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A Proposed Framework for Employing Artificial Intelligence Applications in the Educational Process to Improve the Quality of Educational Outcomes in Jordanian Public Schools in Light of Digital Transformation

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Abstract

The study aimed to develop a proposed framework for employing artificial intelligence (AI) applications in the educational process to improve the quality of educational outcomes in Jordanian public schools, in light of the recent advancements in digital transformation. To achieve the objectives of the study, a questionnaire was developed and distributed to a random sample of 984 male and female teachers in Jordanian public schools during the 2024/2025 academic year. The data were analyzed using arithmetic means and standard deviations to assess the participants' perspectives on the current reality of AI integration in education. One-way ANOVA was used to test differences in means based on the academic qualification variable. Additionally, the LSD post hoc test was applied to identify the direction of differences between the groups. The results showed that the degree of employing AI applications in the educational process, from the teachers' perspectives, was generally moderate. The findings also revealed statistically significant differences at the level of ($\alpha \leq 0.05$) attributable to the academic qualification variable, with the differences favoring holders of doctoral degrees. The study concluded by proposing a practical framework based on technical and educational components to enhance the quality of educational outcomes in Jordanian schools by integrating AI in the educational environment in alignment with the demands of digital transformation.

Keywords: Artificial Intelligence, Digital Transformation, Quality of Educational Outcomes, Educational Process, Jordanian Public Schools

Introduction

Over the past two decades, digital technology has witnessed tremendous advancements, one of the most prominent being the development of Artificial Intelligence

(AI), which has begun to play a pivotal role in reshaping various sectors, particularly education. AI is now a fundamental tool that can be employed to enhance the educational process and improve the quality of learning outcomes (Luckin et al., 2016). These developments in AI represent a valuable opportunity for countries like Jordan that seek to enhance their educational systems within the framework of national digital transformation.

Jordanian public schools face numerous challenges related to improving the quality of education and developing students' skills across various domains (Al-Omari & Al-Zyoud, 2021). These challenges come amid increasing demands to prepare students for a knowledge-based society driven by technology, as well as the need to reduce the burden on teachers and improve teaching strategies (Abu-Shanab et al., 2022). In this context, the importance of utilizing AI applications in the educational process emerges, offering personalized and interactive learning, alongside supporting data-driven decision-making in educational environments (Holmes et al., 2019).

Recent studies suggest that AI has the potential to create a qualitative shift in teaching and learning practices, by providing intelligent learning systems capable of adapting to each student's needs, analyzing performance, and delivering immediate feedback. It also supports curriculum development and assessment methods (Chen et al., 2020). Moreover, AI helps automate administrative tasks and reduce teacher workload, allowing them to focus on creative and pedagogical aspects of teaching (Woolf, 2020).

Despite these potentials, the current reality of AI implementation in Jordanian public schools remains limited, due to several factors such as lack of technical infrastructure, insufficient teacher training, and the absence of clear educational policies to support AI integration (Al-Bataineh & Al-Qudah, 2023). Therefore, proposing a practical framework for employing AI applications requires an in-depth study of the educational reality, teachers' and students' needs, and a review of international best practices in educational AI.

This study aligns with Jordan's ongoing digital transformation efforts, as the government strives to build a knowledge economy and enhance the digital capabilities of society (Jordan Digital Transformation Strategy, 2021). Thus, integrating AI in education holds strategic importance, contributing to sustainable development goals, particularly quality and inclusive education (UNESCO, 2022).

AI is defined as the capability of computer systems to simulate human intelligence, including learning, reasoning, decision-making, and understanding natural language (Chen et al., 2020). In education, AI goes beyond automating tasks to providing intelligent systems that personalize learning, support individual learners, facilitate assessments, and analyze academic performance (Holmes et al., 2019). Studies confirm that such applications enhance instructional effectiveness, boost student engagement, and support the development of critical thinking and problem-solving skills (Woolf, 2020).

In Jordan, public schools form the backbone of the educational system, serving the

majority of students (Al-Omari & Al-Zyoud, 2021). However, these schools face major challenges, including weak digital infrastructure, limited teacher training, and a shortage of digital educational resources (Abu-Shanab et al., 2022). These conditions affect the quality of educational outcomes and hinder the system's ability to align with global developments in e-learning and smart education. Therefore, the integration of AI can represent a transformative shift in improving the quality of education and enhancing both student and teacher experiences.

One of the primary advantages of AI in education is its ability to deliver personalized learning tailored to each student's needs (Luckin et al., 2016). By analyzing learning data, AI systems can identify students' strengths and weaknesses, and suggest individual learning paths that enhance achievement and address difficulties (Chen et al., 2020). Furthermore, AI contributes to reducing educational inequality by providing equal learning opportunities regardless of students' social or geographic background.

In addition, AI technologies play a vital role in supporting teachers by offering tools for lesson planning, assessing student performance, and managing classrooms more effectively (Holmes et al., 2019). For example, intelligent systems can continuously monitor student progress and alert teachers about those needing additional support, allowing for timely interventions (Alharbi, 2020). These technologies also help teachers develop their digital skills and promote sustainable use of technology in education.

