levels.

In addition, In their empirical research, Sanusi et al. (2024) surveyed (N=796) pre-service teachers in several Nigerian universities to study the perceptions of pre-service teachers and their behavioral intention to learn AI by identifying factors that might affect learning and promoting AI in teacher preparation programs. The study tested the relationships between nine factors, which are derived from the Theory of Planned Behavior (TPB). These factors are AI Anxiety (AN), Basic knowledge of AI (BK), Subjective norms (SN), Perceived self-efficacy (SE), Personal relevance (PR), AI for social good (SG), Behavioral intention (BI), and Actual learning of AI (AL). Fourteen hypotheses were tested in this study to answer the main research question. Data was analyzed using confirmatory factor analysis, structural equation modeling, and importance-performance map analysis. Results show that pre-service teachers' behavioral intention to learn AI is highly affected by AI anxiety, basic knowledge, subjective norm, self-efficacy, personal relevance, and self-transcendent goals. Additionally, pre-service teachers' realization of the personal relevance of learning AI and self-efficacy of pre-service teachers to learn AI are both affected by basic knowledge and subjective norm influence.

Regarding teachers' readiness and willingness to integrate AI in teaching, Jatileni et al. (2023) conducted a study exploring psychological factors among Namibian in-service teachers. One hundred fifty-nine (N=159) responded to a survey that examined the following factors: AI Anxiety, AI Readiness, AI Relevance, Attitude towards AI, AI for Social Good, Confidence in AI, and Behavioral Intention. The study found that the behavioral intention to teach AI significantly affected AI relevance, attitude toward AI, social good aspects, and confidence. However, AI Anxiety and AI Readiness did not significantly influence teachers' intentions to use AI in education. The study emphasizes the need for professional development programs to build teachers' confidence in integrating AI in classrooms. With all the above studies, it is crucial to understand the extent to which pre-service teachers feel prepared and confident in using AI-powered educational platforms and tools as part of their teaching practices at Sultan Qaboos University.

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Methodology

Research Design

A quantitative research approach is followed to investigate pre-service teachers' experiences and perceptions of the use of AI in educational settings in Oman. According to Gall et al. (2014), qualitative research is interested in studying a phenomenon using numerical data that is gathered from specific samples and populations and then conducting statistical analysis to answer the outlined research questions related to the studied phenomenon. Qualitative studies focus on the interpretation of characteristics of a sample or population by measuring variables specified by the researcher.

Instrument

A structured survey questionnaire was utilized as the primary data collection instrument. The survey questionnaire consisted of both closed-ended and Likert-scale items designed to assess pre-service teachers' experiences and perceptions of the use of AI in teaching and learning. The questionnaire was adopted from Pokrivcakova (2023), who studied pre-service teachers' attitudes towards artificial intelligence and integration into EFL teaching and learning. However, the survey was translated into Arabic and modified to include all majors at the College of Education at an Omani university. The instrument consisted of three main parts: demographic data, experience of AI, and perceptions of AI use in teaching and learning. The demographic data section collected data about participants' gender, age range, cohort, years in the program, and specialization. Furthermore, the AI experience section collected data about training related to AI, use of AI in general, expertise in dealing with AI tools, and interest in enhancing skills and knowledge about AI. Finally, the last section collected data about pre-service teachers' perceptions of the use of AI in teaching and learning. The items in this section are related to the benefits and risks associated with using AI in teaching and learning and the importance of integrating AI tools and topics in the curriculum.

Before data collection, ethical approval was obtained from the university administration. The survey was administered electronically using the QuestionPro survey service in the fall semester 2024. The survey was send to all students at the teacher preparation program who were enrolled in the different courses that were offered by the Department of Instructional and Learning at Technologies at the College of Education, Sultan Qaboos University, Oman. Participants were given a specified period to complete the survey, and reminders were sent to maximize response rates.

Descriptive statistical analyses were employed to summarize the responses obtained from the survey questionnaire. Frequencies, percentages, and means were calculated to describe the experiences and perceptions of pre-service teachers of the use of AI in teaching and learning. A scale of the mean interval was developed to interpret the values. Table 1 below shows the interpretation of means vale based on the suggested scale by Alkharusi (2022).

