SCIENTIFIC CULTURE

www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 11, No. 3.1, (2025), pp. 246-257
Open Access. Online & Print

DOI: 10.5281/zenodo. 18394344

THE DEGREE OF SCIENCE TEACHERS' KNOWLEDGE OF ARTIFICIAL INTELLIGENCE APPLICATIONS AND THEIR EMPLOYMENT IN TEACHING-A COMPARATIVE STUDY

Jehad Ali Almomani[1*],Mo'en Salman Alnasraween[2],Mohammad Mousa Maabreh[3], Naim Farhan Almomani[4], Najwa Dheif Allah Al qubelat[5]

[1]Amman Arab University, Jordan. jmomani@aau.edu.jo
[2]Al-Yarmouk University, Jordan. moen.na@yu.edu.jo
[3]Ministry of Education United Arab Emirates. m.maabreh1977@gmail.com
[4]Seagull AI Solutions, United Arab Emirates. nmomani@sais-lab.ai
[5]Al-Zaytoonah University n.alqubelat@zuj.edu.jo.

Received: 28/05/2025
Accepted: 28/08/2025

Corresponding Author: Jehad Ali Almomani (Jmomani@aau.edu.jo)

ABSTRACT

This comparative study assessed science teachers' knowledge and application of artificial intelligence (AI) tools in teaching within Jordan and the UAE. Employing a mixed-methods approach (descriptive and qualitative), data were collected from 405 science teachers using a rigorously validated instrument. This comprised a five-point Likert-scale questionnaire and open-ended questions addressing AI knowledge, practical use, and encountered challenges. Findings indicated a moderate overall level of AI knowledge and application among participants. ANOVA results revealed statistically significant differences ($p<.05$) based on workplace, strongly favoring teachers in the UAE, and significant differences based on years of experience, particularly among those with less than 10 years. Differences based on gender or academic qualification were non-significant. Qualitative analysis confirmed substantially higher AI application use: 70% of UAE teachers reported active use compared to 30% in Jordan. However, both groups primarily utilized a limited range of tools, such as adaptive learning platforms. Major challenges included insufficient practical experience, inadequate specialized training, significant time constraints, and excessive workload. Consequently, participants emphasized the critical need to enhance institutional support and teacher motivation for AI integration in science education. This necessitates providing adequate resources, comprehensive professional development, dedicated implementation time, and supportive policies within the school environment.

KEYWORDS: Knowledge of Artificial Intelligence Applications, Employment of Artificial Intelligence Applications in Teaching, Science Teaching, Comparative Study.

1. INTRODUCTION

Today the technological rapid and tremendous developments and emergence of AI technologies in the various aspects of life especially the educational field are able to create a qualitative shift in science teaching field, which requires a deep understanding and practical application of the content and included concepts. AI became one of the most important modern technologies, and it is considered an unprecedented technological revolution on the global level. This technology entered all aspects of life through its varied applications, and resulted in a clear qualitative shift in it; AI applications have emerged and they still emerge every day which they can be used and employed in the economic, health, social, educational and other fields; AI created deep effect in how to deal with information and data, and how to perceive the world around us, and feel the need to AI applications in this accelerating world since they provide various characteristics, privileges and capabilities which they expand every day, which makes it a qualitative and influential choice on the global level.

AI is considered one of the branches of computer science that focuses on studying and understanding the nature of human intelligence and its simulation through smart computers which can be computerized to achieve tasks requiring high abilities such as induction, deduction, realization and learning. Many definitions of AI have been mentioned such as the definition by Haenlein & Kaplan(2019) which indicated that AI is the systems' ability to process and understand external data accurately, gain knowledge from these data and use them to achieve specific objectives through flexible adaptation with different positions, and the definition by Wartman & Combs (2018) which indicated that AI is the computer devices and automated ability to simulate human perception and actions. Through these definitions, we find that AI is intelligence that automates and programs show which simulate human mental abilities and their work types such as the ability to learn, induct, solve problems and make decision.

In the educational field, AI with its all applications became a strong and effective tool with tremendous abilities that can be integrated in education to create a qualitative shift in the educational process, develop teaching methods, improve educational outputs, increase students' motivation towards learning through providing educational and electronic platforms and applications, and AI tools such as automated and deep learning to analyze educational data, extract information, analyze students' behaviors, needs and determine their educational levels, take into account individuals differences while learning, provide self-learning anytime without the need to teachers through determining strengths and weakness among students, and provide proper training to enhance their skills, since it will provide students a distinguished educational experience, and develop teaching-learning experience in the face to - face or distance implemented educational situations synchronously or asynchronously through teachers' planning and direction (Chukwuma, & Okeke, 2024; Doğan, et al. 2025; Khawaji, 2024).

Almomani & Alnasraween (2024) pointed out the need to develop diverse thinking skills among teachers, especially higher-order thinking skills, to enable them to teach science effectively by designing interactive scientific activities and experiments that offer innovative solutions for teaching the science curriculum.