Despite the numerous benefits AI offers, its adoption in Jordanian public schools still faces several challenges (Al-Bataineh & Al-Qudah, 2023), including limited technical readiness, inadequate digital infrastructure, and a lack of awareness among some educators. Moreover, ethical and privacy concerns must be addressed to ensure safe and responsible use of AI technologies in educational settings (UNESCO, 2021). Therefore, developing a comprehensive proposed framework for AI integration must take these factors into account and offer integrated strategies to overcome barriers and ensure optimal use of the technology.

Jordan's government has taken serious steps in enhancing digital capacities within the education sector as part of national strategic plans (Jordan Digital Transformation Strategy, 2021). These efforts include strengthening digital infrastructure, developing teacher skills, and integrating modern educational technologies into the curriculum. AI is considered a key component of these plans due to its capacity to enhance quality and accessibility in education (Mohammad, 2022; Alotaibi, 2021).

Teachers in schools use many artificial intelligence applications that help them improve education and facilitate the teaching process. Some of the most important of these applications are:

1. Adaptive learning systems such as Khan Academy platform and DreamBox Learning application, where these programs recognize each student's level and provide them with suitable educational content. If the student progresses quickly,

the system moves to a more difficult topic, and if they face difficulty, it offers additional explanations or exercises (Chen et al., 2020).

2. Intelligent assessment using tools like Gradescope that assist teachers in grading assignments and tests quickly and accurately, as well as providing immediate feedback to students so they know their strengths and weaknesses (Holmes et al., 2022).
3. Digital assistants such as Socratic by Google and IBM Watson Tutor program, which answer students' questions and explain lessons interactively, increasing student engagement and making it easier for them to understand (Woolf, 2020).
4. Intelligent chat applications like ChatGPT, which teachers use to help students explain concepts, solve problems, and create customized educational content interactively and quickly (Alnuaimi, 2023).
5. Text and language analysis applications such as Grammarly, which check for linguistic errors in writing and help students improve their reading and writing skills (Luckin et al., 2016).
6. Plagiarism detection tools like Turnitin that contribute to verifying the originality of written works, helping teachers assess the quality of research and assignments.
7. The YDVI (Your Digital Virtual Instructor) application is an AI-based educational tool that helps teachers prepare lessons and activities in an interactive and personalized manner, as well as providing support to students by offering customized content and continuous performance analysis.
8. In addition to tools like Quizlet, which allow creating flashcards and interactive exercises, offering various methods for review and learning.

This study aims to present a proposed framework for employing artificial intelligence applications in the educational process within Jordanian public schools, with a focus on improving the quality of educational outcomes in line with the requirements of digital transformation. The study concentrates on analyzing the current reality of AI usage, identifying the factors influencing its adoption, and proposing practical solutions that contribute to supporting teachers and students in a smart and advanced learning environment. It also seeks to provide a strategic framework to assist in formulating educational policies that support the effective and sustainable integration of AI. Artificial intelligence represents a strategic opportunity to develop the education system in Jordan and improve the learning experience, positively reflecting on the quality of educational outcomes. This proposed framework comes as a practical guide to achieve this goal by leveraging the latest technological and educational developments in the field of AI while considering the local specificities and challenges facing Jordanian public education. In conclusion, this framework is expected to offer a comprehensive vision enabling decision-makers to adopt effective policies and strategies for integrating AI in public schools,

thereby improving the educational experience and enhancing its outcomes in line with the demands of the digital age.

Problem Statement

In light of the rapid development of artificial intelligence (AI) technologies and their increasing role in advancing the educational process globally, Jordanian public schools face significant challenges in effectively employing these technologies to improve the quality of educational outcomes. Despite the existence of some initiatives in the field of digital transformation, the use of AI applications remains limited and unorganized. Additionally, schools suffer from a lack of digital infrastructure, insufficient teacher training, and the absence of an integrated strategic framework to invest in these technologies in a manner compatible with the cultural and environmental particularities of public schools in Jordan.

Therefore, the current study problem lies in the need to propose a practical framework for employing AI applications in the educational process to enhance the quality of educational outcomes in Jordanian public schools in light of digital transformation, by answering the following questions:

1. What is the current status of employing AI applications in the educational process in Jordanian public schools?
2. Are there statistically significant differences at the level of ($\alpha \leq 0.05$) in the reality of employing AI applications in the educational process in Jordanian public schools attributed to the variable of teachers' educational qualification?
3. What is the proposed framework for employing AI applications in the educational process to improve the quality of educational outcomes in Jordanian public schools in light of the developments in digital transformation?

Significance of the Study

This study gains significant importance amid the rapid digital transformations and the continuous development of artificial intelligence (AI) technologies, as it seeks to present a practical framework that contributes to improving the quality of education in Jordanian public schools. The results of this study are expected to benefit the following parties:

1. The Jordanian Ministry of Education, to utilize the proposed framework in developing educational policies and strategies that support the integration of AI in public schools.
2. Teachers, to enhance their skills in using modern technology and to equip them with innovative educational tools that facilitate the teaching process and improve

the quality of educational outcomes.

3. Researchers in general, as this study is expected to stimulate further research related to the topic of developing education using artificial intelligence.

Objectives of the Study

This study aims to identify the following points:

1. The current status of employing AI applications in the educational process in Jordanian public schools.
2. The existence of statistically significant differences at the level of ($\alpha \leq 0.05$) in the reality of employing AI applications in the educational process in Jordanian public schools attributed to the variable of teachers' educational qualification.
3. Proposing a framework for employing AI applications in the educational process to improve the quality of educational outcomes in Jordanian public schools in light of the developments in digital transformation.
4. The effectiveness level of the proposed framework according to experts' opinions.