Table 1: Interpretation of means Mean Scale Value

Intervals	1.0 to 1.8	1.81 to 2.6	2.61 to 3.4	3.41 to 4.2	4.21 to 5.0
Description	Very low	Low	Moderate	High	Very high

Population & Sampling

According to Gall et al. (2012), a defining feature of descriptive research is that it focuses on a representative sample or the entire population to draw a general conclusion about the studied topic. A convenience sampling technique was employed to recruit participants for this study. Potential participants were approached through email invitations and direct communication with some faculty members in the teacher education programs. Participants in this study were pre-service teachers enrolled in the different teacher preparation programs across the College of Education at Sultan Qaboos University. The study population consisted of all pre-service teachers who are currently at the different teacher preparation programs in an Omani national university (n= 1831). Two hundred thirty-six participants responded to the survey. However, only 187 were complete responses. Therefore, the final sample of this study included 187 participants. In terms of gender and age, there were 113 females (60.4%) and 74 males (39.6%). The participants ranged in age from 17 to above 23. Additionally, the participants ranged in their year in the program from the first to the sixth year. Majorwise, 28.3 % of the participants are from Educational Technology major, followed by English Education and Islamic Education (17.6% and 16.6%, respectively). At the end of the list, we have Physical Education and Primary Education, which represented a percentage of 3.2% and 2.7%, respectively. Table 2 summarizes the characteristics of the participants in terms of gender, age, cohort year, year in the program, and major.

Table 2: Characteristics of the Participants in Terms of Gender, Age, Cohort Year, Major, and Year in the Program (N = 187)

Category	Sub-category	Frequency	%
Gender	Male	74	39.6%
	Female	113	60.4%
Age	17-19	35	18.7%
	20-22	124	66.3%
	23+	28	15.0%
Cohort	2017	1	0.5%

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	2018	8	4.3%
	2019	17	9.1%
	2020	23	12.3%
	2021	65	34.8%
	2022	46	24.6%
	2023	19	10.2%
	2024	8	4.3%
Major	Science and Mathematics	15	8.0%
	Islamic Education	31	16.6%
	Arabic Language	15	8.0%
	Art Education	15	8.0%
	Physical Education	6	3.2%
	Educational Technology	53	28.3%
	English Education	33	17.6%
	Preschool Education	14	7.5%
	Primary Education	5	2.7%
Year in Program (Post-Foundation)	1	26	14.0%
	2	38	20.4%
	3	60	32.3%

	4	36	19.4%
	5	18	9.7%
	6	8	4.3%

6. Results and Discussion

Pre-service Teacher's familiarity with AI

Pre-service teachers' familiarity with AI is addressed in this study from three main perspectives. First, whether they have received any training or education related to AI. Second is participants' use of AI in academic work and use of AI in non-academic activities. The third perspective is their understanding of AI. A descriptive statistical analysis was conducted to address the first research question regarding pre-service teachers' familiarity with AI. The mean was interpreted according to the mean intervals presented in Table 1. Table 3 demonstrates participants' answers about whether they received any training or education about AI. Additionally, Table 4 reports the mean scores and the interpretations of these scores for identifying pre-service teachers' perceptions regarding their use, encounter, and understanding of AI tools (N = 187).

First, about half of the participants (53.3%) reported having no prior training in using AI, whereas (47%) of the participants reported having prior training in using AI. On the other hand, results indicate a high level of AI use in daily life with a mean of (M = 3.54), indicating a high engagement. In contrast, their encounter with AI tools at university was moderate (M = 3.40), with 34.1% encountering them sometimes and 30.3% often.

In terms of understanding, most teachers demonstrate a moderate grasp of basic AI principles (M = 3.32), with 34.9% reporting a good understanding. Additionally, there is a moderate understanding of the AI limitations; about 26.5% of teachers have low understanding, and 34.1% have moderate, leading to a mean of (M = 2.79).

