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The Role of Artificial Intelligence Applications in Enhancing Future-Foreseeing Skills among Early Childhood Teachers

Dr. Najlaa Mohammed Ali Ibrahim ⁽¹⁾, Ashwaq Obaid Majid Al-Rashidi ⁽²⁾, Abeer Obaid Majid Al-Rashidi ⁽³⁾

⁽¹⁾ Early Childhood Education – Faculty of Specific Education – Benha University-, Early Childhood Education – Faculty of Education – Al Jouf University. Email: nmali@ju.edu.sa, <https://orcid.org/0000-0002-7945-9011>

⁽²⁾ Master's degree in education early childhood Specialization – Hafr Al-Batin, Email: ashoq_11@icloud.com, <https://orcid.org/0009-0006-0851-7380>

⁽³⁾ Master's degree in education early childhood Specialization – Hafr Al-Batin, Email: ab26er@gmail.com- <https://orcid.org/my-orcid?orcid=0009-0004-0276-479X>

Corresponding Author: Najlaa Mohammed Ali Ibrahim

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Abstract

This study aimed to identify the role of artificial intelligence applications in enhancing future-foreseeing skills among early childhood teachers. The study adopted the descriptive analytical method, and data was collected using a questionnaire administered to a sample of 120 early childhood teachers in Al-Qurayyat Governorate. The results of the "first axis" showed that teachers have a positive vision regarding future foresight for the axis, with a high mean of (4.2). The phrase "I constantly develop my skills to keep pace with future changes" ranked first, followed by "I can adapt to technological changes in the field of education." In the "second axis," the results showed that teachers use technology to enhance their skills for the axis, with a high mean of (4.3). The phrase "Artificial intelligence helps save the teacher's time" ranked first, followed by "I use artificial intelligence applications to develop innovative study plans." In the "third axis," the results for the axis showed that teachers face challenges in using artificial intelligence applications with a high mean of (4.3). The phrase "There is a lack of educational resources related to artificial intelligence" ranked first, followed by "The technical infrastructure is insufficient to support the use of artificial intelligence." In the "fourth axis," the results showed a high approval rate for the proposals for the axis, with a high mean of (4.4). The phrase "Providing continuous training programs on the use of artificial intelligence" ranked first, followed by "Enhancing cooperation between educational and technical institutions will contribute to the development of integrated educational curricula that include artificial intelligence applications." Based on these results, a proposed vision was developed aimed at improving the quality of education by developing teachers' skills and empowering them to effectively face future challenges.

Key words

Future foresight, artificial intelligence, education, early childhood teachers

Introduction and Problem of the Study

The rapid technological development in the current era has led to a real revolution and radical changes in all aspects of life, resulting in new phenomena and direct impacts on various organizations and social structures. Early childhood is a fundamental turning point in the lives of children in educational institutions for this age group. Artificial intelligence applications are considered one of the main drivers for developing future education, with many hopes and expectations surrounding their potential applications in various fields of life. Education is one area where artificial intelligence can realize its greatest potential, especially in the professional development of teachers, starting from early education.

Artificial intelligence technology has imposed itself on all fields and levels, particularly in education and training, as it is a measure of progress and the development of the educational system globally, due to the effort and time savings it provides, and its push of the learning process for learners towards achieving their personal project, building self, and developing their skills and abilities, whether during classroom practice or lifelong learning (Shehata, 2022).

Su & Yang (2022) indicated that AI tools are increasingly used in early childhood education to enhance learning and development among young children and also to develop and nurture early childhood education workers, as the demand for AI-educated workers will increase in the future for early education. It is important to develop AI competencies for the next generation and educate them on how to work with and use AI. Previous studies on AI have primarily focused on secondary and university education; however, research on AI applications in early childhood is scarce.

Uymaz (2024) explained that it is necessary to work on developing future skills of female teachers using "Artificial Intelligence," as the development of teachers' skills is reflected in children, their education, and skill development. Additionally, kindergarten teachers have a prominent role in the educational process, so they must be prepared with future professional preparation that focuses on developing future education and its curricula in light of AI applications, which contributes to preparing children capable of consciously and effectively facing future problems.

Based on this, artificial intelligence, thanks to developments in the digital revolution and modern future technologies, has seen its applications interact with the educational system and the educational process for further development and improvement. This has been witnessed recently, where the human mind simulates programmed intelligence, understands its symbols, and becomes capable of finding solutions to complex problems in the future educational process (Kamel, 2024).

Al-Mahdi (2021) emphasized the importance of conducting studies on education and future challenges considering the philosophy of artificial intelligence because it is an important priority that should be on the list of concerns for education theorists and officials in society, due to the positive impact of this technology on education. Previous studies emphasize the importance of AI applications and their positive impact on developing teachers' skills, as confirmed by the results and recommendations of many previous studies, including the following:

- **Kamel (2024) study:** Aimed to explore the requirements for applying AI in early childhood education colleges and its impacts on the professional preparation of female student teachers in light of future foresight. The study used the field method, applying the study tool to a sample of students from early childhood education colleges. Key

findings included varying cognitive awareness among student teachers about AI applications and the need to develop specialized training programs to enhance teachers' skills.

