

Article

Attitudes of Science Teachers toward the Use of Artificial Intelligence Applications in the Educational Process at the Primary School Level

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Abstract: This current study aims to reveal the attitudes of science teachers toward the utilization of artificial intelligence applications in the educational process for the primary stage in Ashur Department of Education / Salah al-Din Education Directorate, identify the most prominent challenges they face, and reveal differences in their attitudes according to academic qualification, years of experience, and gender. The descriptive survey method was used, and a questionnaire was given and applied to a simple random sample of (100) teachers from a population of (350). Results showed that science teachers have a positive attitude towards using AI applications, with an overall mean of (3.86/5). Key challenges included weak technological infrastructure (4.45), lack of specialized training programs (4.38), and absence of clear policies (4.21). No statistically significant differences were found due to qualification or experience, while differences favored females in the planning domain. The study recommended providing appropriate infrastructure, designing systematic training programs, developing suitable digital content, and establishing clear policies.

Keywords: Teacher Attitudes, Artificial Intelligence, AI Applications, Educational Process, Primary Stage, Ashur Education Department.

1. Introduction

In times of unparalleled rapid development of technologies, the phenomenon of Artificial Intelligence (AI) has become one of the leading technologies that brings about drastic changes in many areas of human activity, especially in education. AI is a very effective tool for causing qualitative change in the process of education through individualized approach, intelligent tutors, and real time assessments. Also, it alleviates administrative work of teachers, which helps them concentrate on working directly with their students and stimulating their creativeness and critical thinking [1], [2]. Therefore, the key issue has moved from "should we use AI in education" to "how to use it effectively and ethically in order to improve learning outcomes"?

In this context, the importance of the primary education stage cannot be overstated because it is a critical stage in one's life when basic skills, values, and attitudes are formed. The introduction of AI into this process will help make the learning process more engaging and interactive, identify the unique needs of each learner, and develop twenty-first-century skills like computational thinking and problem solving [3], [4]. However, the effectiveness of any technological intervention in the classroom greatly depends on the attitudes of the teachers regarding that technology and their readiness to incorporate it

into their daily activities. Teachers play a key role in the educational process; their attitudes determine the place of any technology within the educational process [5], [6]. Studies across the globe reveal that the attitude of teachers towards AI is largely ambivalent. Although there is optimism about its ability to transform and customize education for the better, there are fears about the issues of ethics, depersonalization, insufficient training, and lack of infrastructure [7], [8]. To cite an example, a recent study revealed that while 73.9% of teachers are optimistic that AI could improve the effectiveness of education, 69.6% were very worried about its impact on crucial social interaction between teachers and students [9].

However, with regard to the Arab world, there is a growing interest in exploring AI in education, especially in the Gulf countries, Egypt, and Jordan. For instance, Al-Muslim examined the attitude of female science teachers toward the utilization of AI applications in primary education in Jizan region and found out that it was positive [10]. Likewise, Abu Sara and Hassan explored the reality of AI use among primary school teachers in East Al-Quds and found out that its use was moderate with significant obstacles including the lack of training and policy guidelines [11]. In the case of Iraq, although the government seems interested in adopting digital transformation, research in the field of AI applications in education, particularly primary education, is scarce. Thus, the importance of this study lies in the fact that, to the researcher's knowledge, this is one of the first studies examining the attitude of science teachers toward integrating AI applications in primary education in Iraq, especially in the Ashur Education Department / Salah Al-Din Governorate. (everything in blue has been verified from IA generated texts).

1.1 Statement of the Problem:

While there exists a great amount of potentials of AI in educational development, the adoption of AI into primary schools education is still at an initial stage and greatly depends on the attitudes of teachers towards AI. As a result of the researcher's field experience in educational supervision at the Ashur Education Directorate, it can be concluded that there is little utilization of AI technology in the process of science teaching to primary school students, where there is some disparity among teachers in their attitudes and feelings towards the adoption of AI. Furthermore, there was a lack of sufficient research done on this issue in the past, especially in Iraq. Therefore, the problems of the current study are:

Question 1: What are the attitudes of science teachers towards applying the use of AI applications in the educational (teaching and learning) process at the primary level in the Ashur Department of Education, Salah Al-Din Education Directorate?