Almasri. (2024); Okunade(2024) pointed out that with the increasing integration of AI into various areas of life including the educational field, the understanding of teachers in general and science teachers in particular of AI techniques, their educational applications and how to deal with them have become a very important issue, as the provision of tools and technologies by the educational institution won't be efficient; it is essential to prepare and train teachers in the educational field to be able to understand AI abilities and applications, and how to employ it the educational process to enhance learning and using virtual labs, interactive simulation of scientific, chemical or complex experiments in a safe environment, or simulation of physical phenomenon such as movements of planets or electric circles, or using the enhanced virtual reality to present three-dimensional interactive scientific lessons such as exploring the human body and moving around inside the body and its parts in a way that makes learning interesting and attractive to learning

Additionally, through AI students' performance data can be analysed and determine the strengths and weakness, and get detailed reports about students; performance, determine the scientific content or concepts that they face difficulty in learning them, in addition to deal with AI chat robot, which they are computerized programs supported with (AI) simulating human interaction, and provide learners with a possibility to address questions and communicate through a text or voice to get information rapidly and easily such as (Chatbot) ,(ChatGPT) and (Gemini) which they are used to

generate an educational content to ask (ChatGpt) or (Gemini) to explain the phenomenon of photosynthesis or the work of the circulatory system, and encourage students to deal with them to support self-learning. AI also helps the science teacher in setting lesson plans and educational subjects, changing the video into content, or changing texts materials to other formula that suit students various needs including varied educational contents, updating it continuously and adapting it according to its levels and students various abilities (Aina, et al .2023; Almasri, 2024).

With the increasing of employment of AI in the educational process, the science teacher's role changed into a facilitator or guidance and director of the students while learning science, who designs for scientific experiments in a technical and interactive manner and data analysis, and he keeps pace with new technological developments. He is also able to employ various AI applications in teaching science, and adapt to continuous changes. As for the student's role, it became active and interactive in order to interact with the content and tools provided by artificial intelligence, and he is able to use AI as a tool to develop critical thinking skills, solve problems and creative thinking as they are basic skills in science. Although the use and employment of AI supports and enhances self-learning, learners will need to cooperate with each other in order to achieve the projects and collective tasks assigned by the science teacher that they have to do. The use of AI in teaching science does not mean dispensing with the teacher and his role in the educational process, but to provide and enable him with strong modern tools and applications to enhance his role and effectiveness during the educational situations, and make teaching science more attractive and interesting to the learners. This type of interactive teaching can be generalized to the various educational stages to increase students' motivation of different ages towards learning science (Mohammed,et al .(2021); Okunade, (2024);Chukwuma, & Okeke, (2024).

Although of the tremendous abilities that AI can provide to science teachers to improve teaching science and increase its effectiveness, there are several challenges that can stop integrating AI technologies in teaching science; these challenges are represented in many aspects, the most important of which are human challenges representing the lack of knowledge, training and qualification of teachers, and their need to train on using AI tools effectively, material challenges represented in the lack of infrastructure, technical resources and technical support in the educational institution which they are essential to employ AI technologies in teaching and the curriculum challenges represented in the educational designing of the current curricula and their the difficulty to understand integrating AI technologies in teaching. Additionally, the educational challenges represented in how to reformulate teaching strategies and methods to suit with AI tools. There are also other moral and social challenges including issues related to the privacy of students' data and there is no bias in the algorithms used AI applications, and how to guarantee the fair use of these technologies among all teachers and students, the lack of the society awareness of the importance of AI applications in teaching, and finally challenges related to time pressure and the teachers' need to much time because of additional burdens upon them to plan, implement and evaluate when using these technologies and employing them in teaching science (Mohebi, (2025) Okunade, 2024).

Referring to the previous studies, we found a lot of studies related to AI applications and the extent of teachers' attention to know them and apply in teaching; among these studies the study by Mohebi (2025) that aimed to explore in- service and pre-service teachers' point of view in the UAE abut AI in teaching and facing challenges using the quantitative method. The study sample consisted of (135) teachers distributed into two groups including in-service and pre-service teachers who currently stay in the UAE, who teach or plan to start teaching. The data of the study were collected using a questionnaire including Likert-scale phrases, in addition to multiple questions relating to knowledge of AI technologies. Their usage, advantages and disadvantages, and the need to more professional development to teachers and moral aspects. The study results indicated that there is an increasing attitude among teachers in the UAE towards AI applications to develop the personalized education, develop evaluation methods and automating paperwork. The results showed a strong positive relation between teaching experience and teachers' confidence in using AI technologies in their educational activities. The results also revealed several obstacles facing application of AI in teaching science such as the lack of training, the lack of accessing resources and the privacy of data and moral issues. The study recommended paying attention to professional development, increasing confidence in integrating AI in teaching, and addressing issues of data privacy and morals.

Khawaji (2024) conducted a study aimed to identify the level of digital skills teachers' knowledge of AI applications in teaching in Saudi Arabia, their teaching practices level and their attitudes towards

employing them in providing middle school students with digital skills. The study adopted the descriptive survey method, and the study sample consisted of (140) male and female teachers in the middle school in Saudi Arabia. To achieve the study objectives, a questionnaire has been developed including three axes (knowledge, teaching attitudes and practices). The study results showed that the study sample perception to their knowledge and practices of AI applications in teaching were medium, and they had high positive attitudes towards them. The results also showed that there were no statistically significant differences among the sample members about using AI applications in providing middle school students digital skills due to the two variables of qualification and years of experience, while the results showed that there were statistically significant differences due to the variable of obtaining training programs in AI and they were for male and female teachers who obtained training programs. The study recommended the need to increase information awareness in artificial intelligence through organizing conferences and seminars to raise awareness among teachers to the importance of artificial applications in teaching.

