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Article

Artificial Intelligence Implementation Requirements in School Education from the Perspective of Jordanian School Principals

Reda S.M. Al-Mawadieh*
Faculty of Educational Sciences, Zarqa University, Zarqa, Jordan.
Email: rmawadieh@zu.edu.jo

Hala Alsabatin
Faculty of Educational Sciences, Zarqa University, Zarqa, Jordan.
Email: halahs1980@gmail.com

Malek Jdaitawi
1Faculty of Education Sciences, Zarqa University, Zarqa, Jordan.
Email: mjdaitawi@zu.edu.jo

Mohammad Aboud Al-Harahsheh
Prof., Department of Educational Administration & Foundations, Faculty of Educational Sciences, Al al-Bayt University, Jordan.
Email: dr_harah@aabu.edu.jo,
Email: dr_harah@yahoo.com

Ahed Mousa Alawneh
Email: Ahed4alawneh@yahoo.com

Hatoon Zuhair Kadi
Dr. College of Business Administration, University of Business and Technology.
Email: hatoon@ubt.edu.sa

Abstract

The research explores the extent to which school principals in Jordan apply artificial intelligence (AI) requirements, as perceived by teachers. It further assesses whether teachers' views vary according to gender, academic qualifications, or professional experience. A descriptive survey design was employed, with a structured questionnaire serving as the main instrument for data collection, and its validity and reliability were confirmed. The sample comprised 356 teachers. Findings indicate that principals' application of AI requirements is perceived at a moderate level. Additionally, the analysis showed no statistically significant variations in responses related to gender, academic qualification, or years of service.

Keywords

Artificial Intelligence, School Principals, Education, Jordan.

Correspondence to Reda S.M. Al-Mawadieh., Faculty of Educational Sciences, Zarqa University, Zarqa, Jordan.Email: rmawadieh@zu.edu.jo

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Introduction

AI is rapidly expanding across multiple sectors worldwide, demonstrating its growing relevance and integration into everyday life. Nations are actively competing to apply AI technologies, particularly within education, where AI plays a crucial role in preparing future generations and strengthening global competitiveness. According to prior literature, AI continues to evolve as an innovative and forward-looking field. The development of AI tools, applications, and software is progressing daily, reinforcing its significance across diverse domains. A prior study defines intelligence as the capacity to learn, adjust, and respond flexibly to situations and challenges underpinned by purposeful and productive reasoning. Literature describes AI as "the skilful imitation of human behaviour or thought through tools and software,". Additionally, it has been characterised as "a branch of computer science concerned with creating intelligent systems that replicate human cognition, enabling them to carry out tasks and emulate human functions through logical, qualitative, and computational approaches".

The incorporation of AI into education has recently become increasingly vital and is now being embedded in both teaching and learning processes. AI enhances educational outcomes by enabling personalised learning, tailoring materials to meet individual students' needs and interests. It also broadens access, raises quality, assists teachers in tracking performance, delivers immediate feedback, and supports lesson planning and assessment. AI applications provide ongoing, customised support that benefits both teachers and learners. The adoption of AI in education is evident worldwide, and Jordan is part of this global trend. In line with this, Jordan launched its Artificial Intelligence Strategy and Executive Plan (2023–2027) to align with international developments. The strategy seeks to advance AI innovation, expand human capital, and strengthen educational efficiency. It outlines five central objectives, four of which focus on capacity building, research development, the promotion of investment, and the establishment of a robust legal framework. The fifth aims at enhancing public sector services and performance through AI (Ministry of Digital Economy and Entrepreneurship, 2023). Moreover, the plan emphasises the importance of intensifying AI research and development, with particular focus on applied studies that address pressing national challenges within the public sector.