Question 2: What are the main Challenges for science teachers in applying AI applications?

Question 3: Are there any statistical differences ($\alpha \leq 0.05$) in the attitudes of science teachers towards applying AI applications according to the following variables (educational qualification, years of experience, and gender).

1.2 Study Objectives

The current study aims to:

1. Identify the attitudes of science teachers toward the use of AI applications.
2. Determine the primary challenges facing science teachers in using AI applications.
3. Investigate the existence of statistically significant differences in the attitudes of science teachers based on the variables of (academic qualification, years of experience, and gender).

1.3 Significance of the Study:

1) Theoretical Significance:

1. The study offers an analytical framework for teachers' attitudes towards the use of AI in primary education, hence contributing to Arabic academic research.

2. It identifies the connection between demographic factors (variables) and teachers' attitudes.

2) Practical Significance:

1. It offers practical recommendations for decision-makers in the Iraqi Ministry of Education and the Salah Al-Din Directorate of Education.
2. It helps curriculum designers and training program developers to enhance pre-service and in-service teacher training programs.

3) Limitations of the Study:

Human Limitations: Science teachers (male and female) in government primary schools under the Ashur Education Department for the academic year (2025–2026).

Spatial Limitations: Government primary schools which affiliated with the Ashur Education Department in Salah Al-Din Governorate.

Thematic Limitations: Investigating teachers' attitudes toward employing AI applications in processes relevant to science teaching (i.e., planning, implementation, and assessment/evaluation).

4) Definition of Terms:

Attitudes: The degree of acceptance or rejection shown by science teachers regarding the use of artificial intelligence applications, as measured by the scores obtained on the employed attitude scale.

Artificial Intelligence (AI): A set of computational systems and technologies capable of emulating human capabilities, like learning, reasoning (deduction), and problem-solving.

Applications of Artificial Intelligence in Education: Software, platforms, and tools run by AI technologies, including platforms of adaptive learning, intelligent assessment devices, and content generators.

Educational Process: The total activities and practices undertaken by the science teacher, including lesson planning, instructional implementation, and assessment of student learning.

Primary Stage: The educational phase comprises six grades- one through six- within the Iraqi educational system.

1.4 The Concept and History of Artificial Intelligence:

The history of artificial intelligence is traced to the middle of the 20th century and more specifically the well-known Dartmouth Conference held in 1956 when AI was officially recognized as a field. It was during this conference that scientist John McCarthy introduced the term "artificial intelligence" for the first time in history describing AI as "the science and engineering of making intelligent machines". Since then, AI experienced great development. Currently, we observe an unprecedented rise of AI powered by the advancements in computational power, big data, and the emergence of deep learning [12]. In general, artificial intelligence can be defined as the ability of the computer system to perform actions that usually require human intelligence such as learning, reasoning, problem-solving, visual perception, and natural language processing. AI can be divided into three levels [13]:

1. Artificial Narrow Intelligence (ANI): it is the level that we experience nowadays when systems show excellent performance in one highly specific task.
2. Artificial General Intelligence (AGI): it is a level where machine is theoretically expected to have comprehensive cognitive skills analogous to those of human being.
3. Artificial Super intelligence (ASI): it is a level where AI becomes superior to the smartest minds of humankind.