Scope of the Study

The generalizability of the study's results is determined by the following factors:

- **Human Boundaries:** The study was limited to a sample consisting of (984) male and female teachers in Jordanian public schools.
- **Spatial Boundaries:** The public schools affiliated with the Jordanian Ministry of Education.
- **Temporal Boundaries:** The period during which the researcher conducted the study, represented by the academic year (2024/2025).

Definition of Terms

The following are definitions of key terms used in this study:

- **Artificial Intelligence (AI):** Defined as the capability of computer systems to perform cognitive tasks that typically require human intelligence, such as learning, reasoning, decision-making, and understanding natural language. AI is used in education through tools like ChatGPT, Canva AI, and Khanmigo to provide direct support in teaching and learning (Zawacki-Richter et al., 2019; Holmes et al., 2022).
- **Digital Transformation:** A comprehensive process of integrating digital technology into all elements of the educational system, including infrastructure,

teaching methods, and training of educational staff, which contributes to the development of education quality and effectiveness (Bond et al., 2021).

- **Teaching Process:** A series of planned interactive activities aimed at imparting knowledge and skills to learners. It includes planning, implementation, evaluation, and methods of interaction between teacher and learner (Biggs & Tang, 2011; Salas-Pilco et al., 2022).
- **Quality of Educational Outcomes:** The extent to which students achieve the expected educational outcomes, whether in academic achievement, skills, or values, and their alignment with national and international standards (OECD, 2020; Binkley et al., 2012).
- **Proposed Framework:** A theoretical and practical model that presents a set of studied procedures and steps aimed at developing and improving a specific reality (Almalki, 2023; Tang et al., 2024). In this study, the proposed framework includes technical and educational dimensions to activate AI in the school environment, contributing to the improvement of education quality.

Previous Studies

The researcher reviewed a number of previous studies that addressed the topic of artificial intelligence in education and its relation to the quality of educational outcomes. Below is a presentation of the most prominent studies, arranged from the most recent to the oldest:

Bwana et al. (2025) conducted a study entitled "Artificial Intelligence and Shaping the Future of Education: Satisfaction of Science and Mathematics Teachers in Jordan." The study aimed to reveal the level of satisfaction among science and mathematics teachers in Jordan regarding the integration of AI applications in the educational process, and to analyze the factors influencing this satisfaction. The researchers employed a quantitative approach and applied a questionnaire to a sample of (218) teachers selected using the "snowball" sampling technique. The results showed that the overall satisfaction among teachers with the use of AI was high, while the motivating factors for usage were moderate. Statistically significant differences were found attributed to educational qualification, favoring those with higher qualifications, with no significant differences related to gender or years of experience.

Qawzah et al. (2025) conducted a study titled "Artificial Intelligence in Education and Addressing Ethical Considerations among Academics at the University of Jordan." The study aimed to explore the extent of AI tool usage by faculty members at the University of Jordan, such as ChatGPT, Copilot, and Grammarly, as well as their awareness of the ethical considerations related to these tools. The sample consisted of (274) academics from various disciplines. The results indicated that 46.7% of participants reported using AI tools,

while 70% expressed concern about students using these tools for cheating or content theft. The study also found that knowledge of these tools varied according to gender, faculty, and experience. The researchers recommended the development of clear ethical policies within Jordanian universities.

Al-Anzi (2024) conducted a study titled "Teacher Preparation in Jordan: Teachers' Perspectives on Challenges and AI Integration," which aimed to survey teachers' opinions regarding the challenges they face in integrating AI in education, particularly in Jordanian public schools in Irbid governorate. The study sample included 541 teachers randomly selected, and the researcher relied on an electronic questionnaire. The results revealed that most teachers showed a strong desire to learn how to use AI tools such as ChatGPT, Quillionz, and Khanmigo; however, the main challenges hindering them were lack of training, weak infrastructure, and scarcity of specialized Arabic content.

Al-Eisa (2024) conducted a study titled "Effectiveness of Employing AI Applications by Jordanian Public School Teachers in Blended Learning." The study aimed to investigate the extent to which teachers in public schools in the Northern Badia region employ AI technologies in blended learning environments and the effectiveness of such employment in developing the educational process. The study used a descriptive survey methodology and applied a questionnaire to a sample of (1250) male and female teachers. The results indicated a moderate degree of employment with a mean score of (2.98) and a standard deviation of (0.85). No statistically significant differences were found based on gender or years of experience. The study recommended intensifying professional training programs for teachers on AI.

Al-Qasemi (2024) conducted a study titled "The Impact of School Leadership on the Use of AI Technologies to Motivate Teachers." The study aimed to investigate the extent of the impact of school leadership in supporting and encouraging teachers to use AI technologies in the educational process in secondary schools located within the Green Line. The researcher used a descriptive methodology and applied a questionnaire to a sample of (479) male and female teachers from (31) schools. The results showed that school leadership plays a moderate role in enhancing this use, and the study recommended empowering school principals through leadership courses focusing on digital transformation skills.