- **Al-Aqla (2024) study:** Aimed to identify the requirements for applying AI in early childhood. The study used the field method, applying the study tool to a sample of early childhood teachers. Key findings included high percentages of requirements related to AI, and it recommended activating the application of AI in early childhood.
- **Al-Amri (2024) study:** Aimed to determine the role of AI applications in developing teacher performance in the Sultanate of Oman. The study used the field method, applying the study tool to a sample of Omani teachers. Key findings included the importance of employing AI in the teaching-learning process, and it recommended drawing the attention of decision-makers to the importance of applying AI tools in education.
- **Uymaz, M (2024) study:** Aimed to explore the perspectives of prospective teachers on the current state of AI and their expectations for its future development. The study used the field method, applying the study tool to a sample of prospective teachers. Key findings were that AI can be used to identify students' mental states, assess their levels, and provide customized content.
- **Solichah & Shofiah (2024) study:** Aimed to use AI in early childhood education. The study used the field method, applying the study tool to a sample of early childhood teachers. Key findings were that integrating AI into early childhood education significantly contributes to the development of active educational interventions for children.
- **Mishaal & Al-Eid (2023) study:** Aimed to examine the reality of employing AI applications in early childhood from the perspective of teachers in Al-Majma'ah Governorate, Saudi Arabia. The study used the field method, applying the study tool to a sample of early childhood teachers. Key findings included a significant weakness in early childhood teachers' knowledge of AI applications and the rarity of their employment in education.
- **Al-Zoghbi (2023) study:** Aimed to evaluate the effectiveness of an AI-based program in improving skills. The study used the field method, applying the study tool to a sample of teachers. Key findings were that the program showed significant effectiveness in improving skills, and it recommended providing continuous training for teachers.
- **Al-Ghamdi (2023) study:** Aimed to study the impact of using AI applications on improving selective attention in female students with learning disabilities in the primary stage. The study used the field method, applying the study tool to a sample of female students. Key findings were that there is an impact of using AI applications on improving the selective attention of female students.
- **Al-Anzi (2022) study:** Aimed to study the effectiveness of AI applications in improving and developing the educational environment. The study used the field method, applying the study tool to a sample of teachers. Key findings were that AI applications are effective in improving and developing the educational environment by reducing time and effort and solving complex problems.
- **Al-Jaroui (2020) study:** Aimed to study the impact of using AI technology in the e-learning environment on the development of future thinking skills and academic

achievement. The study used the field method, applying the study tool to a sample of teachers and students. Key findings were that the use of AI technology has a positive impact on developing future thinking skills and academic achievement.

Commentary on Previous Studies in terms of:

Points of Agreement with Previous Studies:

- **Importance of AI in Education:** All previous studies confirmed the positive role of AI applications in improving the quality of education and developing the skills of teachers and students.
- **Need for Training and Development:** Many studies, such as Kamel (2024) and Al-Aqla (2024), indicated the need for training programs to enhance teachers' skills in using AI applications.

Points of Difference from Previous Studies:

- **Focus on Early Childhood:** While some previous studies addressed AI applications in different educational stages, the current study focuses specifically on early childhood.
- The current study specifically focuses on enhancing future-foreseeing skills among teachers, an aspect not heavily emphasized in previous studies.

Points of Distinction from Previous Studies:

- The current study is distinguished by its focus on how to use AI applications to enhance future-foreseeing skills among early childhood teachers.
- The study presented a proposed vision for enhancing future-foreseeing skills using AI applications, adding practical value that can be applied in the educational reality.

Benefits from Previous Studies:

- The current study benefited from previous studies in building the theoretical framework and identifying basic concepts related to AI applications and future-foreseeing skills.
- Through reviewing previous studies, the current study was able to identify research gaps that have not been sufficiently addressed, such as the focus on early childhood and future foresight.
- The current study benefited from the tools and methods used in previous studies to develop its own research tools, such as questionnaires and interviews.

Due to the importance of the role played by the early childhood teacher in preparing the young for the future, by providing them with the necessary skills to efficiently deal with future events; it was important for her to know and acquire future-foreseeing skills, such as prediction, anticipation, imagination, and other skills, in addition to the necessity of her interest in including these skills while presenting and implementing lessons through AI applications to help create a thinking generation capable of participating in building the future of its homeland. The results of **El-Morsi study (2023)** indicated the importance of providing children with the skills necessary for future success and identifying a set of necessary educational competencies for early childhood teachers, recommending the need to pay attention to training programs provided to early childhood teachers and the use of modern technological methods in teaching. The results of **Hamed study (2023)** indicated that there is variation in the level of teachers' awareness of the concept of future foresight and its importance and emphasized the importance of integrating future foresight concepts into teacher training programs to develop future education for children, recommending the enhancement of continuous training programs for

teachers on future foresight concepts and the development of educational curricula focusing on children's future skills. The results of Abu Bakr study (2021) emphasized the importance of developing children's abilities to face future challenges and the necessity for teachers to possess the necessary experience and skills for self-learning and raising children according to the requirements of future childhood.

Based on what previous studies have confirmed and recommended, and the scarcity of studies that addressed developing future-foreseeing skills using AI applications, there became an urgent need to conduct this study to examine the role of AI applications in developing future-foreseeing skills among teachers in early childhood. Hence, the problem of the current study is summarized in answering the following main question:

What is the role of artificial intelligence applications in enhancing future-foreseeing skills among early childhood teachers?

Study Questions

1. What is the reality of future-foreseeing skills among early childhood teachers?
2. What is the role of artificial intelligence applications in enhancing future skills?
3. What is the proposed vision for enhancing future-foreseeing skills among early childhood teachers using artificial intelligence applications?