A study by Alneyadi,et al (2024) aimed to identify science teachers' perceptions and practices relating to integrate science, technology, engineering and maths (STEM) with (AI) through techniques of mental mapping in the context of the United Arab Emirates. A mixed-methods sequential exploratory design was used consisted of quantitative and qualitative methods. The study dealt with three major questions: (1) methods that science teachers use in integration of mental mapping techniques. (2) Teachers' perceptions and experiences relating to the integration process. (3) The extent of institutional support to implement teaching science, technology, engineering, maths and AI through mental mapping. The study results revealed positive opinions among science teachers towards integration of science, technology, engineering, maths and AI through mental mapping although there are challenges such as primary technological teaching and limits of resources. The study recommended continuous professional development to teachers, and provide sufficient resources to deal with obstacles.

Al Darayseh (2023) conducted a study aimed to use Technology Acceptance Model (TAM) to reveal the teachers' perceptions of factors affecting the use AI applications in teaching science. The study adopted the descriptive method, as a six-dimensional scale was designed based on the components of the (TAM), and then it was applied to a sample consisted of (83) science teachers in Emirate of Abu Dhabi in the UAE. The study results showed a high acceptance to use (AI) in classrooms by science teachers and positive correlations with self-efficacy, easiness of use, expected advantages, positions and behavioural intentions. The results also showed that anxiety and stress don't significantly affect the other factors. As for the predictive ability of the study models, the combined factors which are the predictive advantages, easiness of use and attitude towards (AI) applications predict with a percentage of (71.4%) from the future behavioural changes related to use of (AI) applications in teaching science. The study did not show statistically significant differences in teachers' answers according to gender, teaching experience and qualifications relating to their behavioural intentions to use (AI) in teaching science. The study recommended raising awareness of using (AI) among science teachers through training programs, awareness lectures and seminars, in addition to provide training to use (AI) applications to in-service and pre-service science teachers. The study also recommended conducting analysis studies to science curricula and the extent of including (AI) issues and applications.

A study by Alissa & Hamadneh (2023) aimed to identify the level of science and math teachers' employment to (AI) applications in the educational process in Jordan from their point of view. The study adopted the descriptive method to achieve its objectives. A questionnaire consisted of (22) items has been developed, and the study sample consisted of (358) teachers. The results showed that the level of science and math teachers' employment to (AI) applications in the educational process was medium. The results also showed statistically significant differences between both genders, and they were for the female teachers in the level of employment of (AI) applications, and no differences have been shown due to the specialization. The study recommended highlighting new services and applications provided by (AI) in teaching and learning, and introducing them to teachers through teaching methods and educational activities.

A qualitative study conducted by BAGIR, et al. (2022) aimed to reveal science teachers' views on the use of (AI) in education, as the study adopted the phenomenological model, which is a qualitative research approach. To achieve the study objective, focus group interviews were conducted with (30) science teachers in (15) different public middle schools in the Diyar Bakır city. Before conducting the focus group interviews, a collective focus group interview was conducted with (6) science teachers to

access the study tool axes, which is a semi-structured interview questionnaire, as its questions were addressed in the focus group interviews, and teachers' views on the use of (AI) in education were collected under five main headings: "effect on students," "effect on teachers," "effect on the teaching - learning process," "interests," and "suggestions." As for each of the subjects "effect on students," "effect on teachers," "effect on the teaching - learning process,"" two categories were defined: positive effect and negative effect. As for interests, **two categories were identified**, professional effect and moral concerns, while two categories related to suggestions were identified: methodological suggestions and practical suggestions. The results showed that the total number of statements was (581). The most frequent opinion mentioned was the effect of (AI) on education and teaching, as the majority indicated positive effects of using (AI) in the teaching process, followed by its effect on teachers, with the majority indicating positive effects, whereas the third most frequent opinion mentioned was its effect on students, with the majority indicating negative effects. As for interests, the interview results showed that teachers spoke more about professional concerns regarding the use of (AI) in education, while as for methodological and practical suggestions, the interview results showed that teachers spoke equally about methodological and practical suggestions relating to the use of (AI) in education.

Referring to the previous studies, we find that there is an agreement on among them according to the followed methodology and results which indicated that there are positive attitudes among teachers to use (AI) in teaching and their desire to use its applications in teaching especially science teachers, as indicated by the study results of Al Darayseh (2023), and the study results by Alissa & Hamadneh (2023) which indicated that the employment degree of (AI) applications in teaching science and math was medium, and female teachers exceeded the males in their application degree, whereas the study results by BAGIR,et al. (2022) was different from the other studies in adopting the qualitative method and with its results agreement with the previous studies, as its results showed that the sample indicated with the majority that there were positive effects in using (AI) in the educational process. As for the study results by Mohebi (2025), they indicated that there were several challenges facing teachers while employing (AI) applications in teaching such as the lack of training, lack of accessing resources, privacy of data and moral issues. The current study has benefited from the previous studies in addressing the theoretical framework and preparation of the study tool. What distinguished this study is its focus on conducting a comparative study between male and female teachers in Jordan and the UAE according to their degree of knowledge and employment of (AI) applications in teaching science, as this has not been done in previous, to the best of the researchers' knowledge.