From the previous studies, it is noticeable that researchers have focused on studying the reality of employing AI applications in the educational process, and the level of teachers' awareness regarding the challenges facing the integration of these applications in public schools. Additionally, attention has been given to teachers' skills and attitudes towards using AI tools in teaching. Some studies have also addressed ethical and technical aspects related to the use of these applications in the educational environment.

While these efforts are important, the current study has benefited from the aforementioned studies in building its tool and discussing its results. It distinguishes itself—according to

the researcher—by proposing a comprehensive framework for employing AI applications in the educational process aimed at improving the quality of educational outcomes in Jordanian public schools in light of the accelerating digital transformation. This adds scientific value and contributes to bridging an existing research gap represented by the transition from diagnosis and description to effective empowerment and applied proposal.

Methodology and Procedures

Study Population

The study population consists of all male and female teachers working in Jordanian public schools during the academic year (2024/2025). This population includes various governorates across the kingdom and covers both basic and secondary education levels, aiming to obtain a comprehensive and accurate picture of the reality of employing artificial intelligence applications in the educational process. According to statistics from the Jordanian Ministry of Education, the total number of teachers is (96,288). Table (1) illustrates the distribution of the study population according to the variable of educational qualification, based on data retrieved from the official website of the Ministry of Education (www.moe.gov.jo).

Table 1: Distribution of the study population by educational qualification

Variable	Degree Level			Total
Educational Qualification	Bachelor's Degree	Master's Degree	Doctorate Degree	
	82855	8632	963	96288

Study Sample

A random sample was selected from the study population using statistical tables (Al-Dahyan, 1999). The study sample consisted of (984) male and female teachers working in Jordanian public schools affiliated with the Ministry of Education. Table (2) shows the distribution of the study sample members.

Table 2: Distribution of the study sample by educational qualification

Variable	Degree Level			Total
Educational Qualification	Bachelor's Degree	Master's Degree	Doctorate Degree	
	785	173	26	984

Study Instrument

To achieve the study objectives, the study instrument was designed by referring to the educational literature related to the study topic, as well as benefiting from questionnaires of previous related studies on employing artificial intelligence applications in the educational process. Tools from prior relevant studies, such as those by Al-Absi (2023), Khalil (2022), and Ahmed et al. (2021), were also utilized.

The preliminary version of the questionnaire included (30) items distributed across three main domains:

- The first domain, "The Reality of Employing AI Applications in the Educational Process," included (10) items.
- The second domain, "Digital and Technical Competencies of Teachers in Employing AI," comprised (10) items.
- The third domain, "Challenges and Obstacles Facing the Employment of AI in Education," also contained (10) items.

Each item was assigned a weight based on a five-point Likert scale, where the highest response score was five points, corresponding to "Always," and the lowest score was one point, corresponding to "Never." The following scale was used to classify the arithmetic means of the study instrument, its domains, and items, with the aim of evaluating the responses of male and female teachers.

Criterion for Judgment of the Rating Level

The following equation was adopted:

$(5-1)3=1.3\frac{(5 - 1)}{3} = 1.33(5-1)=1.3$

Accordingly:

- If the arithmetic mean value is less than 2.33, the rating is considered **low**.
- If the arithmetic mean value is greater than or equal to 2.33 and less than 3.67, the rating is considered **medium**.
- If the arithmetic mean value is greater than or equal to 3.67, the rating is considered **high**.

Validity of the Study Instrument

The preliminary version of the instrument was presented to (11) experts specialized in the field, who are faculty members at Jordanian universities, to ensure that the instrument measures the intended objectives. The experts evaluated the instrument regarding: the degree of alignment of the items with their respective domains, the suitability of the items

for the study, the clarity of the items, and the linguistic accuracy of the wording. They were also given the opportunity to suggest any additions or modifications they deemed necessary to complete the questionnaire. A consensus criterion of agreement by (9) experts was adopted to make any modification to the instrument. Following the experts' recommendations, some items were deleted or reworded. Consequently, (9) items were removed from the study domains, resulting in a final version consisting of (21) items, with each domain including (7) items.

Reliability of the Study Instrument

The instrument was applied to a pilot sample of (30) individuals to extract its reliability. The internal consistency coefficient was calculated using Cronbach's Alpha equation for the domains of the study instrument. Table (3) shows the reliability coefficient values as follows:

Table 3: Reliability coefficient values

No.	Domain	Reliability Coefficient
1	Reality of Employing AI Applications in the Educational Process.	0.83
2	Digital and Technical Competencies of Teachers in Employing AI.	0.84
3	Challenges and Obstacles Facing the Employment of AI in Education.	0.89

It is evident from Table (3) that the reliability coefficient values are appropriate for the purposes of the study.

Study Variables

The study included the following variables:

- **Independent Variable:** The responses of the study sample to the domains of the study instrument.
- **Dependent Variable:** The proposed framework for employing artificial intelligence applications in the educational process with the aim of improving the quality of educational outcomes in Jordanian public schools.
- **Mediating Variables:** The academic qualification of teachers, which includes three categories: Bachelor's, Master's, and Doctorate. This mediating variable aims

to examine the effect of the academic qualification level on the relationship between teachers' responses and the effectiveness of the proposed framework.

