Jordanian Teachers' Perceptions of Employing Artificial Intelligence Technologies in the Educational Process

Belal S. Rabab'h[1,*] and Nouf Almoray[2]

[1]Department of Mathematics, Science & ICT education, Bahrain Teachers College, University of Bahrain, Zallaq, Bahrain
[2]Department of Education Studies, Bahrain Teachers College, University of Bahrain, Zallaq, Bahrain
Email: brababh@uob.edu.bh (B.S.R.); nalmoray@uob.edu.bh (N.A.)
*Corresponding author
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***Abstract*—The objective of this study was to ascertain the perspectives of Jordanian teachers regarding the integration of artificial intelligence technology into the educational process. A descriptive approach was used to analyse a sample of 261 male and female teachers from public schools in Irbid, northern Jordan. The study found that, Jordanian teachers have high perceptions of using artificial intelligence in the educational process, which are divided into five categories: assessment, teaching, planning, educational activities and managing student behaviour. Additionally, the research showed that these perceptions are more positive among male teachers and those with graduate degrees. However, they are not related to the teachers' experience or training courses they attended. The study recommends that further studies should be conducted on Artificial Intelligence (AI)-based learning, such as Personalized Learning, Intelligent Tutoring Systems (ITS), and Simulated Learning Environments involving artificial intelligence, particularly in higher education. Furthermore, training courses and workshops should be provided on how to apply artificial intelligence effectively in the educational process, according to the study.**

***Keywords*—artificial intelligence, artificial intelligence technologies, educational process, in-service teachers**

I. Introduction

Educational technology is one of the important components of the educational process, utilized by both teachers and learners to achieve desired educational goals. Considering that technology is key to supporting individuals and groups and encouraging them to engage in productive learning activities [1, 2], this technology has attracted considerable attention from those involved in the educational process. However, with the rapid global changes brought about by The Fourth Industrial Revolution and the use of smarter educational technology tools (today known as artificial intelligence in education), there is a huge gap between educators, stakeholders in the education process, parents, and even learners [3]. Many problems have arisen during this period. The aim is to explore the opportunities these smart ed-tech tools can create. Therefore, it is necessary to understand the various components of Artificial Intelligence (AI) in the educational process and first discuss the educational concepts that should be followed before AI can play a role in the classroom, so as not to limit its effectiveness and enthusiasm [4]. The discussion concludes with the required educational outcomes that are consistent with the future global job market and ensure the well-being of our communities in a sustainable world.

Artificial intelligence is not limited to a set of software; rather, it encompasses a range of social and technical systems. This means that these systems and software develop within specific and diverse social contexts, depending on the diversity of stakeholders, institutions, cultures, and standards [5]. Therefore, when discussing the topic of AI in education, it is necessary to pay attention to the legislative and legal aspects to ensure human responsibilities in the development and regulation of the field of AI in accordance with the law. This is the so-called responsible artificial intelligence, as mentioned in the [5]. Furthermore, the social aspect emphasizes the importance of considering social ethics and cultural values when implementing artificial intelligence, while balancing the values held by stakeholders in a multicultural context [6]. In addition, the institutional aspect also takes into account the nature of the educational institution, its specificities, the learning theory (educational philosophy) it follows, and the regulatory standards that govern its operations.

Following up, the digital transformation we are witnessing in today's era requires students to possess 21st-century skills in addition to technical expertise. This means that the traditional separation between the humanities and sciences does not meet the needs of the digital age [5]. We need to equip students with an interdisciplinary framework that enables them to apply digital skills to solve the problems they face in their daily lives and their future careers. In other words, the application of AI in education is both a goal and a means. Initially, this was a goal, as it involved preparing students to become qualified professionals in the field of artificial intelligence, thereby reducing labor intensity by organizing large amounts of data, so-called big data. This will result in significant changes to current workflows. Besides, it is an educational tool that can be applied to various educational stages, targeting different subject properties and learner characteristics.

Even though the current situation still carries a lot of ambiguity and disorganization, there are many scattered, missing, or incorrect data, which in turn poses a significant challenge to the application of AI in the educational field. In light of the above, the current research can help clarify the concept of educational AI and anticipate its expected areas of application in the future.

A. Problem Statement

The growing capabilities of many AI systems in our daily lives bring us back to the components of AI, which include the technical components and the social components. The social components refer to the social systems in which AI develops, as well as the stakeholders, institutions, culture, and norms, which are indivisible [7, 8].

The application of AI in various fields, such as applied science, finance, and medicine, has achieved remarkable results, promoting the development and systematic application of AI in these fields. In contrast, the same progress has not been made in the field of education [9]. Many studies examining the impact of smart learning technologies, particularly AI in education, have questioned the educational value of technology, including research by [10–13]. However, researchers point out that a growing body of research provides strong evidence that some well-designed educational AI programs have a statistically significant impact on student learning and, thus, the success of the educational process [14, 15].