1.1. Study Questions

Q1: What is the degree of science teachers' knowledge of AI applications and their employment in teaching in Jordan and the UAE?
Q2: Does the degree of science teachers' knowledge of AI applications and their employment in teaching differ in Jordan and the UAE according to gender, year of experience, academic qualification, and workplace?
Q3: What are science teachers' opinions about their employment of AI applications and the difficulties they face when integrating these applications into science teaching?
Q4: What are the opinions of science teachers about the factors that might help increase science teachers' motivation to know and employ AI applications in science teaching?

1.2. Study Objective

The study objective which followed the descriptive and qualitative method (mixed) represents in revealing the the degree of science teachers' knowledge in Jordan and the UAE of AI applications and their employment in teaching science and their opinion about challenges facing this, and factors increasing teachers' motivation to integrate these applications in teaching.

1.3. Importance of Study

The current study pays attention to highlight the level of science teachers' awareness of Ai applications and supports the literature review with scientific knowledge about how to integrate these applications in teaching science, which may contribute to developing scientific understanding to employ AI in teaching and develop contemporary teaching and learning theories, in addition to study differences in the level of awareness and application among teachers in Jordan and the UAE, which may provide understanding of the effect of cultural and educational factors to adopt integrating AI applications in the two countries. The study results may also contribute to presenting information about reality of the science teachers' use of AI applications in both countries in teaching science, and know

challenges facing them while practicing the applications to help stakeholders in the ministry of education in Jordan and the UAE to design training programs and specialized workshops to raise science teachers' efficacy, enhance their professional skills and develop modern teaching methods that enable them to integrate AI in teaching science to become more effective.

1.4. Terminological and Procedural Definitions

- The degree knowledge of AI applications: It indicates the level of awareness and understanding that the study sample possess about AI concepts, techniques, tools and how to use them in teaching science, and this was measured through their responses on the current study items.
- The degree employment of AI applications in teaching: It indicates th extent of the study sample use of AI applications and their tools in planning and implementing educational activities during educational situations in teaching science such as using smart systems, virtual simulation, enhanced reality, intelligent analysis programs to educational data and others, and this was verified through the their responses on the current study tool.
- AI in teaching: It is AI application techniques, particularly the automated learning algorithms, computer models and complex programs that help to create systems which are able to learn and adapt in order to improve the learning process, enhance educational outputs and provide educational tools to meet individual needs to every student (Schueller, et al.2017).
- AI in teaching science: It is procedurally defined as the use of AI techniques and systems that simulates human mental abilities such as analysis, make decision, and learning to improve the quality of teaching science and increase its effectiveness through employment of intelligent teaching systems, adapted learning, virtual simulation, automated evaluation by science teachers in planning and implementing science lessons to improve interaction during the educational situation.

1.5. Study Limits and Limitations

- Spatial limits: The current study was applied in Jordan and the UAE.
- Human limits: This study was applied to science teachers in the public and private schools in Jordan and the UAE.
- Time limits: This study was applied in the academic year 2024/2025.

The current study is limited in restricting generalizations of the results on the study sample, and therefore the same results cannot be guaranteed if it is applied to another sample outside the study society. This study is also limited in the tools used in it, and the degree of its reliability and validity.

2. STUDY PROCEDURES AND METHODOLOGY

Study Methodology: The study used a mixed method (descriptive and qualitative) due to its suitability for the study purposes.

Study Population: The study population consisted of all science and science subject teachers in public and secondary schools in Jordan and

Study Sample: The study sample, which was selected using the convenience method, consisted of (405) male and female science teachers in Jordan and the UAE: (166) male and female teachers in the UAE and (239) male and female teachers in Jordan. Table (1) shows the number of study participants by gender variable.

Study Tool: The study tool was developed after consulting theoretical literature and previous studies, such as Khawaji, (2024); Alneyadi, et al., (2024).

Table 1: Study Sample According to Demographic Variables.

Variable		N
Gender	Male	215
	Female	190
Experience	Less than 5 years	56
	5 to less than 10	59
	10 and above	290
Scientific qualification	Bachelor	227
	Post graduate	178
workplace	Jordan	239
	UAE	166

2.1. Validity of the Study Tool

Content Validity: The validity of the study tool, which in its initial form consisted of (33) paragraphs and five open-ended questions, was verified by presenting it to a group of (7) arbitrators working as faculty members in curricula, measurement, and evaluation in Jordan and the UAE. Amendments were made in light of their comments. The final form of the tool consisted of (30) paragraphs It is divided into two domain: knowledge of artificial intelligence applications and the use of applications in science teaching., which were responded to according to a five-point Likert scale (very high, high, medium, low, very low), in addition to (3) open-ended essay questions.

Construct Validity Indicators: The study tool was applied to a survey sample consisting of (25) male and female teachers from within the study community and from outside the primary sample, totalling (25) male and female teachers. Construct validity indicators ranged between (0.32) and (0.69), all of which were positive and statistically significant.