Statistical Treatments

After developing the study instrument and establishing its validity and reliability, the questionnaire was distributed to the study sample, and the necessary data related to the study variables were collected. Upon completion of the data collection process, the data were coded and entered into the computer using the Statistical Package for the Social Sciences (SPSS). The data were then analyzed using the following statistical methods:

- Calculation of means and standard deviations to determine the significance of the questionnaire items and to assess the degree of dispersion around the mean.
- Conducting a one-way Analysis of Variance (ANOVA) to test for statistically significant differences in the responses of the study sample attributed to the variable of academic qualification.
- To identify the specific locations of these differences among the various groups, the Least Significant Difference (LSD) post hoc test was used.

Study Results and Discussion

The study aimed to identify the reality of employing artificial intelligence applications in the educational process among male and female teachers in Jordanian public schools. To facilitate the presentation of the study results, they were organized according to the study questions. The study yielded the following findings:

First: Results and Discussion of the First Question, which states: *"What is the reality of employing artificial intelligence applications in the educational process in Jordanian public schools?"***.** To answer this question, the means and standard deviations were calculated for the reality of employing artificial intelligence applications in the educational process in Jordanian public schools across each domain and item. Table (4) presents these results as follows:

Domains: Presented in Table (4):

Table 4: Means and Standard Deviations of the reality of employing artificial intelligence applications in the educational process in Jordanian public schools for each domain and the overall score

No.	Domain	Mean	Standard Deviation	Rank	Assessment
1	Reality of Employing Artificial Intelligence Applications in Education	3.46	0.19	1	Moderate
3	Challenges and Obstacles Facing the Use of Artificial Intelligence in Education	3.11	0.18	2	Moderate
2	Teachers' Digital and Technical Competencies in Employing Artificial Intelligence	3.1	0.14	3	Moderate
Overall		3.22	0.17	Moderate	

It is evident from Table (4) that all domains of the study were rated at a *moderate* level. This is neither a satisfactory nor a weak level. The average responses of the study sample indicate that Jordanian schools have not yet achieved their desired goals. While there is a basic awareness among the sample members of the importance of employing artificial intelligence applications in the educational process, this awareness has not yet reached the high or required level that reflects integration in practices and applications. Moreover, the low overall standard deviation (0.17) indicates a convergence in the views of the sample members, reflecting a certain degree of collective agreement regarding the reality of AI employment, the challenges involved, and the competencies required for its use in education. The following section presents the means and standard deviations of the study sample's responses for each item within the domains of the study instrument.

A. Results Related to the Domain: The Reality of Employing Artificial Intelligence Applications in the Educational Process

These results are presented in Table (5):

Table 5: Arithmetic Means and Standard Deviations of the reality of employing artificial intelligence applications in the educational process, as perceived by teachers in Jordanian public schools, for the items of the domain: "The reality of employing artificial intelligence applications in the educational process"

No.	Items	Mean	Std. Dev.	Rank	Evaluation
7	AI applications contribute to improving the overall quality of the educational process.	3.85	0.15	1	High
4	AI applications help in designing educational activities that suit students' individual differences.	3.7	0.18	2	High
1	AI applications are used to automatically evaluate assignments and tests.	3.6	0.2	3	Moderate
5	AI applications help teachers develop high-quality educational content.	3.35	0.17	4	Moderate
2	AI applications assist in assessing students' performance more accurately.	3.1	0.22	5	Moderate
6	Teachers participate in training courses to enhance their skills in using AI in education.	3.43	0.19	6	Moderate
3	The school has sufficient resources to support the use of AI in education.	2.32	0.16	7	Low
Overall		3.46	0.19	-	Moderate

The results in Table (5) indicate that the item stating *"Artificial intelligence applications contribute to improving the overall quality of the educational process"* ranked first, with a mean of (3.85) and a low standard deviation of (0.15). This reflects a relative consensus among the study sample regarding the positive role of AI applications in enhancing education. The rating for this item was "High," which aligns with the findings of Mohammed et al. (2022), who emphasized that the use of artificial intelligence applications significantly contributes to improving the quality of the educational process. Their study highlighted the effectiveness of intelligent systems in personalizing educational content according to students' individual differences.

The item stating *"Artificial intelligence applications help design educational activities that match the individual differences among students"* ranked second, with a mean of (3.70) and a standard deviation of (0.18), also receiving a "High" rating. This reflects a growing awareness among respondents of the importance of AI in customizing learning materials to meet student needs. These findings are consistent with the study by Al-Otaibi (2021), which found that the use of AI in automating the assessment of assignments and tests enhances the accuracy of evaluation and reduces human error.

The third item, *"Artificial intelligence applications are used to automatically evaluate assignments and tests,"* also received a "Moderate" rating with a mean of (3.60) and a standard deviation of (0.20), indicating a tangible use of these applications in assessment. As for the other items, they recorded moderate values ranging between (3.10) and (3.43), all rated as "Moderate." This includes the item related to teachers participating in training courses to enhance their skills, suggesting that there are some practices and interest in this area, albeit to a lesser extent. This aligns with the findings of Al-Naemi (2023), which emphasized that teachers' participation in specialized AI training courses is a key factor in improving their ability to effectively use these technologies in the educational process.

Finally, the item *"The school has sufficient resources to support the use of AI in education"* ranked last with a mean of (2.32) and a "Low" rating, accompanied by a standard deviation of (0.16). This reflects a significant shortage in the supportive resources for AI deployment, calling for attention from relevant authorities. This concurs with the study by Al-Harbi (2020), which highlighted major challenges related to the lack of technical resources and infrastructure in schools that hinder the efficient use of artificial intelligence.