Numerous studies have shown that Jordanian educators are receptive to integrating AI into various aspects of the learning process. Jordanian teachers have used ChatGPT as a learning facilitator during lessons, and the results seem to be positive: 65% before utilizing ChatGPT, compared to 78% after using it. Omar and Khlaif [16, 17] investigated the factors that impact the use of generative AI technologies for student evaluation in higher education. The study emphasized the perspectives of Jordanian teachers.

The reference [18] encouraged the use of emerging technologies such as artificial intelligence, stating that open education relies on open technologies, including artificial intelligence, to promote collaborative and flexible learning and the open sharing of teaching practices, enabling educators to benefit from the knowledge of their peers.

Furthermore, AI technology has been applied in the field of education over the past two decades, including knowledge representation, intelligent tutoring, natural language processing, autonomous agents, and more. Over the years, AI has created a positive educational environment and interactive experiences for students [19].

According to the above, the researchers believe that there is no clear approach to the application of AI in education; instead, there is a series of articles and scientific studies focusing on the technologies and practices employed, such as language recognition technology, natural language processing and generation, personalized learning technology, adaptive learning, virtual assistants, monitoring, intermittent learning technology, machine learning, mathematics assessment, smart campuses, games, chatbots, and more.

Recently, the practice of AI technology in education has been extremely limited, and teachers currently need to utilize and apply these technologies. This was confirmed by Hinojo-Lucena [20], although many teachers are unaware of the application areas of educational AI and its components. Therefore, the research problem is summarized in the following research questions:

1) What are the perceptions of Jordanian teachers regarding the employment of artificial intelligence techniques in the educational process?
2) Which aspect has the most significant impact on the educational process through the application of artificial intelligence techniques, according to the perceptions of Jordanian teachers (planning, teaching, managing learner behavior, educational activities, or assessment)?
3) Are there differences in the perceptions of Jordanian teachers regarding the employment of artificial intelligence techniques in the educational process based on variables such as gender, years of experience, academic degree, and training courses?

B. Significance of the Study

Several important features of the current study demonstrate its significance. It highlights the importance of artificial intelligence in education, as well as the originality of research examining its potential applications and impacts on the learning process. Teachers can enhance their understanding of AI in education by using the case study's valuable references, which will help them comprehend how it can be applied in the classroom. By utilizing findings from studies that demonstrate how AI can improve teaching methods, enhance learning outcomes, and facilitate efficient data analysis, this research may also help educators become more familiar with notable experiences that enhance learning experiences and teaching practices. Finally, the study helps educators develop a vision for how AI might support instructors' professional development and how to effectively and equitably integrate technology into their work.

C. Limitations of the Study

The current study has certain limitations, primarily due to its small sample size. Only educators employed by public schools are included in the sample; educators employed by private schools are not. The second limitation is the study's narrow scope, which is restricted to northern Jordan, even though Jordan has several cities. Additionally, since the sample is drawn from a single northern Jordanian governorate and does not include other governorates, it might not accurately represent the population. Despite these limitations, this area is distinguished by the presence of many universities, institutes, and learning centers that are notably focused on technology, which encouraged the researcher to conduct the study in this region.

II. Literature Review

The use of artificial intelligence programs has penetrated every aspect of life, leading to the emergence of many new application areas that require clear identification to understand how to benefit from them in different aspects of work. Education has a significant share in this field, especially since the main idea behind AI programming is technical programming aimed at achieving semi-human intelligence capable of learning, adapting, and decision-making. Therefore, many educational studies have emerged, proposing visions for the application of AI in the educational process. The study by Zawacki-Richter [21] identified four areas of AI applications in education: analysis and prediction, assessment and evaluation, adaptive and personalization systems, and smart tutoring systems.

The role of AI in the educational process has evolved to include performing certain educational tasks independently or in collaboration with teachers [22]. As education undergoes changes, chatbots are becoming increasingly popular and are used as teaching assistants to support teachers and students in various ways [23].

Accordingly, this raises many questions for teachers regarding the use of these applications in the educational process, especially as the academic, administrative, and educational tasks they face increase. It has been emphasized that such applications can reduce their workload, enhance

their work, and facilitate student learning and assessment effectively and simply, as well as assist in many other administrative tasks [24].

Salas-Pilco [25] highlighted the importance of AI applications in supporting the educational practices of pre-service and in-service teachers. Additionally, a study by Duan [26] indicated the role of AI tools in training student teachers toward practical knowledge and interdisciplinary integration, and it underscored the necessity for increased research attention to the role of AI in shaping teachers' educational capabilities.