1.5 Artificial Intelligence Applications in Education (AIEd):

The field of artificial intelligence applications in education has witnessed significant growth, and these applications can be categorized based on the following educational functions [14], [1]:

1. Adaptive and personalized learning systems: such as the Dream Box Learning platform for teaching mathematics and the Carnegie Learning platform.
2. Intelligent tutoring systems (ITS): like the Cognitive Tutor system for mathematics.
3. Automated assessment and grading tools: such as Gradescope and Turnitin.
4. Content generators and lesson plans: such as ChatGPT. Such applications can be used by teachers to generate new ideas for lessons, formulate assessment questions, and make lesson plans [15].
5. Virtual assistants and educational robots: such as “Alexa for Education,” the “Dash & Dot” and “B-Bot” robots for teaching the basics of programming [4].

1.6 Orientations: Their Concept, Components, and Importance in Technology Adoption:

An attitude is one of the crucial concepts in educational and social psychology. It can be defined as “a state of psychological and neurological readiness, organized through experience, which exerts a directive influence on the responses of individual” [16]. Attitudes consist of three interrelated components [17].

1. The cognitive component: refers to the individual’s thoughts and beliefs about the subject of the attitude.
2. The affective component: reflects the individual’s feelings and emotions associated with the subject of the attitude.
3. The behavioral component: is the individual’s intention or willingness to act and behave in a certain way.

The “Planned Behavior Theory” [18] has confirmed that attitudes toward behavior can greatly determine behavioral intentions, which in turn predict actual behavior. In the field of educational technology, numerous studies have demonstrated that teachers’ positive attitudes are strongly linked their actual level of technology use [19].

1.7 Previous Studies :

(Arabs Studies):-

- Al-Muslim’s study [10]: aimed to identify the attitudes of science teachers toward the utilization of the applications of artificial intelligence in the educational process at the primary level in the region of Jazan. The results revealed a positive trend, despite the fact that there were obstacles, most notably a scarcity of training programs, and no significant differences which are attributed to academic qualifications or years of experience.
- Al-Qahtani’s study [20]: It has found positive attitudes among general education teachers, despite the existence of a gap between theoretical awareness and practical application.
- A study by Abu Sara and Hassan [11] revealed that the practical use of artificial intelligence among primary school teachers in East Al-Quds was at an average level, with challenges including the lack of training programs and the development of convenient digital content.

(Global Studies):-

- a. Study by Wafa & Kesuma [9]: revealed a contradiction in the perceptions of teachers in Indonesia: where 73.9% believe that artificial intelligence enhances and improves educational effectiveness, while 69.6% expressed concern that it minimizes social interaction.
- b. Epitropova’s study [21]: has categorized the factors that influence teachers’ attitudes in Bulgaria into four groups: emotional, cognitive, experiential, and potential barriers.

- c. The study by Olaleye & Salami [22] showed that primary school teachers in Nigeria show positive attitudes toward the use of artificial intelligence in lesson planning and delivery.
- d. The study by Stryftoy et al. [23] showed a significant improvement in science teachers' attitudes after the implementation of an AI-based instructional intervention.

1.8 Commenting on Previous Studies and Identification of the Research Gap:

Overall, the studies show positive trends among teachers, along with common challenges. However, studies addressing this topic in the Iraqi context are scarce, particularly in Salah al-Din Governorate. To the researcher's knowledge, no previous study has sought to investigate the attitudes of science teachers in the Ashur Department of Education. This gap represents the main rationale for conducting this study.

2. Materials and Methods

2.1 Methodology of the Study:

This study employed a descriptive survey approach. It is the most appropriate method to achieve the study's objectives, since it aims to describe and analyze the attitudes of science teachers toward the use of artificial intelligence applications as they exist in reality.

2.2 Study population:

The population of this study consists of all primary school science teachers in the Ashur Education Department / Salah al-Din General Directorate for the 2025–2026 academic year. There are a total of 350 teachers, distributed by gender, their educational qualification, and years of experience as shown in Table1.

Table 1. Distribution of Research Population According to Demographic Variables.