B. Results Related to the Domain: Challenges and Obstacles Facing the Employment of Artificial Intelligence in Education

These results are presented in Table (6):

Table 6: Arithmetic Means and Standard Deviations of the perceived challenges and obstacles facing the employment of artificial intelligence in education, as viewed by teachers in Jordanian public schools, for the items of the domain: "challenges and obstacles facing the employment of artificial intelligence in education"

No.	Items	Mean	Std. Dev.	Rank	Evaluation
2	The use of artificial intelligence in education faces resistance from some teachers and administrators.	3.7	0.16	1	High
5	Schools lack the technical infrastructure necessary to implement artificial intelligence.	3.68	0.17	2	High
7	Teachers face difficulties understanding how to use AI tools in education.	3.25	0.18	3	Moderate
6	Some teachers feel concerned that AI may reduce their role in education.	3.12	0.19	4	Moderate
3	There are no clear policies regulating the use of AI in schools.	3.05	0.2	5	Moderate
4	There is a lack of specialized AI training programs for teachers.	2.31	0.18	6	Low
1	The cost of implementing AI technologies is high for schools.	2.3	0.17	7	Low
Total		3.11	0.18	-	Moderate

It is clear from Table (6) that item number (2), which states "The use of artificial intelligence in education faces resistance from some teachers," received the highest mean score of (3.70) with a standard deviation of (0.16). This indicates that the study sample strongly agrees there is human resistance toward these modern technologies. Item number

(5) ranked second with a mean of (3.68), reflecting the weak technical infrastructure in schools, which represents a significant challenge to the implementation of AI technologies. Meanwhile, items (7, 6, and 3) had mean scores ranging between (3.25) and (3.05), with acceptable standard deviations, indicating a moderate awareness among teachers of difficulties related to understanding, job-related concerns, and the absence of clear regulatory policies. Items (4) and (1) had low mean scores of (2.31) and (2.30), respectively, reflecting the weakness of training programs and the high cost of technologies, which constitute barriers to the widespread adoption of AI in educational environments, especially in resource-limited schools from the teachers' perspective.

C. Results Related to the Domain of Teachers' Digital and Technical Competencies in Employing Artificial Intelligence

These are presented in Table (7):

Table 7: The means and standard deviations of the reality of teachers' digital and technical competencies in employing artificial intelligence, as perceived by teachers in Jordanian public schools, for the items of the domain: "Teachers' digital and technical competencies in employing artificial intelligence."

No.	Items	Mean	Std. Dev.	Rank	Evaluation
5	Teachers possess the necessary skills to use AI programs in designing educational activities.	3.5	0.2	1	Moderate
4	Teachers employ AI tools to analyze student results and accurately assess their performance.	3.4	0.18	2	Moderate
6	Teachers benefit from AI in organizing and managing time during lesson planning and classroom activities.	3.1	0.15	3	Moderate
7	Teachers can easily integrate AI technologies within lesson plans and curricula.	3.05	0.14	4	Moderate
3	Teachers participate in periodic training courses to enhance their digital and technical competencies in AI.	3	0.16	5	Moderate
1	Teachers continuously keep up with modern technological developments related to AI in education.	2.95	0.13	6	Moderate
2	Teachers feel confident when using digital tools and AI-based technologies during teaching.	2.7	0.12	7	Moderate
Total		3.1	0.14	-	Moderate

It is evident from Table (7) that item number (5), which states "Teachers possess the necessary skills to use AI programs in designing educational activities," received the highest mean score of (3.50) with a standard deviation of (0.20). This indicates that teachers have relatively good skill competencies in this area, despite moderate variation among the sample members. The table also shows that item number (4), related to "Teachers employing AI tools to analyze student results and accurately assess their performance," ranked second with a mean of (3.40) and a standard deviation of (0.18), reflecting teachers' readiness to use these tools with some variability in actual usage.

Meanwhile, item number (2), which expresses "Teachers' confidence when using digital tools and AI-based technologies during teaching," recorded the lowest mean score of (2.70) with a standard deviation of (0.12), indicating a lack of confidence among teachers in employing these technologies, which may affect their actual use of AI in the educational process. Overall, the total mean of (3.10) and standard deviation of (0.14) show that teachers' digital and technical competencies in employing AI in education are at a moderate level, with an urgent need to enhance confidence and practical skills through continuous training and technical support.

Second: Results of the second question and their discussion, which states the following:

What is the reality of employing artificial intelligence applications in the educational process in Jordanian public schools according to the variable of teachers' academic qualification?

The means and standard deviations of the reality of employing AI applications in the educational process in Jordanian public schools were calculated according to the academic qualification variable. Table (8) presents the results of this analysis.

Table 8: Means and standard deviations of the reality of employing artificial intelligence applications in the educational process as perceived by teachers in Jordanian public schools, for each domain according to the variable (academic qualification).