Despite the importance of studies focusing on pre-service teachers, the current research primarily concentrates on in-service teachers, which is a significant aspect that distinguishes the present study. The researchers concluded that the role of AI applications, particularly data analysis systems, machine learning, humanoid robots, and chatbots, in teachers' work within the classroom environment, which includes educational planning, teaching, managing learner behavior, teaching activities, and assessment. Therefore, it is essential to equip teachers with the necessary foundational cognitive skills and strategies to effectively utilize AI in their daily work within the classroom, as indicated in the studies of Kerneža and Chen [23, 27].

Learning planning is the first step for teachers in achieving educational objectives. Rabab'h [28] pointed out that machine learning algorithm programs are useful in analyzing student performance, providing behavioral data, discourse data, and statistical data, thereby contributing to the refinement of content and teaching methods.

Artificial intelligence applications allow teachers to focus more on teaching and guiding students while enhancing their learning and reducing teachers' workloads, especially those based on Learning Analytics (LA), Virtual Reality (VR), Grading/Assessments (G/A), and admissions [24]. Meanwhile, educational robots assist teachers in identifying suitable training and teaching courses for learners and customize learning experiences for each student by designing educational programs tailored to each learner's preferences and pace [29].

Another crucial topic is learning difficulties, which most teachers find challenging to address. A study by Shen [19] illustrated the role of AI applications in helping learners resolve educational problems related to reading, writing, and spelling difficulties, dyslexia, and mathematics, in addition to providing data and personalizing education, which contributes to improving teaching and imparting twenty-first-century skills.

Classroom behavior management in the educational process includes enhancing communication skills between teachers and learners [30]. Proper use of AI applications in education, with clearly defined roles and work areas, can help activate the role of teachers and support them in enhancing communication with students, especially in light of the significant changes brought about by the COVID-19 pandemic. Accordingly, this forced students and teachers to adapt to emergency remote teaching and helped to alleviate doubts and fears about its use [31].

Furthermore, Alam [22] confirmed that the adoption of AI applications based on machine learning and adaptability in education can improve quality, efficiency, and student experience by adapting to individual needs and enhancing administrative tasks. AI can play a vital role in addressing the skills gap by providing students with high-quality, AI-powered educational tools and resources to help them acquire the skills they need to succeed in the rapidly evolving job market of the future [32].

Additionally, educational games designed with AI can help students learn more effectively by introducing them to enjoyable, immersive learning environments. Such applications assist teachers in creating interactive games and activities that match individual learning styles [28]. AI algorithms benefit teachers by enabling them to create objective and unbiased assessment methods, resulting in more accurate assessments and a more equitable educational environment for all students [33]. In contrast, the study by Kerneža [23] showed that pre-service teachers tend to overestimate their skills required to interpret content generated by chatbots compared to the assessments made by evaluators. This discrepancy can lead to inaccurate or incomplete evaluations of their skills, which may hinder their capacity for growth and development.

Artificial intelligence can assist teachers in providing more accurate and comprehensive feedback to students by analyzing performance data and identifying areas that need improvement. This can help students understand their strengths and weaknesses and identify the areas they need to enhance [23]. Additionally, by analyzing students' learning patterns using big data, AI can enhance traditional classroom assessment methods by providing timely information about their learning progress, success, or failure. Thus, AI can show and provide information that was not accessible using previous assessment methods. AI allows determining whether the learner has achieved the correct answer while providing the teacher with the process that the learner used to arrive at the correct answer. In addition, AI can successfully identify learners' psychological states, such as boredom, frustration, and sadness, as well as provide appropriate support for each situation individually [34].

A. Teachers' Perceptions of the Use of Artificial Intelligence

The use of artificial intelligence in the classroom has not been fully accepted, as many teachers still have a negative view of technology and are reluctant to use AI [35, 36]. This reluctance has been attributed to teachers' concerns about the use of new technologies [37], leading them to continue using the same resources and teaching methods while declining any new implementation that might lead to negative outcomes [38], thereby hindering efforts to integrate technology into the educational process [39].

Previous research has shown that teachers' perceptions of AI are influenced by media coverage and science fiction, leading them to view AI as a threat to their professional future rather than a tool that enhances the learning and teaching process [15]. However, recent research has helped raise teachers' expectations for major changes in education, such as the implementation of AI in various educational settings [40]. In this context, a new concept has emerged: AI in education, covering all aspects of AI educational applications [41, 42].

According to teachers, their perceptions of AI systems in education vary according to their pedagogical beliefs,

educational experience, and prior experience in using educational technology, all of which can influence their readiness to adopt new educational technologies [43, 44].

Many previous studies have investigated teachers' views on artificial intelligence-enhanced education, generally indicating that they expect AI to provide a new effective teaching process through digital educational materials and multimedia interactions between humans and computers [45]. Additionally, they anticipate that it will address the various learning difficulties faced by each student and meet their needs despite the large number of students in the classroom [33, 46]. Furthermore, teachers anticipate that easy and repetitive tasks will be taken over by AI-enhanced education, substantially reducing their administrative workload [47].