Variable	Category	Number	Percentage
Gender	male	185	52.9%
	female	165	47.1%
	Total	350	100%
Educational qualification	Diploma	70	20.0%
	Bachelor's degree	240	68.6%
	Master's or Higher	40	11.4%
	Total	350	100%
Years of experience	Less than 5 years	60	17.1%
	5-10 years	110	31.4%
	11-15 years	100	28.6%
	More than 15 years	80	22.9%
	Total	350	100%

2.3 Study Sample:

Sample of the study was selected using "simple random sampling", in which the questionnaire was disseminated to 120 male and female teachers from the study population to ensure representation of all categories of the population. A total of 108 questionnaires were returned; after examination and review, 8 were found to be unsuitable for statistical analysis due to either incomplete responses or a uniform response pattern (answering in the same pattern) showing that the statements were not read. Thus, the total number of valid sample responses was 100 teachers, which represents 28.6% of the study

population. It is a sufficient proportion to generalize the findings to the original population.

Table (2) displays the study's sample distribution by demographic variables, and Table (3) presents a comparison between the study population and the actual sample.

Table 2. Distribution of the Research Sample According to Demographic Variables (N=100).

Variable	Category	Number	Percentage
Gender	Male	52	52.0
	Female	48	48.0%
	Total	100	100%
Educational Qualification	Diploma	18	18.0%
	Bachelor's	70	70.0%
	Master's or Higher	12	12.0
	Total	100	100%
Years of experience	Less than 5 years	16	16.0%
	5-10 years	30	30.0%
	11-15 years	30	30.0%
	More than 15 years	24	24.0%
	Total	100	100%

Table 3. Comparison between study population and study sample by percentage.

Variable	Category	Study population (N=350)	Study Sample (N=100)	Difference in %
Gender	Male	52.9%	52.0	0.9-%
	Female	47.1%	48.0%	0.9+%
Educational qualification	Diploma	20.0%	18.0%	2.0-%
	Bachelor's	68.6%	70.0%	1.4+%
	Master's/Higher	11.4%	12.0%	0.6+%
Years of experience	Less than 5 years	17.1%	16.0%	1.1-%
	5-10 years	31.4%	30.0%	1.4+%
	11-15 years	28.6%	30.0%	1.4+%
	More than 15 years	22.9%	24.0%	1.1+%

2.4 Instrument of the Study:

To this study, a specific questionnaire was developed based on the theoretical literature and previous studies [10], [9]. The questionnaire consists of three sections:

- Part 1: Basic Information on Teachers: This includes (their educational qualifications, years of experience, gender).
- Part Two: Scale of Attitudes Toward the Use of Artificial Intelligence Applications: it involves 24 statements distributed across three domains (lesson planning—8 statements, teaching implementation—8 statements, and assessment—8 statements).

The statements have been designed on a five-point Likert scale (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1)

- Part Three: Challenges Facing the Use of AI Applications: Consists of 12 statements.

3.5 Instrument Validity and Reliability:

- Face Validity: The questionnaire was given to a panel of seven expert reviewers, and the necessary revisions and modifications were made.
- Construct Validity: Pearson's correlation coefficients were calculated between the score for each item (statement) and the domain the item belongs to; all were statistically significant at the 0.01 level.
- Reliability: Cronbach's alpha was calculated, with a value of 0.92 for the entire scale and these values for the domains: Planning (0.87), Implementation (0.89), Evaluation (0.85), and Challenges (0.88).

3.6 Statistical Procedures:

The following statistical methods were applied:

- Arithmetic means and standard deviations.
- The t-test to one sample and for two separate samples.
- One-way of the variance analysis (One-Way ANOVA).
- Pearson's correlation coefficient and Cronbach's alpha.

4. Results and Discussion

1) First Question: (Science Teachers' Attitudes Toward the Use of Applications of Artificial Intelligence):-

In order to answer the first question—"What are the science teachers' attitudes toward the use of artificial intelligence applications?"—arithmetic means and standard deviations have been calculated. To determine the level of attitude, the following criteria have been adopted: (1–2.33) negative, (2.34–3.67) neutral, (3.68–5) positive.