Study Objectives

The current study aims to achieve the following objectives:

- Identify artificial intelligence applications in early childhood.
- Identify the future-foreseeing skills that an early childhood teacher should possess.
- Reveal the reality of future-foreseeing skills among early childhood teachers.
- Determine the role of artificial intelligence applications in enhancing future-foreseeing skills.
- Reach a proposed vision for enhancing future skills among early childhood teachers using artificial intelligence applications.

Significance of the Study

Theoretical Importance:

- Provide a theoretical foundation and philosophical and methodological framework for future-foreseeing skills and artificial intelligence applications.
- Enrich the scientific literature related to artificial intelligence applications in education, especially in early childhood.
- Contribute to the development of new educational theories and strategies based on artificial intelligence to enhance future-foreseeing skills.

Practical Importance:

- Benefit decision-makers in the Ministry of Education regarding the requirements for enhancing future-foreseeing skills using artificial intelligence applications.
- Provide practical recommendations that the Ministry of Education can adopt to implement the proposed vision for enhancing future skills among early childhood teachers using artificial intelligence applications.

- Provide a framework that can be a starting point for conducting more studies on the use of artificial intelligence applications in the Saudi environment.
- Improve the quality of education in early childhood by enhancing teachers' skills using artificial intelligence technologies.

Study Limitations

- **Topical Boundaries:** The study was limited, in its topical aspect, to studying the role of artificial intelligence applications in enhancing future-foreseeing skills among early childhood teachers.
- **Geographical Boundaries:** The study was limited to a sample of teachers in the early childhood stage in Al-Qurayyat Governorate, Kingdom of Saudi Arabia.
- **Human Boundaries:** The research sample included some early childhood teachers.
- **Time Boundaries:** The field study was applied during the second semester of the academic year 1446 AH.

Study Terms

- **Artificial Intelligence:** "The science concerned with studying ideas introduced to machines to become capable of responding to stimuli in a manner consistent with traditional human responses such as the ability to think and judge, so that the device becomes capable of evaluation, criticism, and selecting different opinions within itself, thus enabling it to produce work with human skill" (Ashehri, 2019, p. 9).
- **Artificial Intelligence Applications:** "Computing systems capable of engaging in human mental processes such as learning, adaptation, synthesis, self-correction, and using data for complex processing tasks" (Luckin et al., 2016, p. 16).
- **Operational Definition:** The tools and programs that use artificial intelligence techniques to improve the educational process. These applications include interactive educational software, intelligent assessment systems, educational data analysis tools, and educational games based on AI. These applications aim to personalize education according to each student's needs, improve student interaction with educational materials, and provide additional support for teachers by automating routine tasks and providing accurate analytics on children's performance in early childhood.
- **Future-Foreseeing Skills:** "The core skills individuals need for the 21st century to understand issues of global importance and work to confront them" (Saavedra & Opfer, 2012).
- Kamel (2024) defined them as: A set of abilities performed by the teacher that enable him to deal and interact positively with future issues, developments, and life requirements in the 21st century.
- **Operational Definition:** A set of personal and performance skills that enable early childhood teachers to develop a future vision for their teaching performance. These skills stem from the teachers' awareness of their current reality and teaching competencies, benefiting from past experiences. These skills include the ability to adapt to the requirements of artificial intelligence and develop innovative teaching methods aimed at improving teaching performance in the future, ensuring better educational outcomes for children.
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Theoretical Framework

First Axis: Artificial Intelligence

AI Applications and Their Role in Education

In recent decades, information systems have witnessed radical transformations due to the enormous technological revolution in the field of information technology. These rapid changes have led to the emergence of new applications related to information activities and the establishment of modern standards for designing these systems. The emergence of the concept of artificial intelligence reflects tremendous progress in the field of technology and is one of the key innovations that enhance systems' ability to interact intelligently with their environment and continuously improve their performance. Artificial intelligence is one of the fruits of the Fourth Industrial Revolution and has diverse uses in several fields, including military, economic, industrial, technological, medical, and service applications.

Abdel-Mawgoud (2024, p. 565) referred to the Beijing Consensus 2017, an important document aimed at promoting international cooperation in artificial intelligence and education. This document was signed by representatives of countries, international organizations, academia, civil society, and the private sector. The document aims to address the challenges posed by AI to education and achieve sustainable development goals. The document focused on five areas:

1. AI for education management and delivery.
2. AI for empowering teaching and teachers.
3. AI for assessing education and learning.
4. Developing necessary skills for life and work.
5. AI for providing lifelong learning opportunities for all.

1. The Concept of Artificial Intelligence and Its Applications:

The term artificial intelligence refers to "systems or devices that mimic human intelligence to perform tasks and that can improve themselves based on the information they collect" (Mahmoud, 2020, p. 130). The term artificial intelligence includes software and systems that simulate intellectual aspects of humans, such as detecting meanings, the ability to think, and learning from previous experiences.

- **Researcher's Operational Definition:** "The science upon which AI applications and various computer programs are based, characterized by properties consistent with the mental capacities of teachers, enabling them to enhance future-foreseeing skills in early childhood, by performing many different processes and tasks to achieve the educational goals of this stage."

Al-Amri (2024) defined AI applications as: A set of applications, tools, and computer programs that a teacher of any subject can use and benefit from in the educational process, whether in planning, teaching, or assessment, to reach the desired goals, thus achieving more efficient education.