Knowledge of AI applications relevant to their teaching specialization was also rated as moderate, with a mean score of M = 3.11, and 42% of teachers reported moderate knowledge in this area. Regarding pre-service teachers' experience of AI, results reveal that teachers have moderate AI application experience in both learning and teaching their specialization with a mean of (M =3.07) and M = 3.03, respectively. Overall, pre-service teachers reflect moderate familiarity with AI in terms of use and understanding, with a mean of (M = 3.22) in various contexts, including daily life, university, teaching specialization, and learning specialization. These results indicate that although pre-service teachers are comfortable with AI, there is still an opportunity to enhance their comprehension and practical application abilities in educational settings.

These results indicate that although about half of the pre-service teachers did not get training and education in AI, they generally have a high level of AI use in daily life activities. Additionally, these pre-service teachers have a moderate understanding of the basic principles, limitations, and applications related to their specialization. This calls for the need for well-designed AI training programs to guide future teachers in the effective integration of AI in teaching and learning. Indeed, this lack of training might negatively affect pre-service teachers' ability to fully leverage AI technologies in their professional practice.

The results here are in line with Galindo-Domínguez et al. (2023) study that found that the majority of teachers have a positive attitude toward the use of AI in education, but few of them have integrated AI tools into their teaching practices. Guided by Sun et al. (2024) study, a well-articulated program in AI integration in teaching and learning might influence pre-service teachers acceptance of AI because AI education is expected to impact Perceived Usefulness (PU), Perceived Ease of Use (PE), and Self-Efficacy (SE), as explained by Sun et al. (2024).

Table 3: Frequency and Mean Scores for Pre-Service Teachers' Use of AI (N = 187)

Question	Responses	Frequency	Mean
AI Training/Education Received?	Yes	87	47.0%
	No	98	53.0%

Table 4: Frequency and Mean Scores for Pre-Service Teachers' Use of AI (N = 187)

	Aspect of AI Experience	Mean	Interpretation
1	Rate of AI use in daily life	3.54	High
2	Rate of encountering AI tools at university	3.40	Moderate
3	Understanding of basic AI principles	3.32	Moderate
4	Understanding AI limitations	2.79	Moderate
5	Experience with AI applications for teaching specialization	3.07	Moderate
6	Experience with AI applications for learning specialization	3.03	Moderate

7	Knowledge of AI applications for teaching specialization	3.11	Moderate
	Overall	3.22	Moderate

Perceptions of AI's benefits on Education

A descriptive statistical analysis was carried out to answer the second research question about pre-service teachers' perceptions of the potential benefits of AI applications in educational settings. Table 5 summarizes pre-service teachers' perceptions of AI's impact on education, with the mean scores and the interpretations of these scores across six statements related to AI's role in teaching and learning.

Results indicated that, collectively, 87.1% of respondents agree or strongly agree that AI will assist teachers with repetitive tasks, indicating that they highly perceive AI as a good assistant for teachers in this kind of task (M = 4.1). Closely followed by a high perception of AI's role in improving education in general, with a mean score of 4.06 and 82.3% of respondents agreeing or strongly agreeing. In addition, data analysis shows that pre-service teachers highly believe that AI will reduce the workload on teachers (M = 3.82). Overall, there is a positive perception of the expected role of AI in facilitating teachers' work and enhancing education. This result indicates a positive perceived AI relevance, which could imply a better adoption of AI in teaching, as found in Jatileni et al. (2023).

Regarding the learning and teaching in the major of pre-service teachers, several participants believe that AI will improve learning in their specialization (M = 3.75), with 70% expressing positive views. In addition, they highly believe that AI will improve teaching in their specialization, reflected in a mean score of M = 3.77. Overall, AI is highly perceived as a good tool for enhancing the teaching and learning of different majors at the College of Education.

Furthermore, the results indicated that participants have a high perception of AI's role in assessment; they believe that AI will help teachers in their specialization make their assessments more objective (M = 3.72). The overall mean score of this dimension is 3.90, indicating that pre-service teachers have a highly positive perception of the benefits of AI in supporting efficiency and quality in educational practices.