Researchers have noted that teachers must first learn how to use technology and, more crucially, how to successfully incorporate it into their curriculum before implementing AI in the classroom, despite the positive expectations that teachers have for the technology's application in learning and teaching. To be open to integrating cutting-edge technology into their classes, they must also understand the importance of AI and the educational opportunities it presents. Additionally, many educators and administrators still have not used AI-based learning support, so they may view it as just a slightly more sophisticated teaching tool. This could lessen the perceived significance of AI in the classroom. For teachers to fully understand how to use AI to improve education, they must use the technology themselves before successfully implementing an AI assistance system in the classroom [48].

B. Definition of Artificial Intelligence

An intelligent computer system or program is what is referred to as Artificial Intelligence (AI). Since computers are capable of thinking like humans, as Turing [49] postulated, this includes artificially created computer programs that display human-like learning, thinking, and cognitive capacities. Creating and automatically enhancing methods and algorithms to enable computers to learn is the goal of machine learning, a subset of computational algorithms. Machine learning algorithms find use in nearly every sector, including pattern recognition, big data analysis, data aggregation and sorting, and even high-precision output prediction based on input data [48].

C. Scenarios of AI Applications

As an application of artificial intelligence tools in the classroom environment, for example, in a science subject, the teacher sets objectives for the lesson, which are: First, enhancing students' understanding of scientific concepts through the use of AI as an educational tool; second, developing students' critical thinking and analytical skills by evaluating AI-generated answers; and finally, promoting collaborative and interactive learning in the classroom.

These objectives are achieved through specific steps. The teacher selects a specific topic from the science curriculum, such as "The Water Cycle in Nature," and prepares an assignment that includes various types of questions (objective, essay, analytical) on the topic. The teacher then chooses an appropriate AI tool for the students, such as DeepSeek or an AI-powered educational tool.

The teacher divides the students into small groups of 3–4 students each, explains how to use the chosen tool, and emphasizes the importance of critical thinking and not relying entirely on AI for answers. Each group is then asked to use the AI tool to answer the questions in the assignment. The activity is carried out by having each group input the questions into the chosen tool, obtain the answers, and then review and discuss the answers internally to evaluate their accuracy and completeness. Each group then modifies the answers or adds additional information based on its own understanding of the topic.

Afterwards, the results are presented, with each group sharing its modified answers in front of the class. The teacher and students discuss the answers together, focusing on the strengths and weaknesses of the AI-generated responses. The teacher then poses additional questions to challenge the students' thinking and deepen their understanding.

Finally, in the evaluation phase, the teacher assesses each group's work based on the accuracy of its modified answers, the group's interaction and critical thinking, and the quality of its presentation and communication during the discussion. The teacher provides constructive feedback to each group to improve their performance in the future.

III. Methodology

A. Research design

The researchers used an analytical descriptive approach to achieve the goals of the study. They used descriptive statistics to determine the rankings, averages, and standard deviations of each item across the many aspects of the study's instrument. Then, One-way analysis of variance (ANOVA) test has been used to apply inferential statistics.

B. The Population and the Sample of the Study

The study population is made up of all Jordanian teachers working in the Ministry of Education in the Irbid area of northern Jordan for the academic year 2023/2024. The research population selected for the present study included 16,397 teachers, 6,470 (39%) males and 9,927 (61%) females, representing all schools in the region (732). The sample size of the present study comprised 261 teachers, 125 (47.9%) male teachers and 136 (52.1%) female teachers. This ensured that the number represents the whole population.

The study's sample was distributed according to its variables, as shown in Table 1. As for the number of years of teachers' experience, it was divided into three levels: the first level (less than five years) with 24 out of 261, representing 9.2%; the second level (from six to ten years) representing 18%; and the third level (more than ten years) with a rate of 72.8%. The study also focused on academic degrees, which were divided into four levels: the first degree (diploma) with 24 out of 261, representing 9.2%; the second degree (bachelor's degree) representing 52.9%; the third degree (master's degree) representing 16.5%; and the fourth degree (doctoral degree) representing 21.4%. Since the study focuses on teachers' perceptions of employing AI technologies in the educational process, the study sample was classified based on their participation in training courses in the field of artificial intelligence. The number of teachers who attended courses reached 218 out of 261, or 83.5%,

while the number of teachers who did not attend training courses was 43, or 16.5%.

The questionnaire was sent online to the study population via Google Forms, and the teachers shared it on mobile phones via various social media platforms. Thus, the questionnaire was distributed to the entire study population in Irbid area of northern Jordan. According to the study of Gay [50], all individuals in the population had equal and independent opportunities during the selection process.