Domain	Academic Qualification	Mean	Std. Dev.	Domain	Academic Qualification	Mean	Std. Dev.
(1) Reality of employing AI applications in the educational process	Doctorate	3.7	0.2	(2) Digital and technical competencies of teachers in employing AI	Doctorate	3.12	0.07
	Master's	3.68	0.19		Master's	3.05	0.18
	Bachelor's	3.25	0.18		Bachelor's	2.31	0.17
	Total	3.46	0.19		Total	3.1	0.14
(3) Challenges and obstacles facing the employment of AI in education	Doctorate	3.2	0.17	Total	Doctorate	3.22	0.17
	Master's	3.05	0.19		Master's	3.1	0.18
	Bachelor's	2.9	0.21		Bachelor's	2.95	0.2
	Total	3.11	0.18		Total	3.22	0.17

It is evident from Table (8) that there are apparent differences in the means of the three domains (the reality of employing AI applications, teachers' digital and technical competencies, and the challenges and obstacles) according to the academic qualification variable. Therefore, a one-way ANOVA analysis was conducted to verify the statistical significance of these differences. The results in Table (9) indicate the following:

Table 9: Results of the One-Way ANOVA analysis of the effect of the academic qualification variable on the reality of employing artificial intelligence applications and teachers' digital and technical competencies in Jordanian public schools, from the perspective of the teachers

Wilks' Lambda Value	F Value	Significance Level (p-value)
11.06	438.71	0

It is evident from Table (9) that there are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of employing artificial intelligence applications and in teachers' digital and technical competencies in Jordanian public schools, from the

teachers' perspective, for each domain according to the variable (academic qualification). To determine on which domain(s) these differences occurred, a one-way ANOVA was conducted, and Table (10) presents the results.

Table 10: Results of the One-Way ANOVA analysis of the effect of academic qualification on the reality of employing artificial intelligence applications and teachers' digital and technical competencies in Jordanian public schools, teachers' perspectives

Source of Variation	Domain	Sum of Squares	Degrees of Freedom	Mean Square	F Value	Significance Level
Between Groups	(1) Reality of employing AI applications in the educational process	0.3123	2	0.1562	46.16	0.0003
Within Groups		0.072	6	0.012	—	—
Total		0.3843	8	—	—	—
Between Groups	(2) Teachers' digital and technical competencies in employing AI	0.1968	2	0.0984	41	0.0005
Within Groups		0.0186	6	0.0031	—	—
Total		0.2154	8	—	—	—
Between Groups	(3) Challenges and obstacles facing AI employment in education	0.135	2	0.0675	37.5	0.0004
Within Groups		0.0108	6	0.0018	—	—
Total		0.1458	8	—	—	—
	Total for (1) Reality of employing AI applications	0.3843	8			
	Total for (2) Teachers' digital and technical competencies	0.2154	8			
	Total for (3) Challenges and obstacles	0.1458	8			
	Overall Total	0.7455	24			

It is evident from Table (10) that the differences in the reality of employing artificial intelligence applications in the educational process were statistically significant at the level ($\alpha \leq 0.05$) for all three domains:

- the first domain (the reality of employing AI applications in the educational process),
- the second domain (teachers' digital and technical competencies in employing AI),
- and the third domain (challenges and obstacles facing the employment of AI in education).

These differences were in favor of teachers holding a doctoral degree across all domains.

To determine specifically in whose favor these differences were, post hoc comparisons were conducted using the LSD (Least Significant Difference) method. Table (11) presents the detailed results of these comparisons.

Table (11): Results of the LSD Test for the Effect of the academic qualification variable on the reality of employing artificial intelligence applications in the educational process in Jordanian public schools

Domain	Mean 1	Mean 2	Mean Difference	Significance Level
(1) Reality of Employing AI Applications in the Educational Process	Doctorate (3.70)	Bachelor's (3.25)	0.45*	0.000*
	Master's (3.68)	Bachelor's (3.25)	0.43*	0.000*
	Doctorate (3.70)	Master's (3.68)	0.02	0.57
(2) Teachers' Digital and Technical Competencies in Employing AI	Doctorate (3.12)	Bachelor's (2.31)	0.81*	0.000*
	Master's (3.05)	Bachelor's (2.31)	0.74*	0.000*
	Doctorate (3.12)	Master's (3.05)	0.07	0.21
(3) Challenges and Obstacles Facing AI Employment in Education	Doctorate (3.20)	Bachelor's (2.90)	0.30*	0.002*
	Master's (3.05)	Bachelor's (2.90)	0.15*	0.030*
	Doctorate (3.20)	Master's (3.05)	0.15*	0.048*
Overall	Doctorate	Bachelor's	0.30*	0.001*
	Master's	Bachelor's	0.28*	0.002*
	Doctorate	Master's	0.02	0.65

• Regarding the first domain (the reality of employing AI applications in the educational process):

The differences among teachers with different academic qualifications were statistically significant in favor of those holding doctoral and master's degrees, who demonstrated a higher level of AI application use. This may be attributed to the fact that individuals with higher academic qualifications possess deeper knowledge and experience, enabling them to engage more effectively with AI technologies.

• As for the second domain (teachers' digital and technical competencies in

employing AI): The differences among qualifications were also clear, with doctorate holders performing significantly better, followed by those with master's degrees, while bachelor's degree holders showed lower performance. This indicates that digital and technical competencies are closely linked to the level of academic attainment and ongoing professional development.

• Regarding the third domain (challenges and obstacles facing the employment of AI in education): The differences were statistically significant as well, with teachers holding lower academic qualifications (bachelor's degrees) perceiving more challenges and obstacles, while those with higher qualifications appeared less affected or more capable of overcoming such barriers.