These outcomes are in congruence with the findings of Jatileni et al. (2023), who found that behavioral intention to teach AI is significantly affected by AI relevance, attitude toward AI, social good aspects, and confidence. In the case of the current study, factors mentioned by Jatileni et al. (2023) are closely related to the statements of the survey used in this study. For example, the statements number 8, 12, and 13 are indicators of pre-service teachers' attitudes towards AI. Additionally, statements number 9, 10, and 11 are indicators of AI relevance. Since all these statements are highly rated, this implies a positive behavioral intention for integrating AI into education.

Table 5: Mean Scores for the Pre-Service Teachers' Perceptions of AI's Impact on Education: (N = 187)

	Statement	Mean	Interpretation

8	AI improves education in general	4.06	High
9	AI will improve learning in my specialization	3.75	High
10	AI will improve teaching in my specialization	3.77	High
11	AI will help teachers in my specialization make their assessments more objective	3.72	High
12	AI will reduce the workload on teachers	3.82	High
13	AI will assist teachers with repetitive tasks	4.12	High
	Overall Mean	3.90	High

Perceptions of the Challenges and Concerns of AI in Education

To address the perceptions of the challenges and concerns of AI in education, a descriptive statistical analysis was conducted, as summarized in Table 6. The highest concern is about being cautious when using AI in teaching, with a mean score of 4.29, representing 88.2% of participants agreeing and strongly agreeing. This result supports Zhang et al. (2024) findings that Perceived Privacy Risk is found to be negatively affecting AI Trust by preservice teachers. The second concern that participants rated moderately is that teachers might lose some skills when applying AI in their practices (M = 3.28). Additionally, participants showed a moderate concern about AI becoming a threat to humanity, with a mean score of 2.80.

Interestingly, participants do not believe that AI will replace teachers in the future, as they have a low concern about it, with a mean score of 1.95; 42.8% of participants strongly disagree with it. Moreover, they have a low concern about AI being an additional burden for teachers (M = 2.50), indicating that AI is helping teachers do their jobs easily. The overall mean score of this dimension is 2.96, indicating that teachers have moderate concerns about using AI in education.

Table 6: Pre-Service Teachers' Perceptions of the Challenges and Concerns of AI in Education (N = 187)

	Statement	Mean	Interpretation
1	AI will replace teachers in my specialization in the	1.95	Low

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4	future		
15	Teachers should be cautious when using AI in teaching	4.29	High
16	Teachers might lose some skills when applying AI in their practices	3.28	Moderate
17	AI will be an additional burden for teachers	2.50	Low
18	AI will become a threat to humanity	2.80	Moderate
	Overall Mean	2.96	Moderate

Conclusion

This study investigated pre-service teachers' experiences and perceptions of the use of AI in educational settings in Oman, with a focus on looking at their perceived familiarity with it. AI, benefits, and concerns related to the integration of AI in teaching and Learning. The findings highlighted the positive intentions that pre-service teachers have toward integrating AI into education. However, results showed that pre-service teachers are not getting adequate training in the integration of AI in teaching and learning, although they showed frequent use of AI in their daily tasks.

Based on the findings of this study, several recommendations are proposed. First, it is evident from the survey results that most of the pre-service teachers have personal experiences with using AI, but they lack training. Consequently, teacher preparation programs need to integrate AI into the curriculum both as teaching tools and as content for training pre-service teachers. Additionally, the confidence that participants showed in their trust in AI as a powerful tool for teachers shows less resistance to AI integration. This is indeed a good indicator but requires clear regulations that guide these teachers on the wise integration of AI in teaching and learning. Finally, future studies are needed to further investigate pre-service and in-service teachers' attitudes, expectations, and applications of AI in teaching and learning, using other research methodologies that go deep into the statements presented in this study survey. The results of the current study are expected to add to the existing body of knowledge on AI in education because they highlight the importance of AI the preparation of on pre-service teachers', particularly within Oman. Also, these findings are anticipated to guide educational policymakers and teacher training programs on approaches to effectively supplement teacher education curricula with knowledge and skills on the use of AI technologies in teaching and learning. This step is important for equipping future educators with the necessary skills and mindset to leverage AI for enhanced teaching and learning experiences.

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