Table 1. Description of study samples of teachers according to study variables

#	Variable	Category	n	P (%)	CP (%)
1	Gender	Male	125	47.9	47.9
		Female	136	52.1	100
		Total	261	100.0	
2	Experiences	≤ 5	24	9.2	9.2
		From (6 to 10) years	47	18.0	27.2
		More than 10 years	190	72.8	100
		Total	261	100.0	
5	Scientific Degree	Diploma	24	9.2	9.2
		Bachelor's degree	138	52.9	62.1
		Master's degree	43	16.5	78.2
		Doctoral degree	56	21.5	100
		Total	261	100.0	
6	Courses in AI	Attend courses in AI	218	83.5	83.5
		Didn't attend course in AI	43	16.5	100
		Total	261	100.0	

Note.P: Percentage & CP :Cumulative percentage.

C. Quantitative Instrumentation

Data for the study were collected through a questionnaire divided into five Sections (I–V), using a total of thirty-three items to assess Jordanian teachers' perceptions of the integration of AI technology into the educational process. These components include planning **(6 items)**, teaching **(9 items)**, behaviour management **(6 items)**, educational activities **(4 items)**, and assessment **(8 items)**, (see Table A1 in Appendix). Teachers were requested to indicate their level of agreement with the statements on a five-point Likert scale **(1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Agree, 4 = Agree, 5 = Strongly Agree)**. The collected data were analysed using the Statistical Package for Social Sciences (SPSS) version 23.0 to examine the information obtained from the study sample.

D. Validity and Reliability of the Study Tool

To ensure the validity of the research tool, an initial version consisting of **49** items was submitted to seven experts in education and AI for review. The experts included three educators from the Faculty of Education at the University of Jordan, three teachers with PhDs from Jordanian public schools, and a university lecturer specializing in artificial intelligence. After the evaluation process, some items were deleted and others reworded based on feedback from the reviewers, resulting in a total of **33 items** in the final questionnaire.

To assess the study tool's reliability, a pilot sample of fifty teachers from the Koura district in the northern Jordanian area of Irbid were given the questionnaire in November of the first semester of the 2023–2024 academic year. The internal consistency and reliability of the scale were assessed using two methods. The first method utilized Cronbach's alpha reliability coefficient to indicate the average correlation of all items constituting the scale [51], with Cronbach's alpha coefficient above **0.60** deemed acceptable [52, 53]. The second method, as recommended by Hair and Henryson [54, 55], required that the corrected item-total correlation for all items exceeds **0.30**. Both methods were employed to evaluate the reliability of the scale. Table 2 illustrates the reliability coefficient for the study tool based on the pilot sample.

Table 2. Reliability analyses for AI Scale factors

Domain	Dimension	Total Items	α
AI applications areas	Planning	6	0.775
	Teaching	9	0.862
	Learner Behavior management	6	0.861
	Educational activities	4	0.825
	Evaluation	8	0.912
	Overall	33	0.939

The questionnaire assessing teachers' perceptions of the integration of AI technologies in the educational process included **33 items**, yielding a total reliability coefficient (Cronbach's alpha) of **0.939**, which indicates a high level of reliability. The AI scale consisted of 5 dimensions (planning, teaching, managing student behaviour, educational activities, and assessment), with Cronbach's alpha values of 0.775, 0.862, 0.861, 0.825, and 0.912 respectively, (see Table 2), all of which are considered acceptable reliability. Table 2 presents the reliability of the study instrument.

IV. Results

To address the first question of the study, which is: "What are the perceptions of Jordanian teachers regarding the use of AI techniques in the educational process?" Table 3 presents the mean scores and standard deviations of the responses from the sample individuals across five axes. The table indicates that the mean score of responses from Jordanian teachers concerning the application of AI technology in the classroom is (**3.80**), which is considered (**high**).

To answer the second question, "Which aspect has the most significant impact on the educational process through the application of AI techniques according to the perceptions of Jordanian teachers (planning, teaching, managing learner behaviour, educational activities, and assessment)?" the researchers calculated means and standard deviations for five axes: planning, teaching, managing learner behaviour, educational activities and assessment. The results are shown in Table 3.

The results in Table 3 show that the AI application fields are ranked as follows: (Assessment, teaching, planning, educational activities, and teacher behaviour management). The highest mean score for the assessment axis was **3.86**, indicating a high level with a standard deviation of **0.67**. In contrast, the student behaviour management axis had the lowest mean score of **3.77**, which also showed a high level with a standard deviation of **0.64**.

Table 3. Means, standard deviations of the five dimensions

No	Dimension	M	SD
1	Planning	3.79	0.55
2	Teaching	3.80	0.57
3	Learner behavior management	3.77	0.64
4	Educational activities	3.79	0.76
5	Evaluation	3.86	0.67
	Total	3.80	0.52

Note. M: Mean; SD: Standard deviation.