Reliability of the Study Tool: The reliability of the study tool was determined after applying it to a survey sample of (25) male and female teachers from the study community and from outside its primary sample. Cronbach's alpha equation for internal consistency was determined using the item statistic, as shown in Table (2).

Table 2: Reliability Assessment Using Cronbach's Alpha Method.

Domain	Cronbach Alpha
Knowledge of AI Applications	0.84
Employment AI Applications in Science Teaching	0.79
Overall Score	0.91

It is noted from the results in Table (2) that the reliability values for the total score using Cronbach's alpha reached (0.91), and for the dimensions (0.84) for the "Knowledge of AI Applications" domain and (0.79) for the "Employment of AI Applications in Science Teaching" domain.

The cut-off score: To assess the descriptive results represented by the arithmetic means of the study instrument, the following formula was used (Alnasraween et al., 2023): (highest value of the scale-lowest value)/3= 5-1/3= 1.33, and so the means will be:

2.33: Low, 2.34-3.67: moderate, 3.68-5: High

3. STUDY FINDINGS

Findings of the first study question what is the degree of science teachers' knowledge of AI applications and their employment in teaching in Jordan and the UAE?

To answer the first question, arithmetic means and standard deviations were calculated of the study sample responses on the study tool with its two dimensions: AI applications and employment of AI applications in teaching science, and Table (3) explains the results.

Noted from the results in Table (3) that the degree of science teachers' knowledge of AI applications and their employment of them in teaching in Jordan and the UAE was average, with an arithmetic mean of 3.13 and a standard deviation of 0.87. The First dimension, "Knowledge of AI Applications," came in at an average of 3.32 and a standard deviation of 0.85, with an average score and a higher rank than the second dimension, "Employment AI Applications in Science Teaching," which reached 2.93 and a standard deviation of 0.96, with an average score.

Table 3: Arithmetic Means and Standard Deviations of Science Teachers' Knowledge of AI Applications and Their Employment of them in Teaching in Jordan and the UAE.

	N	Mean	Std. Deviation	Degree
Knowledge of AI Applications	405	3.32	0.85	Moderate
Employment AI Applications in Science Teaching	405	2.93	0.96	Moderate
Overall Score	405	3.13	0.87	Moderate

Findings of the second study question Does the degree of science teachers' knowledge of AI applications and their employment in teaching differ in Jordan and the UAE according to gender, year of experience, academic qualification, and workplace?

To answer this question, the arithmetic means and standard deviations were extracted for the degree of science teachers' knowledge of AI applications and their employment of them in teaching in Jordan and the UAE, based on gender, year of experience, academic qualification, and workplace. The following tables (4), (5),(6),(7) illustrates this.

Table 4: The Mean and Standard Deviation of the Degree of Science Teachers' Knowledge of AI Applications and Their Employment of Them in Teaching in Jordan and the Emirates, According to Gender.

Dependent Variable	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Knowledge of AI Applications	Male	3.563	.071	3.424	3.702
	Female	3.350	.078	3.198	3.502
Using AI Applications in Science Teaching	Male	3.203	.079	3.047	3.358
	Female	3.129	.087	2.959	3.299
Total	Male	3.383	.072	3.241	3.524
	Female	3.240	.079	3.085	3.395

Table (4) display an apparent differences between the Arithmetic means and of science teachers' knowledge of intelligence applications and their employment of them in teaching in Jordan and the

Emirates, according to gender. Moreover, to find out if these differences are statistically significant, the Manova Test was extracted Table (8).

Table 5: The Mean and Standard Deviation of the Degree of Science Teachers' Knowledge of AI Applications and Their Employment of Them in Teaching in Jordan and the Emirates, According to Year of Experience.

Dependent Variable	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Knowledge of AI Applications	Less than 5 years	3.613	.109	3.399	3.827
	5 years to less than 10 years	3.453	.102	3.252	3.655
	10 years and above	3.303	.048	3.210	3.397
Using AI Applications in Science Teaching	Less than 5 years	3.406	.122	3.167	3.645
	5 years to less than 10 years	3.210	.114	2.985	3.435
	10 years and above	2.882	.053	2.777	2.986
Total Degree	Less than 5 years	3.510	.111	3.292	3.727
	5 years to less than 10 years	3.332	.104	3.127	3.536
	10 years and above	3.092	.048	2.997	3.188

Table (5) display an apparent differences between the Arithmetic means and of science teachers' knowledge of intelligence applications and their employment of them in teaching in Jordan and the Emirates, according to years of experience. Moreover, to find out if these differences are statistically significant the Manova Test was extracted Table (8)

Table 6: The Mean and Standard Deviation of the Degree of Science Teachers' Knowledge of AI Applications and Their Employment of Them in Teaching in Jordan and the Emirates, According to Academic Qualification.