A key priority is to enhance the competencies of Jordanian researchers and to create stronger incentives and institutional support for scientific research, fostering partnerships between academic, governmental, and private institutions. These measures are intended to bridge inter-sectoral gaps and produce applied research that supports national development. However, given that AI is still a relatively new concept, a lack of awareness and understanding of such technologies may hinder adoption. Furthermore, research and practical applications remain limited, leaving significant gaps that need to be addressed. Within this national framework, it is essential to examine the extent to which schools are equipped to meet AI requirements and whether the conditions for their integration are adequately in place. Accordingly, this study seeks to assess the degree to which school principals in the Hashemite Kingdom of Jordan are adopting the necessary requirements for AI implementation in schools. The study is guided by the following research questions:

1. What are Jordanian principals' perceptions of implementing AI requirements within the school system?
2. Do statistically significant differences ($\alpha \leq 0.05$) exist in the mean responses of the sample regarding the level of AI requirement implementation by school principals in Jordan based on gender, academic qualification, and years of experience?

Literature Review

Artificial Intelligence

AI has been described as "a process of designing a computer, a computer-operated robot, or a programme capable of intelligent reasoning in a manner comparable to human cognition" (Mosa & Bilal, 2019, p. 20). In this study, the operational definition of AI is represented by the cumulative scores obtained from a measurement scale specifically developed for the research. This scale evaluates five key requirements: technological, legislative, human (administrative), material, and technical. For the study's purposes, AI refers to human-designed tools or software, including programmes, applications, computers, or machines, that emulate human intelligence. Such systems are based on predetermined algorithms and advanced technologies, which facilitate effective data storage and retrieval, enabling rapid task execution and enhancing human efficiency.

Differences Between Human Intelligence and Artificial Intelligence

Table 1 presents the principal distinctions between human intelligence and AI.

Table 1: *Key Differences Between Human Intelligence and Artificial Intelligence.*

Human Intelligence	Artificial Intelligence
Involves cognitive abilities such as adaptability to different life circumstances, learning from prior experiences, critical thinking, analysis, planning, problem-solving, accurate reproduction, empathy, rapid learning, and the effective application of acquired knowledge.	Seeks to replicate aspects of human intelligence by creating computer programmes capable of imitating intelligent human behaviour.
Prone to forgetfulness.	Distinguished by permanence and consistency.
Knowledge is difficult to duplicate and disseminate.	Knowledge can be replicated and disseminated with ease.
Performs fundamental tasks at a slower pace.	Executes core tasks more rapidly.
Incur lower costs for education and training programmes.	Requires higher investment in education and training programmes.
Possesses the capacity to acquire human knowledge and address human-related problems.	Lacks the ability to independently acquire human knowledge or solve human problems unless specifically programmed to do so.

Requirements for the Implementation of Artificial Intelligence in Education

The successful integration of AI into the educational process depends on fulfilling a set of essential requirements within four main domains.

1. Material Requirements

The incorporation of AI into education necessitates substantial investment in teacher training initiatives, the development of Arabic-based AI platforms, and the effective utilisation of both domestic and external resources. According to Pumplun, Tauchert and Heidt (2019), financial preparedness is a crucial factor, as adequate funding enhances institutional capacity to adopt innovative technologies and to strengthen AI-related expertise.

2. Technical Requirements

For AI to be embedded effectively, updated educational policies and regulatory frameworks mandating its application are required, along with comprehensive training workshops for educators. Such measures contribute to reshaping conventional perspectives and cultivating an AI-oriented culture among both teachers and learners.

3. Human (Administrative) Requirements

The implementation of AI is contingent on the availability of qualified individuals capable of operating and maintaining AI systems. This includes training administrators and teachers in the use of AI tools, introducing AI as a distinct subject within school curricula, fostering leadership attitudes that promote innovation, and ensuring the presence of specialised technical staff to oversee system maintenance.

4. Technological Infrastructure

The establishment of dependable digital networks and the adoption of emerging technologies, such as virtual reality, are fundamental. Equally important is the need to raise awareness within society, particularly among older generations who may resist technological change, in order to encourage acceptance and facilitate effective AI use in educational contexts.

