

Research Article

Cite this article: Al-Dosari, I., Albahiri, M. & Alhaj, A. (2025). Enhancing AI Utilization Skills in Education: Challenges and Proposals for Elementary School Teachers in Bisha.

Educational Process: International Journal, 16, e2025242.

<https://doi.org/10.22521/edupij.2025.16.242>

Received April 2, 2025

Accepted May 29, 2025

Published Online June 10, 2025

Keywords: Skills, Artificial Intelligence, Education, Challenges, Primary School Teachers, Proposals

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Enhancing AI Utilization Skills in Education: Challenges and Proposals for Elementary School Teachers in Bisha

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Abstract

Background/purpose. This study aimed to investigate the skills needed for efficiently implementing artificial intelligence (AI) applications in education among primary school teachers in the Bisha Governorate, the challenges they encounter, and the proposals needed to overcome these challenges.

Materials/methods. This research adopted a descriptive method. A purposive sample was selected using a simple random method, in which 68 primary school teachers were surveyed to identify the challenges they encountered in enhancing their AI utilization skills in education. A structured questionnaire was adopted as the data collection tool and demonstrated a high level of reliability.

Results. The findings revealed a high level of necessary AI-related skills among teachers, including critical thinking, adaptability, and proficiency in using digital tools. Significant challenges were also identified in their AI-related skills development, such as the lack of electronic labs, insufficient training opportunities, high costs of AI tools, and limited availability of qualified personnel. The participants also demonstrated a strong consensus regarding the need to implement actionable measures, including organizing seminars and training, providing modern devices, and addressing technical and logistical challenges.

Conclusion. This study concludes by offering practical recommendations for enhancing AI integration in education and calls for further explorations of AI applications in fields beyond education. This study emphasizes the transformative potential of AI in reshaping teaching and learning processes while addressing critical barriers to its implementation.

1. Introduction

Artificial intelligence (AI) is an innovative, high-tech tool that can boost the power of education and assist teachers in optimizing their performance. Education is considered a vital pillar of every nation, given its profound impact on the development of each economic sector (George & Wooden, 2023; Dede, C., 1987). Education also establishes the groundwork for the present and future and for advanced scientific principles. Therefore, countries around the world are aiming to develop their education systems by improving their teaching methods and integrating advanced technologies, such as AI.

Ministries of education also prioritize the integration of technology into their curricula and are actively organizing training programs for educators to develop their skills. These efforts aim to enable students to learn more efficiently and effectively and attain their desired goals (Schiff, 2022). In this connection, researchers must also enhance their knowledge, skills, and available instruments, especially present-day technologies, to achieve expected outcomes in educational improvement programs. Fishman et al. (2016). stated that the remarkable development in modern technologies across various life domains has introduced innovative technological tools that can advance the development of extant teaching and learning methods.

AI is among the most significant technologies that have gained extensive usage over the last few years. This technology guides computers to perform tasks that are traditionally performed by humans. The application of AI has been directly linked to the enhancement of the educational process. The Arab world is about to witness meaningful improvements in its educational technology as Arab countries start to shift from traditional methods to tech-savvy and innovative education (Adil et al., 2020; Alzubi, 2023). This shift is expected to produce several benefits, including improved education quality, expanded knowledge acquisition, broader experience for learners, and the development of essential life skills (Faggella, 2019).

AI also offers a fresh perspective on the dynamics of personalized learning. AI facilitates virtual communications that improve the learning process by offering individual and tailored support regardless of the time or place (Popenici & Kerr, 2017). Considerable achievements in teaching and learning have also been driven by AI, which depends on an assortment of scientific principles related to the educational trail and the education process. UNESCO (2019) has emphasized the importance of AI in education to enrich human capabilities and promote strong interactions and collaborations between humans and machines in learning, work, and life. UNESCO also serves as a global laboratory for establishing standards and proposals related to AI and education (Alam, 2021).

At the local level, during the Saudi Data and AI Authority (SDAIA) conference held in Riyadh on September 10–12, 2024, the SDAIA, the Ministry of Education, the Education and Training Evaluation Commission, and the National Curriculum Center signed a joint declaration of intent to establish an AI Center of Excellence in Education that utilizes AI technologies to optimize decision making and set a national example (Memish et al., 2021). To seamlessly incorporate AI in education, teachers need to acquire a specific set of skills. Given their critical role in improving all aspects of the educational process, the proficiency of teachers in emerging educational technologies is of paramount importance in facilitating the integration of AI in education. During the age of AI, teachers are considered developers of curricula and didactic materials, which is a profound responsibility that demands multi-faceted expertise associated with scientific and technological advances (Kasztelnik, 2024). Accordingly, this study aims to shed light on the skills that teachers need to effectively utilize AI in education.

As artificial intelligence (AI) continues to advance, it is increasingly transforming the global workforce and reshaping the skills required in the labor market. These rapid technological developments demand that graduates acquire new competencies to remain relevant and

competitive (Amoasi, 2024; Liu et al., 2020). Consequently, educational institutions and vocational training centers face mounting pressure to adapt their curricula and teaching methods to better prepare learners for an AI-driven future.

Amid these shifts, AI also presents significant opportunities to enhance education itself—particularly through personalized learning, intelligent tutoring systems, and data-driven instructional support. However, effectively leveraging these tools requires that educators themselves are adequately prepared. The integration of AI in education is not just a matter of deploying technology; it also hinges on the ability of teachers to understand, manage, and apply AI tools meaningfully in the classroom (Admane et al., 2024; Karsenti, 2019).

Despite the growing importance of AI in education, there remains considerable uncertainty regarding the specific skills and competencies teachers need to use AI effectively. Without clear guidance and targeted training, educators may struggle to support students in acquiring future-oriented skills. Therefore, identifying and developing the AI competencies required by teachers is essential—not only to improve educational outcomes but also to ensure that both educators and learners are equipped to thrive in a rapidly evolving digital landscape.