- **Researcher's Operational Definition of AI Applications:** "The software and technical tools that rely on machine learning techniques and data analysis, which aim to simulate and enhance human mental capabilities, enabling them to perform various tasks effectively and accurately, with the aim of improving future-foreseeing skills among early childhood teachers."

2. The Importance of Artificial Intelligence:

AI applications are considered one of the most prominent technological innovations of the current decade, with educational institutions increasingly benefiting from their potential. This technology allows for rapid and widespread dissemination, enhancing teachers' interaction with educational concepts and applications related to AI in early childhood.

Al-Amri (2024) pointed out the importance of artificial intelligence in the following points:

- In many fields, AI can perform routine tasks faster, better, or at a lower cost than humans.
- Understanding Vast Amounts of Data: AI helps humanity analyze vast amounts of structured and unstructured data.
- AI can use data and other inputs to make fact-based decisions, helping to improve efficiency and reduce errors.
- AI-powered chat interfaces can provide faster and more accurate customer service in many fields. AI can personalize the experience and services, providing customized service for each individual based on their specific needs.

Al-Aqla (2024) and Mishaal and Al-Eid (2023) added the following importance of AI:

- Creating massive databases.
- Adaptive training for learners.
- Increasing interaction among learners.
- Developing 21st-century skills.
- Providing personalized and adaptive education.
- Reducing administrative burdens.

3. Characteristics of Artificial Intelligence

Al-Ghamdi (2023, p. 68) referred to the characteristics of artificial intelligence as follows:

- **Thinking and Perception:** AI enhances teachers' abilities for critical thinking and solving complex problems, helping them make effective educational decisions and implement them efficiently.
- **Using Intelligence to Solve Problems:** AI can analyze a variety of data, whether in mathematics, engineering, or any other fields, helping to solve problems in innovative ways.
- **Learning from Experience:** AI relies on data and past experiences to improve its performance and deliver accurate results over time.
- **Acquiring and Applying Knowledge:** AI contributes to organizing and extracting knowledge from data and applying this knowledge in multiple fields to achieve tangible results.
- **Encouraging Creativity and Imagination:** AI shows high potential for creativity and imagination through innovating new solutions, enhancing traditional educational capabilities.

4. Artificial Intelligence Applications in Education:

Kamel (2024), Abdel-Mawgoud (2024), Al-Zoghbi (2023), and Al-Mahdi (2021) pointed out some AI applications that can be used in education, including:

- **Robotics:** This technology resembles human intelligence in its ability to process information and interact with humans. Robots have the ability for visual anticipation, movement, and touch, making them useful in managing the teaching process or teaching independently or as assistants. They can also help with office tasks such as distributing tasks and correcting tests, in addition to improving learners' motivation and enjoyment of the lesson.
- **Computer Science:** This type focuses on producing supercomputers that perform symbolic processing instead of digital, with a focus on hardware components to produce the required software.
- **Cognitive Science Applications:** Include adaptive learning systems that modify their path based on information provided by the user, in addition to expert systems.
- **Natural Language Processing Applications:** Among the most important applications of AI in expert systems and robotics, as they rely on understanding human languages and operating accordingly, in addition to the ability to talk to humans.

Studies by Al-Aqla (2024), Mishaal and Al-Eid (2023), and Al-Zoghbi (2023) indicated some models of AI applications that can be employed in the field of education in early childhood, namely:

- **Saudi Classera Educational Platform:** Aims to facilitate the distance learning process and provides a variety of educational materials and assessment means.
- **Math Thinker Application:** Monitors the mental processing of each learner and displays problems appropriate to their abilities.
- **Reinforced Machine Learning:** An algorithm that learns behavior through observation and adaptation to improve future performance.
- **Content Technologies Company:** Specializes in creating customized textbooks using algorithms to produce personalized study materials based on the basic concepts of the curriculum.
- **Brainly Website:** A site that allows asking homework questions and receiving answers from learners.
- **Netex Learning Website:** Allows teachers to design educational lessons and make them available.

5. Areas of Employing AI in Early Childhood:

Mishal and Al-Eid (2023) and Al-Zaghbi (2023) pointed to several areas where AI can be employed in early childhood, namely:

- **Understanding Child Learning Stages:** Using artificial neural networks for training on specific tasks and monitoring the impact of this training on performance.
- **Visual-Linguistic Interaction with Children:** Robots that use learning by imitation to teach children by reading and understanding their interaction.
- **Singular Learning:** A system that predicts the appropriate material for each learner based on their data, allowing for customized curricula and tests.

- Speech Recognition Programs: Converting sounds into written text.
- Natural Language Processing Programs: Understanding natural languages to instruct the computer directly.
- Speech Synthesis Programs: Converting written text into speech.
- Games: Using AI to develop computer games and make them closer to reality.
- Character Recognition and Reading Programs: Reading handwritten or printed characters and converting them into text.
- **Virtual Reality (VR) Technology:** Interactive simulation that allows the user to undergo different experiences.
- **Augmented Reality (AR) Technology:** Displaying 2D or 3D scenes in the user's environment to create an interactive display reality.