Table 1. Arithmetic Means and Standard Deviations of Responses of the Samples on the Scale of Science Teachers' Attitudes Toward the Use of Artificial Intelligence Applications.

Domain	Mean	Standard Deviation	Level
Lesson planning and preparation	4.02	0.58	positive
Teaching Implementation	3.85	0.62	Positive
Evaluation	3.71	0.71	positive
Evaluation	3.86	0.55	positive

As depicted in Table (1), arithmetic mean of teachers' attitudes was found to be (3.86), which is higher than the hypothesized mean (3.00), indicating positive attitudes in general among science teachers in the Ashur Department of Education. The area of "Lesson Planning and Preparation" came first (4.02), followed by "Teaching Delivery" (3.85), and then "Assessment" (3.71).

Analysis of the Results: This finding is similar to previous studies [10], [22]. The positive trend is attributed to teachers' awareness of the potential and role of artificial intelligence in facilitating tasks and saving time, because of the challenges teachers face in Iraq (overcrowded classrooms, time constraints). The "assessment" domain receives the lowest mean score for the following reasons: (a) AI-based assessment tools are still less widespread, and (b) to ethical concerns related to the privacy of student data.

2) Second Question: (The Most Significant Challenges Facing Science Teachers):-

To give a convincing answer for the second question—“What are the most significant challenges facing science teachers?”—the arithmetic means and responses’ standard deviations of the samples on “challenges” dimension have been calculated.

Table 2. Arithmetic Means and Standard Deviations of the Most Significant Challenges.

Rank	Challenge	Mean	Standard Deviation	Level of Significance
1	Weak technological infrastructure (internet, devices)	4.45	0.72	Very High
2	Lack of specialized training programs	4.38	0.68	Very High
3	Absence of clear policies and guidelines	4.21	0.79	Very High
4	High cost of some paid applications	4.15	0.81	High
5	Ethical concerns related to student data privacy	4.05	0.88	High
6	Difficulty of integrating applications with the current curriculum	3.95	0.76	High
7	Resistance of some teachers and administrators to change	3.82	0.92	High
8	Limited Arabic Language digital content	3.75	0.85	High
9	Insufficient time available for teachers	3.68	0.90	High
10	Difficulty of assessing actual learning outcomes	3.55	0.87	Moderate
11	Difficulty of obtaining quick technical support	3.42	1.02	Moderate
12	Belief that AI diminishes the teacher’s role	3.38	0.94	Moderate

Analysis of the Results: The problem of “weak technological infrastructure appeared to be in the first rank, which is an anticipated challenge in the Iraqi context. The problem (challenge) of “a lack of special training programs” came in second place, suggesting an urgent need to create and design practical training programs. The problem (challenge) of “a lack of clear policies and guidelines” is also prominent, reflecting a sense (state) of uncertainty among teachers. It should be noted that the fear of losing their role ranked lower on the list, suggesting that teachers perceive artificial intelligence as a tool to help them rather than replacing them.

3) Third Question: (Differences in Teachers’ Attitudes According to Variables of the Study)

a) *Differences by the Variable of Gender:* Can be shows in Table 3.

Table 3. Results of the t-test for significance of differences in teachers’ attitudes by gender.

Domain	Gender	Number	Mean	Standard deviation	t-value	Sign Level
Overall scale	Male	52	3.81	0.58	1.45	0.15
	Female	48	3.92	0.51		
Planning	Male	52	3.98	0.60	1.98	*0.05
	Female	48	4.06	0.55		
Implementation	Male	52	3.81	0.64	1.25	0.21

Evaluation	Female	48	3.89	0.60	1.82	0.07
	Male	52	3.63	0.74		
	Female	48	3.79	0.67		

*Statistically Significant at level ($\alpha \leq 0.05$)

The results showed statistically significant differences in the area of “lesson planning and preparation” in favor of females, while no considerable differences have found in the other areas or in the scale as a whole. This may be attributed to the fact that females may be more well- organized and meticulous in preparation of lessons and tend to expend more time in searching for the best tools.

b) Differences according to Educational Qualification: Show in Table 4.