To answer the third research question, "Are there

differences in the perceptions of Jordanian teachers regarding the employment of AI techniques in the educational process based on variables such as gender, years of experience, academic degree, and training courses?", a one-way ANOVA test was applied, and the test results are listed in Table 4:

Table 4. One-way ANOVA for the extent of employing AI applications in the educational process from the point of view of teachers

Variable	Category	SS	df	MS	F	Sig
Gender	Between groups	14,904.6	1	14,904.6	63.5	0.000
	Within groups	60,812.7	259	234.8		
	Total	75,717.3	260			
Experience	Between groups	1327	2	663.5	2.3	0.102
	Within groups	74,390.3	258	288.3		
	Total	75717.3	260			
Degree	Between groups	2653.97	3	884.66	3.11	0.027
	Within groups	73,063.34	257	284.29		
	Total	75,717.31	260			
Training courses	Between groups	165.065	1	165.065	0.566	0.453
	Within groups	75,552.253	259	291.708		
	Total	75,717.31	260			

Note. SS: Sum of squares & MS: Mean squares.

It can be clearly seen from Table 4 that the research sample's answers to the variables of teaching experience and training courses using AI technology in the educational process have statistically significant values greater than **0.05** at the **α** level of **0.05**. This indicates that there is no statistically significant difference. Conversely, the statistical significance value is less than **0.05** for the variables of gender and academic degree, where the statistical significance value was **0.00, F = 63.5** for the gender variable favouring the male teacher group, and **0.027**, **F = 3.11** for the academic degree variable favouring teachers with higher academic qualifications. Thus, there are differences in the perceptions of teachers regarding the use of AI technologies in the educational process.

The first finding reveals statistically significant differences between genders in favor of male teachers regarding their positive perceptions of employing AI applications in the educational process. This may be attributed to the increased self-confidence of male teachers when using AI techniques in the classroom. Additionally, societal perceptions of male superiority in this field may play a significant role compared to females. A study conducted by Acem [56] confirms that males are more likely to express positive attitudes toward AI compared to their female counterparts. While females may tend to adopt an approach based on stricter rules in the application of AI, this is due to the nature of female teachers, because they are more cautious and fearful of the risks of using AI in the educational process, and the societal perception may also play a role in poor support for female teachers wishing to apply technology in the classroom environment. This result was confirmed by the study [57], which mentioned that female teachers leaned toward rule-based approaches to AI in the classroom, while male teachers tended to focus more on outcomes. On the other hand, the study by Kurshumova [58] reversed the result, showing that female teachers had higher attitudes towards AI than male teachers.

The researchers clarify that Jordanian society's cultural dimension strongly impacts the social roles expected of teachers geared toward AI employment. Two studies [59, 60] that applied to Jordanian society have confirmed that community culture in Jordan influences the roles played by teachers, which is reflected in professional trends and perceptions. Male teachers may have a greater chance than female teachers to be exposed to technology or varying degrees of encouragement to engage in innovative tools such as artificial intelligence. Male teachers may have greater access to technology because of societal norms, which may lead to more positive perceptions of AI. On the other hand, this may create some fear among female teachers, especially if the use of AI tools is associated with insufficient support and encouragement by the departments of their work or difficulty in accessing educational resources and participating in training workshops, as confirmed by Celik [61].

The second finding indicates that there are no statistically significant differences among teachers based on years of experience. This may be due to their shared approach to integrating AI into their educational practices, particularly those that yield positive educational outcomes. This influences teachers' orientation, irrespective of their teaching experience, to utilize tools and strategies, thereby embracing similar concepts regarding the applications of AI. Additionally, another reason could be the rapid technological advancements in artificial intelligence. Regardless of their years of experience, teachers must learn and adapt to the training programs offered by educational institutions, resulting in a more cohesive approach. Recently, teachers have been relying on vocational learning communities that include educators with varying levels of experience. In these communities, teachers collaborate to implement standardized practices for integrating AI into the educational process, thereby minimizing disparities based on years of experience.

The third finding indicates statistically significant differences in teachers' responses based on the higher academic degree variable, as their postgraduate studies primarily focus on the latest research in AI in education. Additionally, their daily need to utilize various technological forms, including artificial intelligence. This is reflected in their responses and willingness to embrace these AI-based applications and platforms, linking them practically to their classroom environment.

Current research on this topic is limited and inconclusive. While one study [59] found no statistically significant differences in the employment of general technology among teachers with higher degrees, no specific studies address the use of AI in this context. As a result, the findings remain inconclusive, and further research is needed to explore potential differences in AI adoption between teachers with varying levels.