6. Requirements for Applying AI in Early Childhood:

Al-Mahdi (2021, p. 127) pointed out some requirements for applying AI, as follows:

- Stimulating Educational Environment: Providing a suitable educational environment for children's needs, including interactive applications and tools.
- Integration of Technologies with Traditional Curricula: Integrating AI with traditional educational curricula.
- Specialized Training for Teachers: Providing specialized training for using AI technologies.
- Providing Necessary Devices and Applications: Supplying schools with the necessary devices and applications.
- Preparing Training Programs: Training teachers on using AI applications in early childhood.

7. Challenges Facing AI Applications in Education:

Kamel (2024) and Al-Aqla (2024) indicated that AI applications in education face several challenges, including:

- Distinguishing Educational Objectives: It is difficult for machines to determine educational objectives according to their importance.
- Data Sources: The need to identify, collect, purify, and organize content.
- Infrastructure: Machine learning algorithms require massive data and high-quality infrastructure.
- Teacher Awareness: Lack of teacher awareness of using AI applications in education.
- Training: Lack of necessary training programs to qualify teachers cognitively.
- Learner Interaction: Weak interaction of learners with the new educational pattern.

Second Axis: Future-Foreseeing Skills in Early Childhood

1. The Nature of Future-Foreseeing Skills:

Future-foreseeing skills are defined as: "A systematic exploration of the future of contemporary issues and problems through a comprehensive scientific study, aimed at analyzing those issues and their potential impact on the course of events in the future, while

providing solutions and alternative visions to draw an optimal picture for the future of the country" (Kamel, 2024, p. 232).

- **Researcher's Operational Definition:** "A set of personal and performance skills related to the ability of the early childhood teacher to develop a future vision based on the current reality and benefiting from past experiences, using artificial intelligence applications."

2. Objectives of Future Foresight for Early Childhood Teachers:

Kamel (2024) and El-Morsi (2023) indicated that the objectives of future foresight are:

- **Educating Individuals and Stakeholders:** Providing society with the necessary knowledge to adapt to expected future economic, technological, social, and political changes.
- **Formulating Strategies:** Developing effective strategies to deal with future challenges, contributing to making informed decisions and avoiding negative repercussions.
- **Encouraging Creativity and Innovation:** Promoting a culture of creativity and innovation in educational institutions and developing future-foreseeing skills among teachers.
- **Identifying Long-Term Goals:** Setting achievable long-term goals and formulating studied strategies to reach those goals.
- **Interpreting the Present and Guiding the Future:** Understanding the present and its impact on the future, which helps in making informed decisions.
- **Anticipating Challenges and Opportunities:** Predicting future challenges and opportunities and preparing to face them effectively.
- **Making Informed Decisions:** Enhancing the ability of student teachers to make informed decisions based on future foresight.

3. The Importance of Future Foresight:

Future foresight is a vital process that requires analyzing current data and inputs and future goals, due to its role in guiding change correctly. Given the importance of development and change, focus must be placed on education to prepare generations for the requirements of the modern era. Therefore, it is necessary to intensify research and studies to determine the requirements of future education and develop educational programs that keep pace with future challenges.

El-Morsi (2023) and Al-Mahdi (2021) indicated that the importance of future foresight is evident in:

- **Contributing to Educational Renewal:** Developing the education process in its objectives, systems, programs, and means, to face future changes.
- **Efficiently Leading the Educational Planning Process:** The process of future foresight is carried out using the information on which the planning process is based to achieve the goals of education. Through future foresight, educators can identify educational alternatives and choose the most appropriate ones.
- **Future educational planning helps in anticipating potential images of the future, which contributes to achieving the desired goals and preparing for challenges without**

encountering problems. Future foresight is an important determinant in setting educational strategies that care about predicting the future of any educational system.

- Dealing with the present effectively is a challenge in future foresight, as individuals sometimes tend to neglect the influence of the future. Those who understand the present and the future will be able to exploit rare opportunities more effectively.
- Preparing for the future starts from the present by building the important infrastructure. Those who learn for the future in the present can succeed and advance in the present and the future. Therefore, a scientific and practical approach must be adopted to achieve the desired goals and prepare for future challenges.

The researcher deduced a set of skills for future foresight, which are as follows: The skill of understanding the present, which is research and reviewing, building self-learning activities, and comprehending current issues and events related to the future, and critical thinking skills. Also, future prediction skills, which are: discovering contradictions in ideas, and making responsible decisions.

Third Axis: Requirements for Applying AI in Early Childhood considering Future Foresight

Modern technology, especially artificial intelligence, helps improve the quality of education in early childhood by providing advanced educational tools. To achieve this, a set of requirements and modern technologies must be met, as indicated by Kamel (2024) and Al-Mahdi (2021), namely:

- Applying Intelligent Teaching Systems: Help improve learners' understanding of subjects by analyzing performance data and identifying weaknesses and strengths and meet the needs of each learner individually.
- Developing Technological Infrastructure: Applying AI requires a strong infrastructure that includes modern devices and advanced software.
- Providing Educational Platforms: Containing diverse educational resources.
- Training Teachers: Providing training programs for teachers to qualify them to use AI technologies.
- Enhancing teachers' skills in data analysis and using technological tools to improve the educational process.
- Developing Curricula: To include 21st-century skills, such as critical thinking and problem-solving.
- Encouraging Innovation and Creativity: Promoting a culture of innovation and creativity in educational institutions and supporting research projects aimed at developing new applications for AI in education.

Study Methodology

First: Study Approach: The current study relied on the descriptive analytical approach in achieving its objectives and answering its questions. The descriptive analytical approach is based on studying and analyzing the phenomenon as it exists, concerned with describing it accurately, the degree of its correlation with other phenomena, and developing a vision for its solutions (Qalash, 2017, p. 71).