Dependent Variable	Scientific qualification	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Knowledge of AI Applications	Bachelor degree	3.470	.060	3.353	3.588
	Post Graduate	3.443	.074	3.297	3.588
Using AI Applications in Science Teaching	Bachelor degree	3.161	.067	3.030	3.293
	Post Graduate	3.171	.083	3.008	3.333
Total Degree	Bachelor degree	3.316	.061	3.196	3.436
	Post Graduate	3.307	.075	3.159	3.455

Table (6) display an apparent differences between the Arithmetic means and of science teachers' knowledge of intelligence applications and their employment of them in teaching in Jordan and the Emirates, according to scientific qualification. Moreover, to find out if these differences are statistically significant the Manova Test was extracted Table (8)

Table 7: The Mean and Standard Deviation of the Degree of Science Teachers' Knowledge of AI Applications and Their Employment of Them in Teaching in Jordan and the Emirates, According to Workplace.

Workplace					
Dependent Variable	Workplace	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Knowledge of AI Applications	Jordan	3.167	.065	3.039	3.294
	UAE	3.747	.081	3.587	3.907
Using AI Applications in Science Teaching	Jordan	2.766	.072	2.624	2.908
	UAE	3.566	.091	3.387	3.744
Total	Jordan	2.966	.066	2.837	3.096
	UAE	3.656	.083	3.493	3.819

Table (7) display an apparent differences between the Arithmetic means and of science teachers' knowledge of intelligence applications and their employment of them in teaching in Jordan and the Emirates, according to workplace. Moreover, to find out if these differences are statistically significant the

Manova Test was extracted Table (8).

Table 8: The Findings of the Manova Test.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	Knowledge of AI Applications	2.569	1	2.569	4.272	.039
	Using AI Applications in Science Teaching	.307	1	.307	.409	.523
	Total	1.162	1	1.162	1.870	.172
Experience	Knowledge of AI Applications	4.554	2	2.277	3.787	.023
	Using AI Applications in Science Teaching	14.463	2	7.231	9.643	.000
	Total	8.778	2	4.389	7.061	.001
Scientific qualification	Knowledge of AI Applications	.069	1	.069	.116	.734
	Using AI Applications in Science Teaching	.008	1	.008	.010	.919
	Total	.008	1	.008	.012	.912
Workplace	Knowledge of AI Applications	19.836	1	19.836	32.992	.000
	Using AI Applications in Science Teaching	37.675	1	37.675	50.238	.000
	Total	28.046	1	28.046	45.122	.000
Error	Knowledge of AI Applications	239.894	399	.601		
	Using AI Applications in Science Teaching	299.221	399	.750		
	Total	248.005	399	.622		
Total	Knowledge of AI Applications	4764.244	405			
	Using AI Applications in Science Teaching	3852.880	405			
	Total	4269.986	405			

It is noted from the results of Table (8) that there are no statistically significant differences between the arithmetic means of the degree of science teachers' knowledge of intelligence applications and their employment of them in teaching in Jordan and the Emirates, depending on the teacher's gender and academic qualification. While the results showed the presence of statistically significant differences in favor of the workplace, and according to the arithmetic means, these differences were in favor of those working in the UAE. The results also showed the presence of statistically significant differences attributed to the number of years of experience. To determine the significance of these differences, the Scheffe test was extracted for post-comparisons, and Table (9) shows this.

Table 9: The Findings of the Post Hoc Comparison.

Dependent Variable	Experience	Mean	Less than 5 years	5 years to less than 10 years	Above 10 years
Knowledge of AI Applications	Less than 5 years	3.613	-	0.160	0.310*
	5 years to less than 10 years	3.453	-	-	0.150
	10 years and above	3.303	-	-	-
		Mean	Less than 5 years	5 years to less than 10 years	Above 10 years
Using AI Applications in Science Teaching	Less than 5 years	3.406	-	0.196	0.524*
	5 years to less than 10 years	3.210	-	-	0.328*
	10 years and above	2.882			
		Mean	Less than 5 years	5 years to less than 10 years	Above 10 years
Total Degree	Less than 5 years	3.510	-	0.178	0.418*
	5 years to less than 10 years	3.332	-	-	0.240*
	10 years and above	3.092			

It is noted from the table (9) results that the differences between the arithmetic means are attributed to teachers with less than 5 years of experience and teachers with experience (5 years to less than 10 years) when compared to teachers with experience (10 years and above).

Findings of the Third study question: What are science teachers' opinions about their employment of AI applications and the difficulties they face when integrating these applications into science teaching?

To answer this question, we reviewed the responses of the study sample and tallied the

frequencies and percentages related to the extent of science teachers' knowledge and employment of AI applications in science teaching in Jordan and the UAE. The responses revealed that (30%) of science teachers in Jordan have knowledge of and have previously used AI applications. These applications included Magicschool, Classpoint, ChatGpt, Deepseek, Metaverse, and PowerPoint AI. Meanwhile, 70% indicated that they had never used AI applications in teaching due to a lack of knowledge and experience in this field. As for science teachers in the UAE, 70% of them indicated that they had previously used AI applications in teaching. These applications were limited to Gemmini, ChatGBT, Deepseek, and Phet AI.

Regarding the difficulties of implementing AI, more than (85%) of science teachers in Jordan indicated that the most prominent difficulties were the lack of experience and training among teachers, the lack of equipment and tools in schools necessary to employ AI applications in teaching, the lack of internet access in many schools, the increased burden on teachers, and the lack of time due to the large curriculum. Meanwhile, 75% of science teachers in the UAE indicated the presence of several difficulties, including the limited availability of free AI applications, the lack of practice, the lack of training for teachers and students, the increased burden on teachers, and time limit.