Importance of AI in School Education

Recent studies have identified AI as an emerging innovation within the field of education (Chiu et al., 2023; Halili, 2019). These technologies overcome spatial and temporal limitations and are supported through a wide range of applications and digital devices. They provide learners with the flexibility to access and review information according to their individual pace and convenience (Wang, Liu, & Tu, 2021). While AI tools appear indispensable for enhancing educational efficiency, improving learning quality, and strengthening teaching

effectiveness (Li, 2023; Sandu & Gide, 2019), research has highlighted challenges associated with their integration. The rapid pace of technological advancement contrasts with educational systems that often rely on inflexible pedagogical frameworks, which do not adequately address the specific needs of individual learners (Abuhassna & Alnawajha, 2023; Al Nabhani, Hamzah, & Abuhassna, 2025).

Despite the growing body of research, a notable gap remains concerning the perceptions of school principals regarding AI implementation and its requirements. This study therefore aims to explore how principals perceive the necessary conditions for AI integration. Scholarship focusing on the adoption of AI by educational leaders has been expanding in recent years (Karakose & Tülübas, 2024; Tülübaş, Karakose, & Papadakis, 2023). For example, Sok and Heng (2023) observed that AI assists teacher leaders in identifying students' learning needs. Similarly, other researchers (Kasneci et al., 2023; Su & Zhong, 2022) have argued that AI-driven decision-making tends to be more effective and efficient. Several studies from Saudi Arabia illustrate regional perspectives on AI adoption in education. Al-Bashar (2020) examined the prerequisites for AI implementation in universities and concluded that technical preparedness and specialist engagement were essential, with overall requirements assessed at a high level. Mahjoub (2021) investigated AI tool usage among secondary school teachers and found moderate levels of integration, stressing the importance of further training and infrastructure support. Al-Ajlan (2022) studied AI utilisation in public schools in Riyadh and reported relatively high adoption, identifying administrative leadership and teacher readiness as pivotal factors for success.

Methodology

This study adopted a descriptive survey design, as it was deemed suitable for addressing the research objectives and scope. A quantitative methodology was utilised to examine principals' perceptions regarding the implementation of AI technology and its associated requirements within their daily practices. To achieve this, a structured survey was administered to school principals in order to capture their views on the conditions necessary for AI adoption.

Sample of the Study

According to official records, the study population comprised all male and female teachers employed in public schools administered by the Ministry of Education in Jordan during the 2023/2024 academic year, amounting to 3,599 individuals. From this population, a sample of 356 teachers, representing 10 per cent of the total, was selected using a simple random sampling technique. Table 2 presents the sample distribution based on gender, academic qualification, and years of professional experience. Of the participants, 191 were male principals, accounting for 54 per cent, while female principals represented 46 per cent. In terms of educational attainment, most respondents held a bachelor's degree (194), while the remainder possessed postgraduate qualifications (162). Regarding technology use, the majority (78 per cent) reported frequent engagement with general technologies, whereas 22 per cent specifically utilised AI-based tools. The demographic characteristics of the respondents are summarised in Table 2.

Table 2: *Distribution of the Study Sample by Gender, Academic Qualification, and Years of Experience.*

Variable	Category	Frequency	Percentage
Gender	Male	191	54%
	Female	165	46%
	Total	**356**	**100%**
Qualification	Bachelor's Degree	194	54%
	Graduate Studies	162	46%
	Total	**356**	**100%**
Experience	Less than 5 Years	78	22%
	5 to Less than 10 Years	147	41%
	10 Years or More	131	37%
	Total	**356**	**100%**

Measurements

To address the research objectives, a study instrument was developed drawing on insights from relevant prior studies. The tool comprised two main sections.

1. The first section collected demographic data from participants.
2. The second section focused on the requirements for integrating artificial intelligence, initially containing 23 items distributed across five domains: human (administrative) requirements, legislative requirements, technical requirements, and technological requirements.

The content validity of the instrument was established by submitting the preliminary version to a panel of ten experts and specialists from Jordanian universities and the education sector. They evaluated the items in terms of relevance to the study domains, clarity of wording, and appropriateness for measurement, while also providing recommendations for refinement. Incorporating their feedback, and following approval from at least 80 per cent of the panel, the tool was revised and expanded to a total of 52 items.

Reliability of the Study Tool

The reliability of the instrument was evaluated using Cronbach's Alpha, with the results presented in Table 3.