Second: Study Population: Table (1) shows the study population, who are early childhood teachers in Al-Qurayyat Governorate in the Kingdom of Saudi Arabia. According to the

statistics of the Education Department in Al-Qurayyat, the number of teachers in government kindergartens is 135, in private kindergartens 56, and the total population is 191 teachers. The research sample size for applying the tool was determined to be (120 teachers) selected randomly.

Table (1): Study Population

Category	Population	Percentage (%)
Public Kindergartens	135	62.96
Private Kindergartens	56	62.50
Total	191	62.83

Third: Study Sample Characteristics: The study relies on a set of variables. Table (2) shows the primary data of the study sample according to the variables related to the personal characteristics of the study sample individuals.

Table (2):

Descriptive Data of the Study Sample (N = 120)

Variable	Response	Frequency	Percentage (%)
Qualification	Diploma	14	11.7
	Bachelor's Degree	89	74.2
	Master's Degree	3	2.5
	Doctorate	14	11.7
Type of Kindergarten	Public Kindergarten	79	65.8
	Private Kindergarten	41	34.2
Years of Experience	Less than 5 years	62	51.7
	5–10 years	27	22.5
	11–15 years	15	12.5
	More than 15 years	16	13.3

Fourth: Study Tool:

Since the aim of this study is to know the role of artificial intelligence applications in enhancing future-foreseeing skills among early childhood teachers, it was necessary to follow the following steps:

- **Preparing a Questionnaire Including:** The questionnaire was built by: determining the tool's objective, identifying sources for building the tool, describing the tool in its initial form, verifying the tool's validity, verifying the tool's reliability, and applying the tool. The tool was built according to the role played by AI applications in enhancing future-foreseeing skills among early childhood teachers.
- **Description of the Tool in its Initial Form:** The role of AI applications in enhancing future-foreseeing skills among early childhood teachers was derived by reviewing educational literature.
- After the arbitrators reviewed the questionnaire in its initial form, some of them suggested modifications to the phrasing of some items to ensure clarity of meaning and correctness of phrasing. The phrasing of some items in each axis was modified separately, bringing the number of tool items to 28 items in its final form.
- **Tool Description:** It is a questionnaire consisting of two parts, as follows:
 1. **Part One:** Deals with personal data (Qualification, Kindergarten Type, Years of Experience).
 2. **Part Two:** Questionnaire axes, which are:
 - **Axis One:** Future-Foreseeing Skills (7 items).

- **Axis Two:** The Role of AI Applications (7 items).
- **Axis Three:** Challenges and Obstacles Facing Teachers (7 items).
- **Axis Four:** Recommendations and Proposals that Enhance the Use of AI (7 items).

The scores were distributed on a five-point Likert scale, and the responses of the study sample individuals were adopted according to the five-point Likert scale from (1-5), where (1) represents the lowest degree of agreement, and (5) represents the highest degree of agreement, as follows:

Table (3):
Distribution of Scores on the Five-Point Likert Scale

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5	4	3	2	1

• **Validity and Reliability of the Study Tool**

The validity of the study tool was confirmed through:

1. **Face Validity of the Tool:** The study tool was presented to (5) arbitrators with experience and specialization to verify the soundness of the linguistic phrasing of the questionnaire, the clarity of its instructions, the belonging of the axes to the questionnaire, the belonging of the items to their axes, and the extent of the questionnaire's suitability for measuring the objectives associated with this study. Based on the arbitrators' opinions, the validity of the questionnaire was verified, as some of them suggested making modifications to the phrasing of some items to ensure clarity of meaning and correctness of phrasing. They also recommended deleting two phrases for not being related to the first axis. These modifications were implemented, including correcting spelling errors and rephrasing some items in each axis separately. Considering these opinions, the final tool was prepared to include 28 items.
2. **Internal Consistency Validity of the Tool:** To calculate validity, a pilot sample was randomly selected consisting of (18) teachers to verify the validity and reliability of the tool before applying it to the actual study sample. The pilot sample showed that the study tool items are correlated with each other and are characterized by a high degree of validity and reliability. Thus, validity and reliability were confirmed, and the tool was applied to the actual study sample. The correlation coefficient between the score of each axis of the questionnaire and the total score of the questionnaire was calculated, as shown in the following table:

Table (4):
Correlation Coefficients Between the Questionnaire Dimensions and the Total Score

No.	Dimensions	Correlation Coefficient
1	Future Foresight Skills	0.89**
2	Role of Artificial Intelligence Applications	0.93**
3	Challenges and Obstacles	0.84**
4	Recommendations and Suggestions	0.91**

Note. *Correlation is significant at the 0.01 level (2-tailed).

It is clear from the previous table that the correlation coefficients between the score of each axis and the total score of the questionnaire are statistically significant at the (0.01) level, indicating the validity of the tool for application.

3. **Reliability of the Tool:** The reliability of the tool was verified using Cronbach's Alpha method to measure internal consistency, and the results were as follows:

Table (5):

Reliability Coefficients of the Questionnaire Axes

No.	Dimensions	Reliability Coefficient
1	Future Foresight Skills	0.91
2	Role of Artificial Intelligence Applications	0.94
3	Challenges and Obstacles	0.87
4	Recommendations and Suggestions	0.98
Overall Questionnaire		0.92

As shown in Table (5), the reliability coefficients of the questionnaire dimensions ranged from 0.87 to 0.98, with an overall coefficient of 0.92. These values indicate a very high level of internal consistency, suggesting that the instrument is highly reliable in measuring the different dimensions. Therefore, the questionnaire can be considered a valid and dependable tool for data collection in this study.