Findings of the Fourth study question: What are the opinions of science teachers about the factors that might help increase science teachers' motivation to know and employ AI applications in science teaching?

Based on the study sample responses, (80%) of the study sample in both Jordan and the UAE agreed that the most prominent factors that could help increase science teachers' motivation to learn about and employ AI applications in science teaching include holding specialized training workshops, providing teachers with time, making AI applications available to teachers and students by schools, encouraging teachers and students to use them, and providing incentives to teachers who excel in using and employing them in science teaching. 45% of science teachers in Jordan also indicated the need to provide various tools, computers, and technological means in schools to facilitate the use of AI in science teaching.

4. DISCUSSION

It is clear through the results that the knowledge degree of the study sample of AI applications and their employment in teaching science was medium, and this may due to that the current science curricula based on the researchers' experience in the educational field in Jordan and the UAE do not include employment of AI in teaching, in addition to, most teachers often hesitate to adopt new techniques like using AI applications because of the lack of experience in these fields, as well as time limit to end curricula, and this is evident through the study sample responses on the open questions related to their knowledge and employment of AI applications in teaching science; as most of them indicated that they have limit knowledge and use of specific AI applications represented in Gemmini, Chatgpt and Deepseek, and the reason for that refers to the lack of their knowledge and practice in this field, increased burden and time limit, in addition to lack of equipment and capacities in most schools they work in, and based upon this, the study sample members agreed on that the most prominent factors that increase their motivation towards employment of AI applications in teaching science represented in holding specialized workshops, giving enough time to teachers, providing AI applications to the teachers and students by schools, encouraging teachers and students to use them, and present motives to the distinguished teachers in their use and employment in teaching science. This result agrees with the study results by (Khawaji, 2024) which showed that the knowledge degree of digital skills teachers and their employment of AI applications were medium, and (Alissa & Hamadneh, 2023) study where its results showed that the level of employment of science and math teachers of AI applications in the educational process was medium. The results related to difficulties and challenges concerning the knowledge and AI applications agreed with the study results by (Mohebi, 2025) which indicated that the most prominent and challenges represented in the lack of experience and training among teachers, in addition to weakness of infrastructure and lack of essential equipment to achieve this.

As for the degree of science teachers' knowledge and employment of artificial intelligence (AI) applications according to the variables of workplace, gender, teaching experience and qualification, it was clear that there were statistically significant differences in the degree of knowledge and AI applications in teaching science due to the variables of workplace and they were for the teachers in the UAE, and the variable of teaching experience and they were for male teachers of teaching experience less than 5 years, and from 5 to less than 10, whereas there were no statistically significant differences due to the variables of gender and qualification, and the excellence of the teachers in the UAE may due to the

better conditions and capabilities allowed to them, in addition to their knowledge of English language since the science curricula are taught in English, and this allows them to refer to more various cognitive sources than the teachers in Jordan. Regarding teaching experience, the excellence of teachers who have experience less than 5 years, and from 5 to less than 10 years may due to that the teachers of this category are able to deal and interact with technology more than those who are older and more experienced, and therefore more curiosity in knowledge and employment of AI applications in teaching. This result disagreed with study results by (Khawaji, 2024) which showed that there were no statistically significant differences due to the teaching experience, and it also disagreed with study results by (Alissa & Hamadneh, 2023) which showed that there were statistically significant differences due to gender and they were for female teachers.

5. CONCLUSION

In light of the tremendous revolution in technology and AI, there is a growing need to understand AI-related applications and how to employment them in science teaching; this is to keep pace with scientific and technological progress and increase students' motivation to learn science and comprehend scientific concepts. The current study, which followed a mixed (descriptive and qualitative) approach, aims to reveal science teachers' knowledge of AI applications and their employment in teaching. It also aims to compare teachers in two Arab countries, Jordan and the UAE, and explore their views on the difficulties they face in understanding and employing them in teaching, as well as the factors that contribute to increasing their motivation. The results of the study showed that science teachers in both Jordan and the UAE had a moderate level of knowledge of AI applications and their employment in science teaching. There were statistically significant differences in their knowledge and employment of AI applications in teaching attributed to workplace, in favour of UAE teachers. There were also statistically significant differences attributed to teaching experience, in favour of teachers with less than 5 years of experience. No statistically significant differences were found attributed to gender or academic qualifications. The survey of the study sample also revealed that Emirati teachers outperformed Jordanian teachers in their employment of AI applications, with 70% of teachers using them compared to 30% in Jordan. This knowledge and employment of both applications was focused on specific applications, including ChatGPT and DeepSeek, as well as AI simulation programs such as PHEt AI and Gemmini AI. The study sample members unanimously agreed that the most significant challenges they face in understanding and employing AI applications are a lack of experience and training, increased burdens on science teachers, and limited time. Based on this, they agreed on the need to increase science teachers' motivation to understand and employ AI applications in science teaching by holding training workshops and motivating and encouraging teachers to learn about and employ AI applications in teaching by providing appropriate opportunities and conditions for this to happen in their workplaces.