Previous studies have gauged the skills of teachers in utilizing AI and the challenges they encounter. For example, Al-Khibri (2020) measured the level of skills possessed by secondary school teachers in the Al-Kharj Governorate for utilizing AI implementation in education and identified the main challenges that impede their utilization of AI in teaching. Similarly, Shin and Shin (2020) investigated the present understanding of primary school science teachers in South Korea regarding AI applications and examined how these applications could be utilized in their teaching and the methods for their implementation. They recommended training these teachers in AI applications to facilitate the integration of AI into teaching and learning. In light of these findings, the present study aims to identify the skills that primary school teachers need to effectively utilize AI in education. AI also offers several facilities for managing learning processes. Luo (2018) pointed out that contemporary trends emphasize a significant demand for institutions, particularly universities, to employ AI technologies to boost their comprehensive efficiency.

Although AI applications have been recently adopted in some public sectors, the education sector lags behind as many teachers are still lacking the skills to optimally use such technology (Schiff, 2022; Mikhaylov et al., 2018). Teachers must develop their skills, engage their students, and integrate AI effectively into their educational and instructional practice for them to make conscious decisions at the appropriate time and place.

In light of rapid advancements in artificial intelligence (AI) and its growing influence across various sectors, education stands at a critical crossroads. Primary school teachers in the Bisha Governorate, like their counterparts worldwide, face the urgent need to adapt and develop new skills to effectively integrate AI applications into their teaching practices. This research seeks to identify the specific skills required by these educators to harness AI technology efficiently and explores the challenges that hinder their development in this area.

The study aims first to delineate the core competencies that enable primary school teachers to utilize AI tools effectively in educational settings. It then investigates the obstacles impeding skill acquisition, such as limited access to training, resource constraints, or resistance to technological change. Building on these insights, the research proposes practical recommendations and strategic measures to overcome these barriers, thereby empowering teachers to embrace AI innovations confidently.

To guide this inquiry, the following research questions are posed: What specific skills must primary school teachers in the Bisha Governorate acquire to effectively employ AI in education? What

challenges do they encounter in developing these skills? What actionable proposals can address these challenges? And finally, what are the essential core skills for the efficient application of AI technologies in teaching?

The theoretical significance of this research lies in its focus on an emerging and pivotal topic: equipping educators with future-ready skills amid sweeping technological transformations. By examining AI's role in education, this study contributes to enriching the theoretical foundations for future research on teaching competencies in the digital age. Moreover, it offers a valuable addition to the Arab academic literature by highlighting how AI can reshape educational practices and the skills educators must cultivate.

Practically, this research draws attention to the necessity of tailored professional development programs and training initiatives that prepare teachers to integrate AI effectively. It provides policymakers and education stakeholders in the primary education sector with insightful data on current AI utilization practices and teacher training needs, guiding efforts to optimize teaching performance. Ultimately, the study offers concrete recommendations to enhance teachers' capabilities in leveraging AI for improved educational outcomes.

2. Literature Review

2.1 Theoretical Background and Definitions of Artificial Intelligence

Introduced by John McCarthy in 1956 during a workshop at the Dartmouth Conference in the United States, AI is a branch of computer science that focuses on simulating human behavior in machines. AI concentrates on designing computer systems and programs that are capable of thinking, learning, making decisions, and acting similar to a human brain. In other words, this branch aims to emulate human cognitive and mental abilities by using computer systems (Ocana-Fernandez, Valenzuela-Fernández & Garro-Aburto, 2019).

Grewal (2017) defined AI as a branch of computer science that enables the creation and design of computer programs that simulate human intelligence. These programs allow computers to execute tasks that require reasoning, understanding, listening, speaking, and acting in a logical and organized manner. Similarly, Tredinnick (2017) described AI as a set of data processing techniques and methods that focus on the ability of computers to make flexible and rational decisions in response to unpredictable environmental conditions. These techniques include natural language processing, machine learning, intelligent agents, and logical decision-making.

Gershenson (2004, p. 12) viewed AI as "a set of behaviors and characteristics viewed in computer programs that enable them to simulate human cognitive abilities through various methods and paradigms." Perez et al. (2018) defined AI as the efficacy of machines and digital appliances to perform specific work that emulates those performed by intellectual beings, such as thinking, learning from past experiences, and performing other cognitive processes. AI aims to develop systems that demonstrate human intelligence and abilities, including learning and understanding, and provide assorted services, such as education, guidance, and interaction. Badaoud (2020) argued that AI represents "the system's ability to correctly interpret extraneous data, learn from this data, and use that knowledge to achieve specific objectives and tasks through adaptive flexibility."

The above review highlights a strong association between AI and digital technologies that focus on replicating human cognitive abilities at the highest level of intellectual capacity. These technologies encompass natural language processing, machine learning, savvy agents, robotics, and logical decision-making.

2.2. Role and Impact of AI in Education

AI has been recognized as a transformative force across various disciplines. Konar (2018) categorized AI into several approaches, including problem-solving, simulating human intelligence, reasoning, and machine learning. They emphasized the importance of integrating these approaches into educational institutions to enhance students' learning outcomes. According to Tomi (2025), AI systems not only replicate human intelligence but also improve efficiency in areas such as personalization, machine learning, and computerized grading, making them invaluable tools in education. Furthermore, AI's ability to adapt and learn independently offers dynamic solutions tailored to individual student needs. Markauskaite et al. (2022) argued that AI's potential extends beyond technical capabilities to encompass ethical and pedagogical considerations, highlighting its role in reshaping human-AI collaboration in education and other domains.

2.3. Types of Artificial Intelligence and Their Applications

AI can be classified into the following types (Martinez, 2018).