Table 3: *Reliability Coefficients of the Instrument Using Cronbach's Alpha.*

Tool	Domains	Number of Items	Cronbach's Alpha
AI Requirements	Human Requirements	6	0.89
	Legislative Requirements	5	0.90
	Material Requirements	4	0.91
	Technical Requirements	4	0.87
	Technological Requirements	4	0.90

Study Results and Discussion

This section reports and interprets the study results in line with the research questions.

For the first research question, the means (M) and standard deviations (SD) of participants' responses were calculated across the five domains of AI requirements, with the outcomes presented in Table 4. The analysis indicated that school principals apply AI requirements to a moderate extent, with greater emphasis placed on material and human-related aspects. Conversely, legislative requirements were rated lowest, which may be attributed to limited awareness or the relatively recent introduction of relevant regulations.

Table 4: *Means and Standard Deviations for AI Requirement Domains by Variables.*

Variables			Human Requirements	Legislative Requirements	Material Requirements	Technical Requirements	Technological Requirements	Overall
Gender	Male	M=	3.34	3.30	3.25	3.37	3.23	3.20
		SD=	0.77	0.88	0.79	0.77	0.79	0.58
	Female	M=	3.40	3.29	3.29	3.24	3.18	3.10
		SD=	0.85	0.87	0.75	0.74	0.73	0.62
Academic Qualification	Bachelor's Degree	M=	2.60	3.32	3.13	3.33	3.16	3.11
		SD=	0.81	0.85	0.75	0.77	0.73	0.62
	Postgraduate	M=	2.68	3.26	3.13	3.29	3.15	3.10
		SD=	0.93	0.79	0.88	0.82	0.86	0.59
Years of Experience	Less than 5 Years	M=	2.73	3.34	3.16	3.38	3.22	3.21
		SD=	0.88	0.87	0.87	0.80	0.77	0.63
	5-10 Years	M=	2.76	3.37	3.20	3.39	3.21	3.18
		SD=	0.83	0.76	0.80	0.63	0.68	0.52
	More than 10 Years	M=	2.78	3.46	3.20	3.46	3.24	3.23
		SD=	0.75	0.77	0.75	0.76	0.70	0.52

With respect to the second research question, Table 5 presents the differences in means and standard deviations regarding the extent of AI requirement implementation among Jordanian school principals, as perceived by teachers, according to gender, academic qualification, and years of experience. A three-way

ANOVA was employed to test the statistical significance of these differences. The results in Table 5 indicate that no statistically significant differences ($\alpha = 0.05$) were found across gender, academic qualification, or years of experience in relation to the implementation of AI requirements, either within individual domains or in the overall score.

Table 5: *Three-Way ANOVA for the Effects of Gender, Academic Qualification, and Years of Experience on the Domains of Artificial Intelligence Requirements.*

Source of Variation	Domain	Sum of Squares	df	Mean Square	F-Value	Sig. (P-Value)
Gender Hoteling = 0.00 $\eta^2 = 0.101$	Human	15.77	1	15.77	16.22	0.06
	Legislative	0.00	1	0.00	0.01	0.94
	Material	6.32	1	6.32	13.00	0.08
	Technical	1.79	1	1.79	4.52	0.06
	Technological	1.99	1	1.99	4.22	0.14
	Total	3.46	1	3.46	9.96	0.08
Academic Qualification Hoteling = 0.583 $\eta^2 = 0.011$	Human	0.02	1	0.02	0.02	0.90
	Legislative	1.38	1	1.38	2.24	0.14
	Material	0.00	1	0.00	0.01	0.93
	Technical	0.50	1	0.50	1.26	0.26
	Technological	0.04	1	0.04	0.08	0.78
	Total	0.16	1	0.16	0.46	0.50
Years of Experience Wilks= 0.005 $\eta^2 = 0.930$	Human	8.02	2	4.01	4.12	0.12
	Legislative	7.25	2	3.63	5.89	0.15
	Material	1.32	2	0.66	1.35	0.26
	Technical	6.20	2	3.10	7.83	0.09
	Technological	1.42	2	0.71	1.51	0.22
	Total	3.67	2	1.84	5.29	0.11
Error	Human	341.41	351	0.97		
	Legislative	215.98	351	0.62		
	Material	170.77	351	0.49		
	Technical	138.78	351	0.40		
	Technological	165.93	351	0.47		
	Total	121.74	351	0.35		
Total	Human	2837.23	356			
	Legislative	4082.83	356			
	Material	3663.61	356			
	Technical	4047.97	356			
	Technological	3721.25	356			
	Total	3560.79	356			