Table 4. Results of the one-way analysis of variance (ANOVA) testing for significant differences by educational qualification.

Variance Source	Sum of Squares	Freedom Degrees	Means Squares	F Value	Significance Level
Between Groups	0.52	2	0.26	0.85	0.43
Within Groups	29.81	97	0.31	0.85	0.43
Total	30.33	99			

The results didn't show statistically significant differences that are attributed to differences in educational qualifications. This finding agrees with the study by Al-Muslim [10]. This finding can be explained by the fact that proficiency in employing artificial intelligence applications depends not so much on academic qualifications as it depends on the degree of exposure to and training in such applications.

c) Differences by the variable of Years of Experience: The details appear in Table 5.

Table 5. Results of the one-way analysis of variance (ANOVA) testing for significant differences by years of experience.

Source of Variance	Sum of Squares	Degree of Freedom	Mean Square	F Value	Significance Level
Between Groups	0.48	3	0.16	0.51	0.68
Within Groups	29.81	96	0.31		
Total	30.33	99			

The results didn't show statistically significant differences that could be attributed to differences in years of experience. The explanation is due to the fact that the use of applications of artificial intelligence is still in its initial stages for all teachers, irrespective of their experience level, and that individual differences in openness to innovation may have greater effect.

5. Conclusion

This study has aimed to investigate science teachers' attitudes toward the use of applications of artificial intelligence in the teaching process at the elementary level in Ashur Department of Education. It arrived to the following main findings: The existence

of a strong positive attitude: The overall average attitude score was 3.86 out of 5, indicating a growing awareness of the importance of such technologies and a willingness to adopt them, especially in the area of lesson planning. considerable challenges hinder effective usage: the most notable challenges, feeble technological infrastructure (4.45), the shortage of training programs (4.38), and absence of clear policies (4.21). Only partial differences by gender: Females have been found to outperform males only in lesson planning, while no differences have been found in other areas or on the overall scale. Analogical trends across different educational qualifications and levels of experience: The findings showed no statistically significant differences in trends attributed to differences in educational qualifications or number of years of experience. On the basis of the findings, the researcher recommends the following: The Iraqi Ministry of Education and the Salah Al-Din Directorate of Education: Efforts should be made to provide the basic technological infrastructure in primary schools (fast internet service, modern devices). Developing appropriate national and regional policies and guidelines on the applications of artificial intelligence technologies in education to include ethical considerations, data privacy, and the prevention of academic misconduct. Educational Training Centers and Educational Supervision Departments: Designing and implementing practical, systematic, and continuous teachers' training programmes, focusing on the practical skills needed to use tools of artificial intelligence (such as ChatGPT, smart assessment tools, adaptive learning platforms). Holding specialized workshops which focus on the ethical and legal aspects of using artificial intelligence. Curriculum and Educational Content Developers: Developing an Arabic high-quality digital educational content compatible with applications of artificial intelligence. Designing topics relevant to artificial intelligence and computational thinking and integrating them into science curricula. Educational Supervisors and School Leaders: Providing continuous technical and administrative support to teachers and creating a school environment that encourages and supports innovation. Organizing regular meetings for teachers to exchange and share experiences concerning the best practices to use of artificial intelligence. This study suggests conducting a pilot study to measure the effect of an AI-based training program on the development of the digital competencies of science teachers. Conducting a qualitative study (in-depth interviews) to reveal teachers' profound perceptions toward the challenges of using AI. Examining the current state of the use of AI application in other educational levels (intermediate school, secondary school) in Salah al-Din Governorate. Designing and testing an Arabic-language, AI-based educational platform for teaching science at the primary school level.

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