1. Narrow AI (Weak AI):

As the simplest form of AI, narrow AI is primarily designed to perform specific tasks within a defined scope and environment. The operation of narrow AI is predicated on coded instructions, and such technology usually reacts to certain situations under agreed-upon conditions. As such, the capabilities of narrow AI are limited to a specific set of functions. One example of narrow AI is IBM's *Deep Blue*, which is a chess-playing robot programmed to defeat the world chess champion Garry Kasparov.

2. Strong AI:

Strong AI outperforms narrow AI by being capable of acquiring, analyzing, and learning from data. This type of AI leverages cumulative experience to make uninfluenced decisions without explicit programming, thereby allowing such technology to perform complex tasks and intricate jobs independently. Notable examples of strong AI include self-driving cars and real-time conversational chatbots.

3. Super AI:

Super AI is a highly enhanced model that rivals or even exceeds human intelligence in cognitive processes, such as reasoning and problem-solving. Still in development, this form of AI aspires to replicate human emotional intelligence, including reactions, interactions, and social behaviors. Super AI is marked by its ability to form relationships and interact effectually with others.

2.4. Advantages and Educational Benefits of AI

The above types of AI represent generational advancements ranging from basic reactive systems to those that are capable of demonstrating self-awareness and engaging in interactions autonomously. Narrow and strong AI are the most widely used AI types in practical scenarios across various domains, including education, healthcare, and industry.

- **Narrow AI in Education:** AI-driven learning platforms, such as customizable learning systems, help personalize didactic content to meet the needs of individual learners (Luckin et al., 2016).
- **Strong AI in Daily Life:** AI-powered virtual agents, such as Siri and Alexa, are capable of understanding natural language and learning user preferences over time (Mahmoud, 2019).
- **Super AI Potential:** Researchers are exploring the applications of super AI in complicated fields, such as advanced medical diagnostics, where systems not only analyze data but also simulate human reasoning to make life-critical decisions (Fu et al., 2022).

2.5. The Importance of AI in Modern Education

The use of narrow and strong AI in education has introduced a range of tools and applications that have positively impacted students and educators. Some examples include AI tutors that provide automated grading and intelligent classroom management systems. These tools have greatly improved students' learning outcomes by offering tailored and interactive educational experiences (Chen et al., 2020).

2.6. AI in Education

AI in education refers to the integration of AI into educational establishments to create modern tools and methodologies that are associated with global developments in the fields of education. These innovations effectively boost and support teaching and learning processes (Ghamdi, 2020).

AI in education is described as an educational application that uses computer-based systems marked by independent databases. These systems include knowledge bases for educational content, learning strategies, lesson planning, and the ability to identify learners' strengths and weaknesses. These knowledge bases enable the system to dynamically adapt the learning process to the learner's needs (Albahiri et al., 2025; Jarbawi, 2020; Al-Shahrani & Alhaj, 2025).

AI in education also involves the development of systems that are capable of performing tasks that typically require human intelligence, such as learning, reasoning, and self-improvement (Panja et al., 2022).

In sum, AI can be utilized in education to enhance the learning experiences and develop the core skills of students by designing educational experiences that are suited to each students' needs while considering their learning difference

2.7. Benefits and Applications of AI in Education

The advantages of incorporating AI applications into education have been highlighted in the literature (Cromton & Song, 2021; Zawacki-Richter; Faggella, 2019). These advantages include the following:

1. Interactive Learning Support: AI facilitates interaction with learners by answering their inquiries and providing more efficient responses.
2. Safe Experimentation: AI reduces the risks and fear associated with learning through trial and error.
3. Adaptive Learning: AI offers personalized learning experiences that are molded to each learner's abilities and preferences.
4. Language Learning: AI supports foreign language acquisition using automatic speech recognition, natural language processing, and error detection to help learners correct their mistakes.
5. Problem Solving with Limited Data: AI can solve problems even with incomplete or contradictory data.
6. Engagement and Motivation: AI promotes excitement, challenge, imagination, and competition among learners.
7. Performance Analysis: AI analyzes learners' performance, accentuates their strengths and weaknesses, and provides timely assistance.
8. Support for Beginners: AI helps novice and primary learners by offering solutions to their educational problems and dilemmas.

9. Data Management: AI manages and stores educational institution data, predicts individual learner weaknesses, and identifies resource deficiencies in schools and universities before they occur.

2.8. Additional Advantages of AI Applications in Education

The present study identifies the following major advantages of utilizing AI in the educational process:

- Alignment with Modern Educational Trends: AI redefines the roles of teachers and learners in contemporary education.
- Efficient Use of the Internet: AI enables high-quality online educational applications.
- Enhanced Content Delivery: AI enriches teaching by adding multi-dimensional layers of information (e.g., text, audio, and video).
- Time and Cost Efficiency: AI saves effort, time, and resources by enabling faster information retrieval and automating routine tasks for instructors.
- Immersive Learning: AI boosts deeper engagement with course materials, thus encouraging learners to explore and navigate content interactively.
- Text Summarization: AI accurately summarizes lengthy texts into easily readable formats.
- Text-to-Audio Conversion: AI converts written course materials into audio files.
- Handwriting Recognition: AI transforms printed or handwritten notes into editable digital text.

2.9. Importance of AI in Education

The importance of AI applications lies in their ability to penetrate various scientific and practical sectors and achieve great progress with precision and quality. AI has become a fundamental component of education that provides tailored learning experiences that suit students' diverse learning styles and needs, thereby reducing the time required for learning (Almuhanna, 2024).

AI also provides academic services across different fields, such as intelligent learning systems. Innovative AI has enhanced the role of teachers by offering advanced and in-depth analyses that identify gaps in teaching and learning. AI also reduces the traditional burdens placed upon teachers, such as paperwork and student assessments, through smart applications that deliver personalized curricula for each individual based on their interests, skills, and performance evaluations (Crompton, 2021).