5.1. Recommendations

In light of the results, **the following recommendations can be made**

- Employing and adopting AI in science teaching by science teachers in Jordan and the UAE by including interactive activities and codes in curricula that enable teachers and students to access interactive applications during the science learning and teaching process.
- The Ministry of Education should hold specialized training workshops for science teachers on the use and application of AI in science teaching.
- The Ministry of Education should provide AI applications and adopt them as mandatory teaching aids for teachers at various educational levels.
- Further comparative studies should be conducted on teachers' knowledge and use of AI applications in various subjects to achieve greater effectiveness in education by employing AI applications in a qualitative manner in the educational process.

REFERENCES

Aina, M. A., Gbenga-Epebinu, M. A., Olofinbiyi, R. O., Ogidan, O. C., & Ayedun, T. O. (2023). Perception and acceptance of medical chatbot among undergraduates in Ekiti State University, Nigeria. British Journal of Education, 11(11), 1-14. https://doi.org/10.37745/bje.2013/vol11n11114.

Al Darayseh, A. (2023). Acceptance ofAIin teaching science: Science teachers' perspective. Computers and Education: Artificial Intelligence, 4, 100132. https://doi.org/10.1016/j.caeai.2023.100132.

Alissa, R. A. S., & Hamadneh, M. A. (2023). The Level of Science and Mathematics Teachers' Employment ofAIApplications in the Educational Process. International Journal of Education in Mathematics, Science and Technology, 11(6), 1597-1608. https://doi.org/10.46328/ijemst.3806

Almasri, F. (2024). Exploring the impact ofAIin teaching and learning of science: A systematic review of empirical research. Research in Science Education, 54(5), 977-997. https://doi.org/10.1007/s11165-024-10176-3.

Almomani, J. & Alnasraween, M. (2024) "The Degree of Inclusion of Twenty-First Century Skills in the Developed Science Textbook of the Eighth Grade in Jordan," An-Najah University Journal for Research - B (Humanities): 38: (5), Article 7. https://doi.org/10.35552/0247.38.5.2194.

Alnasraween, M.S.S., Shawareb, I.J., Ajeely, S.A., Khazaleh, A., Abzakh, H.O.(2023). Standard Properties of Parental Competence Scale for Children with Autism Spectrum Disorder According to the Two-Parameter Logistic Model. Information Sciences Letters, 2023, 12(9), pp. 2035–2046, 12.

Alneyadi, S., Almessabi, A., & Alshraifin, N. (2024). Exploring Science Teachers' Perceptions and Practices in Integrating STEM and AI through Mind Mapping: A Case Study in the UAE. Journal of Ecohumanism, 3(3), 1239-1252. https://doi.org/10.62754/joe.v3i3.3434

Bagir, M., Karakoyun, G. O., & Asilturk, E. (2022). Views of Science Teachers on the Use ofAIin Education. International Online Journal of Educational Sciences, 14(5). https://doi.org/10.15345/iojes.2022.05.007

Chukwuma, C. M., & Okeke, N. L. (2024).AIAND THE IMPLEMENTATION OF INNOVATIVE TEACHING METHODS IN THE 21ST CENTURY SECONDARY EDUCATION IN RIVERS STATE. Journal of Association of Educational Management and Policy Practitioners, 5(1), 275-28

Doğan, Y., Batdı, V., Topkaya, Y., Özüpekçe, S., & Akşab, H. V. (2025). Effectiveness ofAIPractices in the Teaching of Social Sciences: A Multi-Complementary Research Approach on Pre-School Education. Sustainability, 17(7), 3159. https://doi.org/10.3390/su17073159

Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. California management review, 61(4), 5-1. https://doi.org/10.1177/0008125619864925

Khawaji, T. M. (2024). The Level of Knowledge and Practices of Digital Skills Teachers forAIApplications in Providing Middle School Students with Digital Skills and their Attitudes towards them. Journal of Scientific Research in Education, 25(2), 145-185.

Mohammed, A., Ali, R., & Alharbi, A. (2021). The reality of usingAItechniques in teacher preparation programs in light of the opinions of faculty members: A Case Study in Saudi Qassim University. Multicultural Education, 7(1), 5-16.

Mohebi, L. (2025). Exploring the Integration of AI in Education: Perceptions, Challenges, and Opportunities Among In-Service and Pre-Service Teachers in the UAE. Prompt Engineering and Generative AI Applications for Teaching and Learning, 371-386. https://doi.org/10.4018/979-8-3693-7332-3.ch022

Okunade, A. I. (2024). The role of AI in teaching of science education in secondary schools in Nigeria. European Journal of Computer Science and Information Technology, 12(1), 57-67. https://doi.org/10.37745/ejcsit2013/vol12n15767

Schueller, S. M., Tomasino, K. N., & Mohr, D. C. (2017). Integrating human support into behavioral intervention technologies: The efficiency model of support. Clinical Psychology: Science and Practice, 24(1), 27. https://doi.org/10.1037/h0101740

Wartman, S. A., & Combs, C. D. (2018). Medical education must move from the information age to the age of artificial intelligence. Academic Medicine, 93(8), 1107-1109. https://doi.org/10.1097/ACM.0000000000002044