Discussion

The primary aim of this study was to assess the extent to which school principals apply AI requirements. The first research question revealed that principals integrate AI requirements at a moderate level, with stronger emphasis placed on material and human aspects. By contrast, legislative requirements were rated lowest, likely due to limited awareness or the relatively recent introduction of associated regulations. These results align with the findings of Mahjoub (2021), Tayyem et al. (2022), Al-Marikhi (2023), Qirqaji (2023), and Habshi (2024), who similarly reported a moderate level of implementation. However, they contradict the outcomes of Al-Bashar (2020), Al-Ghamdi and Al-Farani (2020), Al-Ajlan (2022), and Al-Ahmadi and Al-Qahtani (2022), which indicated a high level of AI adoption, and also differ from the studies of Al-Khaibari (2020), Hindi (2020), and Al-Saedi and Samrah (2022), which reported low levels of implementation.

The second research question, examined in Table 5, demonstrated no statistically significant differences ($\alpha = 0.05$) in the implementation of AI requirements across gender, academic qualification, or years of

experience, whether within individual domains or in the overall score. This indicates that teachers' perceptions of principals' use of AI requirements are broadly consistent, regardless of demographic or professional characteristics. One explanation for this may be the similarity of administrative functions performed by principals, whether male or female, suggesting that practices related to AI integration do not vary significantly according to teachers' backgrounds or years of service. These findings are consistent with prior research by Mahjoub (2021), Al-Ahmadi and Al-Qahtani (2022), Tayyem et al. (2022), Al-Marikhi (2023), and Habshi (2024), all of whom also reported no statistically significant differences attributable to gender, qualification, or professional experience.

Contribution of the Study

The present study explored perceptions of AI implementation requirements within Jordanian schools, positioning itself as one of the initial attempts to investigate how principals view these requirements. Despite the increasing prevalence of AI technologies and their adoption as the framework for this study, findings indicate that principals' perceptions of AI requirements remain within the low to moderate range. Furthermore, the analysis of differences in perceptions according to gender, academic qualification, or years of experience revealed no statistically significant variation. These outcomes provide contributions at both theoretical and practical levels. From a theoretical perspective, the study advances understanding of how principals in Jordan apply AI requirements from the standpoint of teachers, thereby extending existing knowledge of AI concepts in education and enriching the body of literature in educational administration. On the practical side, the findings offer valuable insights for educational leaders and administrators, supporting the formulation of strategies that promote the effective integration of AI within schools. Additionally, the study provides evidence to assist policymakers in designing frameworks that align with the realities of school leadership. While previous research has often overlooked principals' perspectives on the requirements for implementing AI in school systems, this study addresses that gap by examining the influence of gender, qualifications, and professional experience on principals' perceptions of AI implementation.

Limitations and Recommendations

Although this study contributes to both literature and practice, it is not without limitations. The first limitation relates to the reliance on a single data collection method, namely the survey, which may not have been sufficient to fully capture the complexity of the issue. Future research should therefore employ multiple approaches, such as mixed methods or qualitative techniques, to obtain more comprehensive and in-depth insights into principals' perceptions of AI requirements in schools. Another limitation concerns the varying levels of principals' prior experiences with AI, which may have influenced their responses. Addressing this issue requires providing adequate support and training programmes on AI that include material, technical, and technological resources. Such initiatives could positively influence the teaching and learning process while also fostering greater awareness of AI culture and its diverse applications in education. In addition, workshops and training sessions should be organised for school principals to develop practical skills in applying AI requirements to school management. Finally, seminar programmes should be arranged to highlight the importance of legislation related to AI use, thereby strengthening awareness of the legal and regulatory dimensions of its implementation.

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