One notable advantage of AI-powered learning is the opportunity for continuous learning without restrictions on time or place. AI offers students and teachers with convenient access to educational content, provides students with immediate feedback and actionable suggestions, and aids teachers in their professional development by identifying and enhancing their strengths while addressing their weaknesses.

2.10. Previous Studies

Many studies have emphasized the importance and effectiveness of using AI in education, such as Saragih (2024) and Almuhanna (2024), who both highlighted the potential of AI to transform education by providing innovative solutions to long-standing challenges. Alam (2021) found that education is assisted by AI in at least two ways, namely, by assisting and supporting pedagogy and educators' routine function. Ng et al. (2025) identified three significant challenges encountered by educators when using AI in education, namely, institutions' readiness, instructors' AI competencies, and students' AI literacy and ethics. Ng et al. (2021) focused on teaching and ethical concerns related

to AI literacy and established a foundation for future research on high-level skills development and formative standards for AI literacy. Almuhanha (2024) revealed four main AI approaches, namely, improving AI literacy, developing important soft skills, utilizing AI for extracurricular enhancement, and boosting student performance. Supa'at and Ihsan (2023) stated that tech gadgets, learning methods, and human resources are the most critical obstacles that teachers encounter in the society 5.0 era. To overcome these challenges, teachers must develop professional abilities in utilizing digital instruments during classroom instruction. Hong and Kim (2025) showed a relatively good reliability level of over 0.6. When AIoT education using DIYGO was conducted, the pre-and post-difference test results of students' digital literacy showed statistically considerable improvements in all detailed areas of digital literacy. Furthermore, the difference verification results for AI literacy showed that it was effective in all detailed areas. Seungyeon and Jiyoung (2024) identified eight competencies and 18 behavioral indicators that are classified into three fields, namely, knowledge (understanding, evaluation, and curricular design), skills (utilization and management), and attitudes (personal efficacy and professional education management). Bai et al. (2024) highlighted a difference between their findings and the early anticipations. Their comparative experiments between ChatGPT-3.5 and ChatGPT-4 revealed substantial improvements in example achievement, thus highlighting the potential of using LLMs as a tool for teaching. Wang (2024) identified several challenges in AI application in Bible education, including insufficient educational facilities and the need to preserve the Bible's textual integrity and context. They proposed some AI-driven methods for improving bilingual Bible education and tracks for future research and implementation.

The current study agrees with previous studies in using a descriptive approach to achieve their objectives and in their focus on identifying the skills needed to use AI in teaching. However, previous studies have mostly focused on university faculty members or education levels other than primary school. Therefore, to set itself apart from the literature, the current study specifically focuses on primary school teachers and the skills they need to use AI in teaching.

The benefits of previous studies can be summarized as follows:

- Supporting awareness of the problem and the need to conduct the current study.
- Offering some results that allow the current study to bridge the remaining research gaps.
- Proposing some theoretical frameworks that allow the current study to answer its research questions.
- Offering some recommendations that guide the current study.

The current study distinguishes itself from the literature by specifically focusing on the use of AI in teaching at the primary school level, which is one of the most important stages in education. Teachers at this level need extensive support in developing the skills required to use AI in their teaching practices.

3. Research Methodology

This study employed a descriptive research design, which is appropriate for investigating current conditions, practices, and perspectives without manipulating the study environment. The goal was to explore and analyze the phenomena associated with teachers' readiness and competencies in utilizing artificial intelligence (AI) in education. The descriptive approach enabled the researcher to collect detailed information on the skills Islamic Studies teachers need to integrate AI tools effectively into their teaching practices.

The descriptive methodology was chosen due to its strength in capturing accurate representations of existing phenomena. It facilitates the identification of patterns, relationships, and

specific educational needs, all of which are vital in formulating meaningful conclusions and recommendations regarding AI integration in elementary education.

3.1. Primary Data Analysis of the Sample

The initial data for the sample were analyzed by calculating the frequencies and percentages for each variable.

3.1.1. Years of Experience

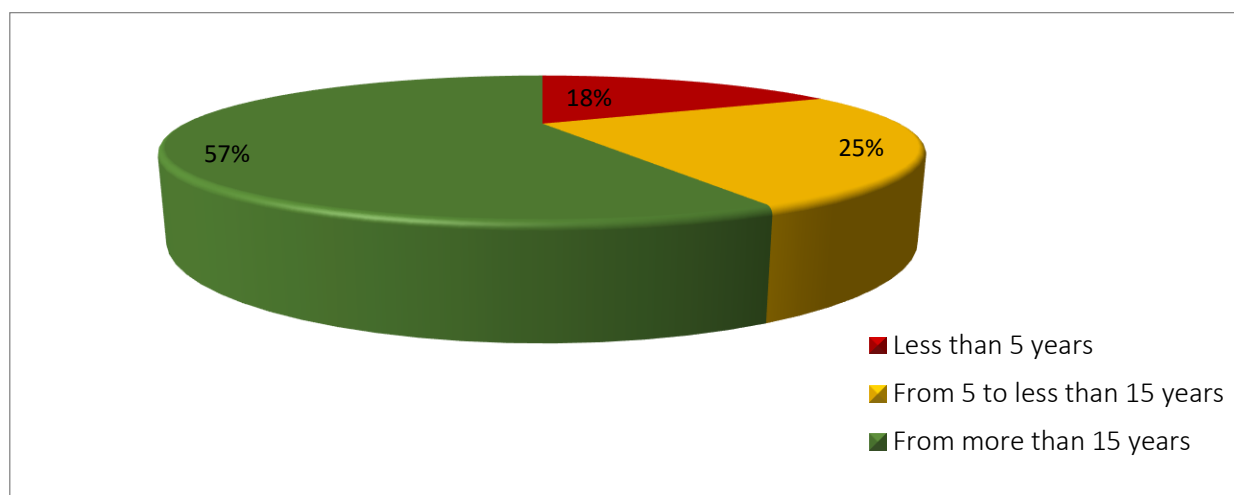
Table 1. Sample Distribution by Years of Experience

Years of Experience	Frequency	(%) Percentage
Less than 5 years	12	17.6
5 years to less than 15 years	17	25.0
15 years or more	39	57.4
Total	68	100%

The above table shows that

- 57.4% of the sample have 15 years of experience or more.
- 25% of the sample have experience ranging from 5 years to less than 15 years.
- 17.6% of the sample have less than 5 years of experience.