4. **Statistical Processing:** The Statistical Package for the Social Sciences (SPSS) version 27 was used to calculate the following:

- The Mean (Arithmetic Average).
- The Standard Deviation.
- Pearson's Correlation Coefficient to verify the internal consistency validity.
- Cronbach's Alpha Coefficient to assess the reliability of the study instrument.

Additionally, percentages and means were employed to analyze the responses of the study sample. The following table presents the classification of the study's mean score values and the corresponding category for each range.

Table (6):

Classification of the Study's Mean Score Values

High	Moderate	Low
3.68 – 5.00	3.34 – 3.67	1.00 – 2.33

Note. This classification was used to interpret the arithmetic mean values of the study variables. Thus, it became possible to classify the mean score values of the study.

Results and Discussion

The statistical analysis of the participants' responses yielded the following results according to the study's main dimensions:

Answer to the Question:

What is the reality of future foresight skills among early childhood teachers, and what is the role of artificial intelligence applications in enhancing them?

To answer this question, the **mean** and **standard deviation** were calculated for each dimension separately.

Table (7) presents the arithmetic mean and standard deviation values of the participants' responses for the statements of the **first dimension**.

Table (7):

Means and Standard Deviations for the Dimension of Future Foresight Skills (n = 120)

No.	Item	Mean	Standard Deviation	%	Rank	Level
5	I continuously work on developing my skills to keep pace with future changes.	4.5	0.73	100	1	High
2	I can adapt to technological changes in the field of education.	4.4	0.56	97.8	2	High
3	I use innovative teaching methods to meet the future needs of students.	4.4	0.53	97.78	3	High
7	I use technology to enhance my skills in future foresight.	4.4	0.70	97.78	4	High
6	I participate in training courses on future foresight.	4.2	0.74	93.33	5	High
1	I possess the ability to think critically and analyze problems.	4.1	0.68	91.11	6	High
4	I can predict future challenges in the field of education.	3.8	1.00	84.44	7	High
Overall Mean		4.2	0.71	94.60		High

Interpretation:

Table (7) shows the results related to *future foresight skills*. The overall mean score was **4.2 out of 5 (94.60%)**, indicating a *high* level of agreement since it falls within the (3.68–5.00) range. The statement “*I continuously work on developing my skills to keep up with future changes*” achieved the highest mean (4.5), reflecting teachers' strong belief in the importance of continuous professional development. The relatively low standard deviation (0.73) indicates minor variability in responses. Similarly, the statement “*I can adapt to technological changes in the field of education*” also received a high mean (4.4) with a standard deviation of (0.56), suggesting a consistent consensus among respondents.

Table (8): Means and Standard Deviations for the Items of the Second Dimension: The Role of Artificial Intelligence Applications

No.	Item	Mean	Standard Deviation	%	Rank	Level
6	I believe that artificial intelligence helps teachers save time to focus on creative activities.	4.6	0.48	100.00	1	High
2	I use artificial intelligence applications to develop innovative lesson plans.	4.5	0.49	98.56	2	High
4	I believe that artificial intelligence helps in better analyzing children's performance.	4.4	0.56	97.83	3	High
1	I believe that artificial intelligence applications help improve my teaching skills.	4.3	0.50	97.65	4	High
3	I believe that artificial intelligence applications contribute to improving children's interaction with learning materials.	4.2	0.70	96.57	5	High
5	I use artificial intelligence applications to personalize learning according to each child's needs.	4.1	0.56	96.57	6	High
7	I believe that artificial intelligence contributes to improving the overall quality of education.	4.0	0.82	95.67	7	High
Overall Mean		4.3	0.59	97.55		High

Interpretation:

As shown in Table (8), the results related to the role of artificial intelligence (AI) applications in education indicate a high overall mean score of **4.3 out of 5** (97.55%), which falls within the *high* range (3.68–5.00). This suggests that the participants strongly agree on the positive role of AI in enhancing educational practices.

The item *“I believe that artificial intelligence helps teachers save time to focus on creative activities”* achieved the highest mean (4.6) with a low standard deviation (0.48), reflecting strong consensus among teachers on the efficiency of AI in reducing workload and enabling creative engagement. Likewise, the item *“I use artificial intelligence applications to develop innovative lesson plans”* scored a high mean (4.5) and low standard deviation (0.49), indicating that teachers view AI as a valuable tool for innovative instructional design.

Furthermore, the item *“I believe that artificial intelligence helps in better analyzing children’s performance”* obtained a mean of (4.4) with a standard deviation of (0.56), highlighting teachers’ recognition of AI’s potential in educational assessment while showing slight variation in responses.