The fourth finding shows no statistically significant differences between teachers who completed technological training courses and those who did not. This may be due to the training not being tailored to teachers' actual needs or the training program being theoretical without practical application or follow-up from educational institutions. Consequently, there is no practical connection between their training and the reality of AI practices in the classroom. This lack of connection did not create a difference in the perceptions of teachers trained in educational AI practices compared to those who were not, as indicated by the statistical analysis. Hence, the researchers highlight the importance of creating a supportive environment for all teachers to build upon the outcomes of teacher training, particularly since the topic of AI is still relatively new in the training field. The study [62] indicated a lack of technical and instructional support for Jordanian teachers, which hinders their ability to use technology effectively in education.

V. Discussion

The current study found that teachers have positive perceptions regarding the employment of artificial intelligence technologies in the educational process. This may be attributed to the belief among many teachers in the ability of AI tools and applications to assist in enhancing teaching methods, providing personalized learning experiences, improving student outcomes, and creating more interactive learning environments. This aligns with studies by Ahmad, Salas-Pilco and Duan [24–26], which confirmed the role of such applications in reducing the workload for teachers and facilitating their efforts in effectively and easily educating and assessing students, as well as in many administrative tasks. Many Jordanian teachers acknowledge the significance of integrating technology into their teaching practices. AI offers opportunities for professional growth and assists them in staying current with the educational environment. This aligns with the study by Qin [47]. AI can furnish teachers with a wealth of resources and data analysis tools, facilitating improved lesson planning and assessment strategies, which is consistent with the study [63].

In addition, similar to other fields where AI has brought significant changes, the application trend of AI in education is growing rapidly. This has encouraged many teachers to consider the potential benefits that AI may offer, which reflects positively on their views, especially given the numerous educational opportunities that AI offers, including smart tutoring systems and AI-driven analytics that track student progress. Therefore, this motivates teachers to adopt these technologies to support their educational strategies.

On the other hand, as highlighted in the study [64], teachers expressed some concerns and challenges regarding the possibility of AI applications replacing their roles and leading to unemployment. Furthermore, according to Gasimova's study [65], concerns about data privacy and the need for transparency in AI algorithms are key issues that must be addressed for the successful implementation of AI in education.

Likewise, Rabab'h [28] clarified that machine learning algorithms are beneficial in analysing student performance and providing behavioural, discursive, and statistical data, which can help in adapting content and teaching methods. On the other hand, the statement "Educational robots determine appropriate training and teaching courses for learners" received the lowest score (3.38) and was considered (medium). This may be due to the lack of material resources in schools to provide educational robo ts; therefore, teachers are not familiar with the use of robots. The current study shows this, in contrast to several studies that highlight the increasing trend of using chatbots as teaching assistants to support teachers and students in various ways [23]. Harry [29] confirmed the role of educational robots in assisting teachers in identifying appropriate training and teaching courses for learners and tailoring a learning experience for each learner by designing educational programs to adapt to individual learning preferences and speeds.

Accordingly, the current study suggests the need to train teachers in the use of AI applications in the educational process. This is consistent with the findings of Kerneža and Chen [23, 27], which highlight the importance of equipping teachers with basic skills, knowledge, and strategies to effectively utilize AI in daily classroom activities.

The study indicated that the dimensions of employing AI in the educational process, according to teachers' perceptions, are ranked as follows: (assessment, teaching, planning, educational activities, managing teacher behaviour). It shares only the assessment dimension with the study by Zawacki-Richter [21], which focused on four areas of educational AI applications: (profiling and prediction, assessment and evaluation, adaptive and personalized systems, and intelligent tutoring systems).

Besides, many studies have found that AI algorithms can help teachers create objective and unbiased assessment methods, thereby making assessments more accurate and providing a fairer educational environment for all students [33]. Teachers often find it challenging to assess diversity, especially formative assessment. Therefore, some AI applications may help, according to González-Calatayud's study [66]. AI can also enhance traditional classroom assessment methods by analysing students' learning patterns based on big data and providing timely information about students' learning progress, success, or failure [34].

According to the current study, the variables of experience and training courses do not influence Jordanian teachers' perceptions of the field of utilizing AI technologies in the educational process. However, male teachers may have more positive views on the use of artificial intelligence, which is contrary to the results of a study by Zhang [67], which showed that female teachers excel in this area. Additionally, teachers with advanced degrees are likely to use such applications more frequently in their work, reflecting a higher awareness of their use.

VI. Conclusion and Recommendations

The novelty of this research lies in its focus on Jordanian teachers' perceptions of employing AI technologies in the educational process. This study is unique as it offers insights into a region that has not been extensively explored in this context. These findings are crucial for informing policymakers and academic leaders about the readiness and needs of teachers, leading to more effective and contextually appropriate implementation strategies. Additionally, the study highlights how gender variables, levels of educational experience, scientific degrees, and courses in AI influence

teachers' expectations. The innovative analyses employed in this research enhance its authenticity. The results contribute to a broader understanding of the impact of AI on teaching and learning, paving the way for future studies on the application of AI in various research areas and the associated challenges.