Figure 1. Sample Distribution by Years of Experience



3.1.2. Academic Qualifications

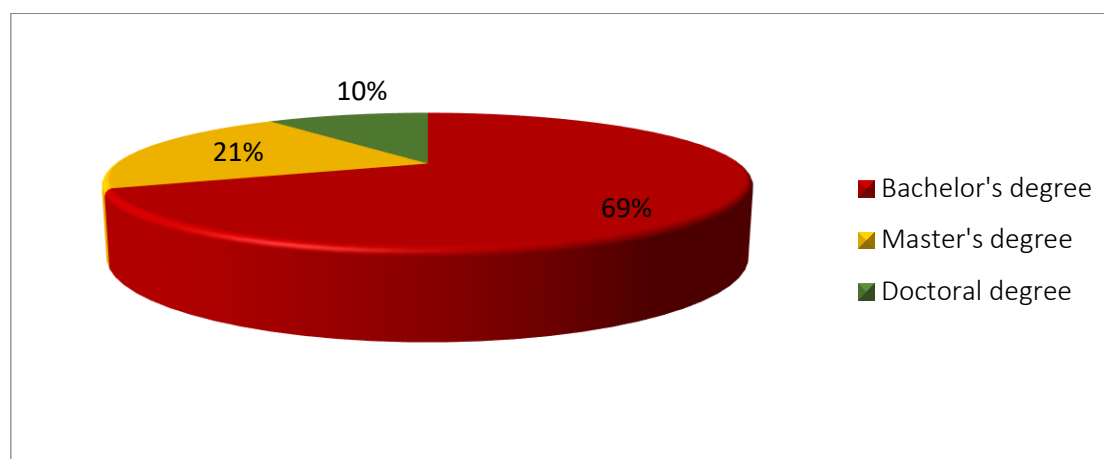
Table 2. Sample Distribution by Academic Qualification

Academic Qualification	Frequency	(%) Percentage
Bachelor's Degree	47	69.1
Master's Degree	14	20.6
Doctorate	7	10.3
Total	68	100%

The above table shows that

- 69.1% of the sample holds a bachelor's degree.
- 20.6% of the sample holds a master's degree.
- 10.3% of the sample holds a doctoral degree.

Figure 2. Sample Distribution by Educational Qualification



In sum,

1. The majority of the sample (57.4%) have a significant teaching experience of 15 years or more, indicating that the participants are relatively well-experienced.
2. Most of the participants (69.1%) hold a bachelor's degree, which aligns with the standard entry-level requirement for teaching positions in Saudi Arabia.

3.2. Research Instrument

Based on the literature review and the proposed theoretical framework, this study developed a questionnaire as its primary tool for data collection. This tool was deemed appropriate for achieving the research objectives and answering the research questions.

3.2.1. Construction of the Questionnaire

The questionnaire was designed with the primary aim of identifying the skills needed by teachers to utilize AI in education. The questionnaire design was finalized after reviewing the relevant literature and examining the existing tools related to the research topic. The questionnaire comprises the following components:

1. Primary Data

This section collects the demographic and background information of the participants.

2. Skills Necessary for Teachers to Utilize AI Applications in Education (Section 1)

This section includes 11 questions, along with an open-ended question to capture additional insights from the participants

3. Challenges Hindering the Development of Teacher's AI Skills (Section 2)

This section includes 12 items along with an open-ended question to explore other potential challenges

4. Solutions and Proposals to Address the Challenges in Developing Teachers' AI Skills (Section 3)

This section includes seven items along with an open-ended question for the participants to propose additional solutions.

The questionnaire was developed in the following steps:

1. Reviewing the relevant literature and theoretical foundations to identify the key variables related to the study.
2. Examining the instruments adopted in previous studies to ensure the questionnaire's relevance and validity.
3. Structuring the questionnaire items to align with the research objectives and questions.
4. Incorporating open-ended questions in each section to allow the participants to offer additional perspectives.

3.2.2. Validity of the Research Instrument

The validity of the questionnaire was tested using the following methods:

1. Expert Review:

The questionnaire was reviewed by a group of faculty members specializing in the field of education to seek their feedback regarding the following aspects:

- Clarity of the statements.
- Relevance of the statements to the research objectives.
- Suitability of the items within their respective sections.

These faculty members offered several suggestions and recommendations for improving the questionnaire, and their comments were incorporated in the revision. Only those questions that achieved consensus among these reviewers were retained in the revised questionnaire.

2. Construct Validity:

Construct validity was assessed by calculating the Pearson correlation coefficient between each item in a section and the total score for that section. This method ensures that these items align with their respective sections and measure the intended construct.

3.3. Results for Section 1

Table 3. Pearson Correlation Coefficient Between Each Item and the Total Score for Section 1

Item Number	Pearson Correlation	Item Number	Pearson Correlation
1	.608**	7	.676**
2	.557**	8	.579**
3	.557**	9	.771**
4	.753*	10	.573**
5	.711**	11	.699**
6	.787**		

Significance Levels:

- $p \leq 0.01$ (**)
- $p \leq 0.05$ (*)

The Pearson correlation coefficients between the items and the total score for Section 1 are all statistically significant at **0.01** or **0.05**, thereby suggesting strong and acceptable correlations and confirming that these items are well-aligned with the section's construct, thus confirming the validity of the research instrument.