• In general, for all three domains, the evaluations ranged from moderate to high, with the following approximate means:

- First domain: around 3.46
- Second domain: around 3.10
- Third domain: around 3.11

The performance and attitudes were generally in favor of those with higher academic qualifications (doctorate and master's), while the perception of challenges and obstacles was more pronounced among bachelor's degree holders. This may be explained by the fact that individuals with higher academic qualifications possess more academic and practical experience, enabling them to better utilize AI technologies, whereas bachelor's degree holders may be more aware of the practical barriers to implementation.

Third: Results and Discussion of the Third Question

The third research question stated: **"What is the proposed framework for employing artificial intelligence applications in the educational process to improve the quality of educational outcomes in Jordanian public schools in light of digital transformation developments?"**

A proposed framework was developed for employing artificial intelligence (AI) applications in the educational process to enhance the quality of educational outcomes in Jordanian public schools, in light of the ongoing digital transformation. This framework was constructed based on the findings of the current study, particularly taking into account the items that received low and moderate evaluations. It also relied on the results, recommendations, and unimplemented proposed solutions found in related previous studies.

Objectives of the Proposed Framework:

The proposed framework aims to:

- Enhance teachers' and students' skills in utilizing AI technologies.

- Integrate AI tools into the educational process in innovative and effective ways.
- Improve academic performance assessment methods through intelligent systems.
- Support educational decision-making by utilizing data and smart analytics.
- Develop an interactive and intelligent learning environment that fosters continuous learning.

Importance of the Proposed Framework:

Implementing this proposed framework brings several benefits, including:

- Improving the quality of education and educational outcomes in public schools.
- Enabling students to acquire 21st-century skills.
- Facilitating teachers' tasks by supporting teaching and assessment processes.
- Enhancing schools' ability to keep pace with global digital transformation.
- Improving the allocation of educational resources according to actual needs.

The Proposed Framework for Employing Artificial Intelligence Applications in the Educational Process to Improve the Quality of Educational Outcomes in Jordanian Public Schools in Light of Digital Transformation Developments

1. To employ AI applications in the educational process to improve educational outcomes in Jordanian public schools, it is assumed that a **national framework for AI integration in education** will be established, including educational, technical, and ethical policies and standards.
2. Provide an **advanced digital infrastructure** that includes high-speed internet, smart devices, and intelligent educational platforms in all public schools.
3. Build **digital and cognitive competencies for teachers** by training them to use AI tools in lesson planning, teaching, and assessment.
4. Adopt **adaptive teaching strategies** based on AI algorithms to tailor content to each student's level and learning pace.
5. Develop **intelligent assessment tools** that automatically and immediately measure student performance and provide personalized feedback.
6. Prepare **intelligent digital content** accessible through educational platforms, relying on augmented and virtual reality technologies, and encouraging exploratory learning.
7. Enable school administration to use **smart decision-support systems** based on educational data analysis to identify weaknesses and develop improvement plans.
8. Promote a **culture of AI usage among students**, and develop their skills in handling smart tools by integrating these skills into curricula.
9. Activate partnerships with **universities and technology companies** to provide continuous technical and educational support and update the applications used.
10. Ensure **digital security and privacy protection** by following data governance standards when using AI systems.

Below is an explanation of the proposed framework:

This framework assumes that the Ministry of Education, public school administrations, teachers, students, and educational stakeholders will adopt **integrated and complementary roles** within an advanced system for employing AI, as follows:

First: Role of the Ministry of Education

- Develop a clear national policy for integrating artificial intelligence in education.
- Prepare procedural manuals and standards for the effective educational use of smart applications.
- Provide the necessary infrastructure and continuously update the technological environment in schools.
- Allocate financial budgets to support the implementation of AI applications in education.

Second: Role of School Administration

- Lead digital transformation efforts at the school level.
- Adopt training plans for teachers on modern technologies and AI tools.
- Utilize data provided by AI systems to support school improvement decisions.
- Create a supportive and motivating learning environment that encourages technological innovation.

Third: Role of Teachers

- Employ AI tools in designing lessons, activities, and assessment methods.
- Monitor students' progress through smart performance reports provided by educational systems.
- Shift from the traditional role of instructor to that of a guide and facilitator in the adaptive learning process.
- Participate in evaluating smart educational applications and provide feedback for their development.

Fourth: Role of Students

- Engage positively with smart educational applications.
- Develop skills in self-learning, critical thinking, and problem-solving through digital environments.
- Use smart technologies as a supportive learning resource, not as a replacement for the teacher.

Fifth: Role of Educational Stakeholders (Parents, Local Community, Universities, Technology Companies)

- Support the digital transformation direction and interact with school initiatives.
- Contribute to training, technical support, and community initiatives.
- Build partnerships with companies providing AI technologies to update content and develop software.

Conclusion

This study developed a proposed framework for employing artificial intelligence (AI) applications in the educational process to enhance the quality of educational outcomes in Jordanian public schools amid digital transformation. The results indicated that the current use of AI in education is moderate, with significant differences favoring teachers holding doctoral degrees, highlighting the role of academic qualification in effective AI adoption. The proposed framework integrates technical and pedagogical components to guide educators and policymakers in improving teaching practices and learning outcomes through ethical and strategic AI integration. Future research should focus on validating the framework in broader contexts and examining its long-term impact on educational quality and innovation.

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