However, it is essential to address concerns regarding resources, training, ethical considerations, and educational robots for successful implementation. Furthermore, understanding the differences in perceptions based on demographic variables such as gender and scientific degree can help tailor professional development programs to better support teachers. Future research should be conducted to provide training courses for educational professionals to familiarize them with the latest applications and strategies of AI in education, as well as ongoing research into the challenges teachers face in applying educational AI.

The researchers propose a phased implementation plan for AI-focused teacher training, which includes three stages:

1) Theoretical Definition: This stage includes an explanation of the concept of educational AI in the classroom. There are many educational resources issued by UNESCO in this area.
2) Practical Implementation: This involves workshops and practical training by specialists, in addition to providing teachers with educational resources that assist them in their work, such as the **"Getting Started with AI-Enhanced Teaching"** guide from MIT.
3) Assessment and Support: In this stage, teachers begin to apply what they have learned in the classroom environment. This includes interactive lessons, lesson plans, assessment of duties, and other tasks performed by the teacher using artificial intelligence. A dedicated evaluation and follow-up unit can be established in each school to provide support to teachers.

The current study recommends applying the research tool to other research communities and a larger and more diverse sample. It could be applied to faculty members and university students, as this community employs AI applications to a greater extent. Additionally, this study emphasizes the need to pay attention to the data provided by artificial intelligence, especially in assessments. Therefore, the researchers suggest having multiple methods for evaluating students' skills by teachers, thus forming an accurate picture of students' actual abilities and subsequently providing an educational plan to develop these skills and support students' progress. Finally, it recommends offering training courses for teachers to familiarize them with the latest applications of AI used in the educational process. It also suggests training teachers on the basic technical skills necessary for using AI tools, instructing them on how to use AI tools in the classroom and how to apply them effectively. Furthermore, it emphasizes the importance of integrating AI into the curriculum, designing educational activities that incorporate AI applications, and discussing ethical issues related to the use of technology in education.

This research offers valuable insights into Jordanian teachers' perceptions of employing AI techniques in the educational process. The positive outlook on AI integration, along with the significant impact identified on planning, highlights the potential benefits of AI in education.

APPENDIX

Table A1. AI-based educational practices inventory

Dimension	No	Item
Planning	1	Artificial intelligence tools develop learner profiles based on similar characteristics and performance.
	2	Data analysis and machine learning systems identify patterns and trends of learners based on educational data.
	3	Machine learning systems identify the learning difficulties experienced by students.
	4	Machine learning systems design educational programs tailored to the needs of students.
	5	Expert learning systems design suitable educational content.
	6	Educational robots determine the appropriate training and teaching courses for learners.
Teaching	7	Educational robots provide explanations and interactive learning activities.
	8	Educational robots provide an interactive and engaging learning experience for students.
	9	Using artificial intelligence applications for communication and collaboration with peers and colleagues on the topic of learning.
	10	Data analysis and machine learning programs enhance interaction with students.
	11	Expert learning systems provide a tailored educational approach for each student according to their interests, tendencies, and needs.
	12	Expert systems assist teachers in making decisions based on learners' databases.
	13	Expert systems assist teachers in accomplishing tasks.
	14	Employing artificial intelligence applications to interpret learning outcomes.
	15	Meets the needs of students with special needs.
Learner Behavior management	16	Recording learner verbal and non-verbal responses.
	17	Using multimodal data that tracks eye, body movement, and facial recognition to detect learner emotions toward learning.
	18	Tracking the problems and challenges facing the learner to address them.
	19	Expert systems help teachers provide queries, guidance and individualized instruction to learners.
	20	Expert systems help students who face challenges to continue learning.
	21	Employing positive learner behaviours recorded through AI applications in the learning process.
Educational activities	22	Designing learner-centered activities using educational robots.
	23	Summarize reports under an open license from classified sources (such as open textbooks).
	24	Have a conversation on a specific topic using AI-powered chatbots.
	25	Design activities that respond to the educational challenges facing the learner using educational robots
Evaluation	26	Employing online learning platforms for homework, assessments, and communication with parents and other stakeholders.
	27	Creating qualitative assessments tailored to each learner using machine learning.
	28	Correcting learners' exams using machine learning tools.
	29	Provide appropriate feedback to learners using machine learning tools.
	30	Track learner achievement data with AI applications.
	31	Recording learners' progress on learning tasks.
	32	Preparing quarterly and annual reports on learner evaluation.
	33	Ranking the quality of OERs based on learner feedback, number of downloads, or ratings by applying ranking algorithms.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Belal Rabab'h collected the data, wrote the research methodology, and analyzed the results, while Nouf Almoray wrote the literature review, participated in discussing the results, wrote the recommendations, and reviewed the references. Authors had approved the final version.

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