3.4. Results for Section 2

Table 4. Pearson Correlation Coefficient Between Each Item and the Total Score for Section 2

Item Number	Pearson Correlation	Item Number	Pearson Correlation
1	.871**	7	.724**
2	.750**	8	.645**
3	.824**	9	.744**
4	.531**	10	.801**
5	.642**	11	.776**
6	.705**	12	.646**

Significance Levels:

- $p \leq 0.01$ (**)
- $p \leq 0.05$ (*)

The Pearson correlation coefficients between the items and the total score for Section 2 are statistically significant, thereby suggesting that all items are strongly and appropriately correlated with the construct, further confirming the instrument's validity.

3.5. Results for Section 3

Table 5. Pearson Correlation Coefficient Between Each Item and the Total Score for Section 3

Item Number	Pearson Correlation
1	.588**
2	.736**
3	.732**
4	.807**
5	.751**
6	.753**
7	.618**

Significance Levels:

- $p \leq 0.01$ (**)
- $p \leq 0.05$ (*)

The Pearson correlation coefficients for all items in this section are statistically significant at 0.01, thereby indicating that each item is strongly correlated with the overall construct of solutions and proposals and further confirming the validity of the instrument.

The results of the construct validity analysis for Sections 2 and 3 reveal the following:

- All items are well-aligned with their respective sections.
- The significant correlations confirm that the questionnaire is valid for measuring the challenges hindering the development of teachers' AI skills and the solutions required to address these challenges.

3.6. Reliability of the Research Instrument

To measure the reliability of the questionnaire, Cronbach's alpha coefficients were used to assess its internal consistency. Table 6 presents the Cronbach's alpha values for each section of the questionnaire.

Table 6. Cronbach's Alpha Coefficients for the Questionnaire Sections

Section	Number of Items	Cronbach's Alpha Value
Skills Necessary for Teachers to Utilize AI Applications in Education	11	.884
Challenges Hindering the Development of Teachers' AI Skills in Education	12	.843
Solutions and Proposals to Address Challenges in Developing Teachers' AI Skills	7	.812
Overall Questionnaire	30	.899

The above table reveals the following:

1. Section-Wise Reliability:

- The Cronbach's alpha values for all sections exceed the commonly accepted threshold of 0.70, thereby indicating that the items in each section exhibit a high degree of internal consistency.

2. Overall Reliability:

- The entire questionnaire obtained an excellent Cronbach's alpha value of .899, which confirms its high level of reliability.

The above Cronbach's alpha coefficients confirm that the questionnaire is a reliable tool for data collection. The high-reliability values indicate that this questionnaire can be confidently used in the study and that the results derived from this instrument can be trusted.

3.7. Data Analysis Methods

To achieve the research objectives and analyze the collected data, various statistical methods were applied using SPSS. After encoding and entering the data into the software, the following steps were undertaken:

1. Likert Scale Responses

A five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree") was used to rate each item in the questionnaire.

2. Determining Scale Intervals

To determine the intervals for interpreting the results, the range of the scale ($5 - 1 = 4$) was divided by the number of scale categories (5), resulting in a length of 0.80 for each category. Table 7 presents these intervals.

Table 7. Degree and Range of Agreement on the Likert Scale

Interpretation	Range		Scale Value	Likert Scale Level
	from	to		
Very Weak	1.00	1.80	1	Strongly Disagree
Weak	1.81	2.60	2	Disagree
Moderate	2.61	3.40	3	Neutral
High	3.41	4.20	4	Agree
Very High	4.21	5.00	5	Strongly Agree

3. Statistical Methods Used

Several statistical methods were employed to analyze the data and the participant's responses to the questionnaire items:

1. Percentages and Frequencies:
 - Used to identify the personal characteristics of the participants.
2. Mean:
 - Calculated to determine the overall trends in the participants' responses for each section and for each item in the questionnaire.
3. Standard Deviation:

- Used to measure the degree of variation in the participants' responses for each item and section. A smaller standard deviation indicates less dispersion and greater consistency in responses, while a higher value indicates more variability.
4. Pearson Correlation Coefficient:
- Applied to measure the internal consistency between the questionnaire items and their corresponding sections.
 - Ensures the reliability and validity of the instrument's construct.
5. Cronbach's Alpha Coefficient:
- Used to calculate the reliability of the instrument.
 - Demonstrates the overall internal consistency and stability of the questionnaire for achieving accurate and trustworthy results.

The above statistical methods ensure a comprehensive analysis of the data and provide insights into the research questions. The use of SPSS facilitates accurate and efficient data processing, thus contributing to the validity and reliability of the research findings.

4. Results and Discussion

4.1. Presentation, Discussion, and Interpretation of Results

This chapter presents the findings from the data analysis. The analysis is grounded in the proposed theoretical framework and the related literature. The findings are discussed and interpreted in light of the proposed research questions.

4.1.1. Results Related to Research Question 1

The arithmetic means, standard deviations, ranks, and agreement levels for the items in Section 1 were calculated to identify the skills required from primary school teachers in the Bisha Governorate to effectively utilize AI applications in education.

Table 8. Arithmetic Means, Standard Deviations, and Ranks for Section 1

Item Number	Item Description	Mean	Std. Deviation	Rank	Agreement Level
1	Learning programming is essential for using artificial intelligence in education	4.37	1.035	6	Strongly Agree
2	The teacher must have the skills to solve mathematical problems in order to be able to use artificial intelligence	4.15	1.011	11	Agree
3	Critical thinking skills enable teachers to create innovative models and solutions when using artificial intelligence technology	4.59	.652	1	Strongly Agree
4	The teacher must have skills in researching applications of artificial intelligence in education	4.28	.844	10	Strongly Agree

5	The teacher must have sufficient knowledge of educational software platforms, e-learning technologies, and artificial intelligence	4.59	.738	2	Strongly Agree
6	The teacher must be proficient in using data analysis tools and digital learning management systems	4.31	.851	8	Strongly Agree
7	Data collection and analysis skills are among the most important skills a teacher must possess when using artificial intelligence in education	4.29	.963	9	Strongly Agree
8	The teacher needs to be flexible and receptive to modern teaching methods, such as artificial intelligence	4.47	.855	5	Strongly Agree
9	Building trust and open dialogue are skills that teachers must have when using artificial intelligence	4.51	.801	4	Strongly Agree
10	A teacher must be open to trying new things to meet the needs of his/her students and the learning process	4.53	.801	3	Strongly Agree
11	Artificial intelligence applications can bridge the communication gap between teachers and students	4.37	.896	7	Strongly Agree
Overall Mean		4.41	0,85	Strongly Agree	

The necessary skills for utilizing AI applications in education among elementary school teachers in the Bisha Governorate were rated at a very high level, with an overall mean of 4.41 and a standard deviation of 0.85, reflecting strong consistency in the participants' responses.

Key Findings

To enhance comprehension and provide a richer interpretation of the data, the findings are presented in narrative form. This approach allows the reader to grasp not only the statistical outcomes but also the contextual nuances that inform them. By weaving the results into a cohesive story, the narrative sheds light on patterns, anomalies, and key insights that may otherwise be obscured in purely quantitative formats. Through this method, the data becomes more accessible and meaningful, enabling stakeholders to make informed decisions based on a deeper understanding of the results.

4.1.2. Results Related to Research Question 2

The arithmetic means, standard deviations, ranks, and agreement levels for the Section 2 of the questionnaire were calculated to identify the challenges that hinder the development of AI-related skills among primary school teachers in the Bisha Governorate.

Table 9. Arithmetic Means, Standard Deviations, and Ranks for Section 2

Item Number	Item Description	Mean	Std. Deviation	Rank	Agreement Level
1	Low availability of electronic labs and subscription services for AI applications	4.63	.571	1	Strongly Agree

2	Insufficient technical support for faculty during the teaching process	4.54	.656	5	Strongly Agree
3	Lack of supportive e-learning tools for using AI applications	4.44	.741	8	Strongly Agree
4	Lack of studies and references on how to use AI in teaching	4.47	.722	6	Strongly Agree
5	High costs associated with using AI applications	4.31	.918	10	Strongly Agree
6	Variability in AI application sources, leading to inconsistencies in usage	4.43	.903	9	Strongly Agree
7	Low skill level of teachers in handling AI applications	4.57	.630	3	Strongly Agree
8	Teachers' need for training on the use of AI applications	4.56	.608	4	Strongly Agree
9	Lack of qualified personnel in managing AI applications	4.60	.626	2	Strongly Agree
10	Difficulty in measuring students' affective and psychomotor learning objectives using AI applications	4.47	.819	7	Strongly Agree
11	Negative attitudes of some teachers toward using AI applications in teaching	4.31	1.011	11	Strongly Agree
12	Belief that AI applications in teaching may eliminate the teachers' role	4.29	.963	12	Strongly Agree
Overall Mean		4.47	0,76	Strongly Agree	

The challenges hindering the development of AI-related skills among primary school teachers in Bisha Governorate were rated at a very high level, with an overall mean of 4.47 and a standard deviation of 0.76, which reflects a strong consistency in the participants' responses.

Key Findings

The study revealed several key challenges that hinder the effective integration of artificial intelligence (AI) applications in primary school education within the Bisha Governorate. Among these, the most pressing issue identified by participants was the low availability of electronic laboratories and subscription services required for AI applications. This challenge received the highest mean rating of 4.63, with a relatively low standard deviation (0.571), indicating a strong consensus among respondents regarding the severity of this infrastructural limitation. Such limited access to technological resources significantly impedes teachers' ability to explore and implement AI-driven tools in their classrooms.

Closely following this was the lack of qualified personnel to manage AI applications, which received a mean rating of 4.60 (SD = 0.626). This finding points to a broader systemic issue in human resource development, suggesting that even when digital infrastructure is in place, the absence of skilled technical support remains a critical bottleneck in leveraging AI technologies for educational improvement.

The third most significant challenge was the low skill level of teachers in handling AI applications, with a mean score of 4.57 (SD = 0.630). This highlights a clear need for professional development

initiatives focused on enhancing teachers' competencies in AI, as many currently lack the necessary skills and confidence to effectively integrate such tools into their teaching practices.

Interestingly, although still regarded as a notable concern, the belief that AI applications may eliminate the role of teachers was rated as the least severe challenge, receiving a mean of 4.29 and a standard deviation of 0.963. While this reflects a degree of apprehension about the role of AI in the classroom, it also suggests that teachers are more concerned with practical barriers—such as access to resources and training—than with existential threats posed by technology.

These findings are consistent with previous research in the field. Studies by Saragih (2024), Almuhanha (2024), Ng et al. (2021, 2025), and Bai et al. (2024) also identified similar challenges among mathematics teachers and emphasized the transformative potential of AI in education. Their research supports the idea that while educators recognize the promise of AI to address long-standing issues in teaching and learning, they are simultaneously constrained by technical and logistical limitations. Likewise, Al-Khibri (2020) found that primary school science teachers faced similar obstacles when attempting to implement AI, underscoring the broader relevance of these issues across subjects and educational levels.

In summary, the results of this study shed light on the complex interplay of infrastructural, technical, and attitudinal challenges that impede the development of AI-related skills among primary school teachers in Bisha. Addressing these challenges will require coordinated efforts, including investment in digital infrastructure, comprehensive teacher training programs, and awareness-raising initiatives to help educators see AI as a tool for enhancement rather than replacement. By focusing on these areas, policymakers and education leaders can create a more enabling environment for the effective integration of AI in primary education

4.1.3. Results Related to Research Question 3

The arithmetic means standard deviations, ranks, and agreement levels for Section 3 of the questionnaire were calculated to identify some proposals and measures for overcoming the challenges in developing teachers' AI skills in education.

Table 10. Arithmetic Means, Standard Deviations, and Ranks for Section 3

Item Number	Item Description	Mean	Std. Deviation	Rank	Agreement Level
1	Organizing scientific lectures and seminars to introduce teachers to AI and its importance in education	4.68	.502	1	Strongly Agree
2	Organizing necessary training courses for teachers on AI applications in education	4.63	.667	5	Strongly Agree
3	Providing necessary and specialized personnel for using modern technology in schools	4.66	.507	3	Strongly Agree
4	Encouraging teachers to attend AI-related training courses by offering financial incentives	4.62	.547	6	Strongly Agree
5	Providing modern devices necessary for using AI in education	4.68	.722	2	Strongly Agree
6	Providing studies and references on how to use AI in education	4.54	.762	7	Strongly Agree

7	Emphasizing the teachers' role in using AI in education and reassuring that it does not eliminate their role	4.65	.641	4	Strongly Agree
Overall Mean		4.64	0,62	Strongly Agree	

The proposed measures and suggestions for addressing the challenges of developing teachers' AI skills in education were rated at a very high level, with an overall mean of 4.64 and a standard deviation of 0.62, reflecting a high degree of consensus among the participants.

Key Findings

The study revealed that teachers place the greatest importance on organizing scientific lectures and seminars designed to introduce them to AI and its role in education. This proposal received the highest average rating, with a mean score of 4.68 and a relatively low standard deviation of 0.502, reflecting strong agreement among participants. This suggests that educators view direct engagement and awareness-building activities as crucial first steps in fostering AI integration.

Closely following this, the proposal to provide modern devices to support AI use in classrooms was rated just as highly, also receiving a mean score of 4.68, though with a slightly higher standard deviation of 0.722. This highlights that while there is general agreement on the importance of equipping teachers with the necessary technological tools, opinions vary somewhat more on this aspect.

Interestingly, the proposal with the lowest rating—though still regarded as important—involved providing studies and reference materials on how to use AI in education. It scored a mean of 4.54 with a standard deviation of 0.762. While this indicates it is somewhat less prioritized compared to direct training and resource provision, it remains a significant factor for supporting educators' development in this area.

These results align well with findings from previous research by Alam (2021) and Wang (2024), who emphasized the need for a multi-faceted approach to successfully implement AI in education. Such approaches include enhancing infrastructure, offering targeted training programs, and motivating teachers through incentives. Taken together, the evidence underscores the necessity of combining awareness-raising, resource availability, and teacher support initiatives to effectively build AI competencies among educators.

For policymakers and education leaders, these insights translate into clear actionable steps: prioritize organizing training and awareness sessions, ensure the provision of modern technological tools, and foster an encouraging environment that values teachers' roles amid AI integration. By adopting such comprehensive strategies, educational institutions can better prepare teachers to harness AI's potential in transforming learning experiences.

5. Conclusion

The findings highlight the crucial need for a comprehensive approach to overcoming the challenges faced in developing teachers' AI skills. One of the most significant factors is the organization of targeted training sessions and awareness programs, which equip educators with the knowledge and confidence to effectively integrate AI into their teaching practices. Equally important is ensuring that teachers have access to modern technology and the necessary resources, creating an environment conducive to experimentation and growth.

Beyond infrastructure and training, motivation plays a pivotal role. Providing incentives and reassuring teachers about their indispensable role in the education process is essential, especially as

AI becomes more integrated into classrooms. Teachers need to feel valued and supported, recognizing that AI is a tool to enhance their work rather than replace it.

Together, these insights offer actionable recommendations for policymakers and education leaders. By adopting this holistic strategy, they can foster an educational landscape where AI is effectively leveraged to improve learning outcomes, while empowering teachers to embrace these technological advances with confidence and enthusiasm.

5.1. Summary of Research Findings and Recommendations

The research revealed that primary school teachers in the Bisha Governorate require a substantial level of proficiency to effectively integrate AI applications into their educational practices. This need highlights the growing importance of equipping educators with the necessary technological skills to keep pace with advancements in teaching methods.

However, these teachers face numerous challenges that impede the development of their AI-related skills. Such obstacles range from limited access to resources and training opportunities to a lack of institutional support, all of which contribute to difficulties in adopting AI tools in the classroom.

Despite these challenges, the participants expressed a strong consensus regarding the proposed solutions aimed at addressing these barriers. They agreed that implementing targeted measures—such as professional development programs, improved infrastructure, and ongoing support—would be essential in empowering teachers to enhance their AI competencies and better utilize these technologies in education.

5.2. Research Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Establish electronic laboratories and provide subscription-based access to AI applications to enhance technological resources in schools.
2. Employ qualified specialists in modern technologies to offer ongoing support to teachers and educational institutions.
3. Develop and implement targeted training programs to equip educators with the necessary skills to effectively integrate AI tools into their teaching practices.
4. Organize regular scientific seminars and lectures to increase teachers' understanding of AI and its critical role in modern education.
5. Ensure the availability of up-to-date technological devices that facilitate the optimal use of AI in the classroom environment.

5.3. Research Proposals

In light of the findings and recommendations presented, this study emphasizes the need for further research exploring the applications of AI beyond the educational sector, given its substantial potential to impact a wide range of fields.

Declarations

Author Contributions. The authors contributed equally to drafting, analyzing the data, and proofreading this paper.

Conflicts of Interest. The authors declare no conflict of interest.

Funding. This research is funded by the Deanship of Scientific Research at King Khalid University, Saudi Arabia.

Ethical Approval. Approval from the university's authorities was obtained before the implementation of the study.

Data Availability Statement. Data are available from the corresponding author upon official request.

Acknowledgements. The authors extend their appreciation to the Deanship of Scientific Research in King Khalid University for funding this study through the Small Research Project under Grant Number G.R.P 1, /180/1446.

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