Table (9):*Arithmetic mean and standard deviation of the statements of the third axis: Obstacles*

No.	Statement	Mean	Standard Deviation	%	Rank	Level
4	I believe there is a shortage of educational resources related to artificial intelligence.	4.6	0.48	100.00	1	High
2	I think the school’s technological infrastructure is insufficient to support the use of AI applications.	4.5	0.49	98.74	2	High
3	I face challenges in integrating artificial intelligence into the curriculum.	4.4	0.66	95.14	3	High
7	There is a lack of administrative support for the use of artificial intelligence in education.	4.4	0.50	96.94	4	High
5	I believe some colleagues resist using artificial intelligence in education.	4.3	0.58	94.43	5	High
1	I face difficulties using AI applications due to lack of training.	4.2	0.95	91.55	6	High
6	I find it difficult to keep up with rapid developments in the field of artificial intelligence.	4.0	0.86	88.31	7	High
Total Degree		4.3	0.51	95.02		High

It is evident from **Table (9)** that the results related to the obstacles faced by female teachers in using artificial intelligence applications indicate a **high level of agreement**, with a **percentage of 95.02%** and an **overall mean of 4.3 out of 5**, which falls within the high-level range (3.68–5.00).

The statement *“I believe there is a shortage of educational resources related to artificial intelligence”* obtained the **highest mean (4.6)**, indicating that teachers strongly believe there is a lack of educational resources related to AI. The **low standard deviation (0.48)** reflects a high level of agreement among participants.

Similarly, the statement *“I think the school’s technological infrastructure is insufficient to support the use of AI applications”* received a **high mean (4.5)** and a **low standard deviation (0.49)**, indicating consensus that the technological infrastructure is inadequate.

The statement *“I face challenges in integrating artificial intelligence into the*

curriculum” scored a **mean of 4.4**, which suggests that teachers encounter challenges in integrating AI into the curriculum; the **standard deviation (0.66)** shows some variation in responses but remains relatively low.

Table (10):

Arithmetic Mean and Standard Deviation of the Statements of the Fourth Axis: Proposed Solutions

No.	Statement	Mean	Standard Deviation	%	Rank	Level
1	I believe that providing continuous training programs on the use of artificial intelligence will improve my teaching skills.	4.6	0.46	100.00	1	High
2	I think enhancing cooperation between educational and technological institutions will help develop integrated curricula that include AI applications.	4.5	0.71	96.09	2	High
4	I believe that improving the technological infrastructure in schools will enhance the use of artificial intelligence.	4.5	0.71	96.09	3	High
3	I believe that providing advanced educational resources will improve the use of artificial intelligence in education.	4.4	0.71	96.09	4	High
5	I think providing administrative support and encouragement for using artificial intelligence will improve the quality of education.	4.3	0.70	97.33	5	High
6	I believe that organizing workshops and training courses on artificial intelligence will enhance teachers' skills.	4.2	0.70	97.33	6	High
7	I believe that sharing experiences among teachers regarding the use of artificial intelligence will improve teaching performance.	4.1	0.70	95.20	7	High
Total Degree		4.4	0.67	96.87		High

artificial intelligence in education show a **high level of agreement**, with a **percentage of 96.87%** and an **overall mean of 4.4 out of 5**, which falls within the high range (3.68–5.00).

The statement “*I believe that providing continuous training programs on the use of artificial intelligence will improve my teaching skills*” obtained the **highest mean (4.6)**, indicating that teachers strongly agree on the importance of continuous training to enhance their teaching skills. The **low standard deviation (0.46)** reflects a high level of consensus among participants.

Similarly, the statement “*I think enhancing cooperation between educational and technological institutions will help develop integrated curricula that include AI applications*” received a **high mean (4.5)**, suggesting that teachers view institutional cooperation as a key factor in developing comprehensive curricula that integrate AI applications. The **standard deviation (0.71)** indicates some variation in opinions yet remains within acceptable limits.

The statement “*I believe that improving the technological infrastructure in schools will enhance the use of artificial intelligence*” also achieved a **mean of 4.5**, emphasizing teachers' belief in the importance of strengthening technological infrastructure to support AI integration in schools.

Proposed Framework for Enhancing Future Foresight Skills among Early Childhood Teachers through Artificial Intelligence Applications

Introduction

In response to the study question: “*What is the proposed framework for enhancing future foresight skills among early childhood teachers using artificial intelligence applications?*”, the researcher developed a comprehensive conceptual framework entitled: “**A Proposed Framework for Activating the Role of Artificial Intelligence Applications in Enhancing Future Foresight Skills among Early Childhood Teachers.**”

Drawing upon both theoretical and empirical findings, the proposed framework aims to operationalize the role of AI technologies in fostering teachers’ foresight capabilities. It articulates the conceptual and philosophical foundations, rationale, objectives, target beneficiaries, implementation steps, and mechanisms for monitoring and evaluation, while also addressing the main barriers and potential solutions.

1. Concept of the Proposed Framework

The proposed framework represents a **forward-looking strategic plan** grounded in empirical evidence and methodological rigor. It aims to provide a **structured vision** for integrating artificial intelligence into early childhood education to empower teachers with the skills necessary for anticipating and addressing future educational challenges.

2. Philosophical Foundations

The framework is based on the **educational and technological philosophy** that artificial intelligence can play a transformative role in teacher development and classroom innovation. It emphasizes:

1. **Enhancing community participation:** Encouraging parental and local community engagement in educational decision-making to strengthen belonging and shared responsibility.
2. **Continuous evaluation and quality assurance:** Establishing ongoing mechanisms to track and improve educational performance.
3. **Leveraging community expertise:** Utilizing local talents and resources to support educational innovation.
4. **Employing AI for engagement and interaction:** Implementing AI-driven learning experiences that increase participation and connection among stakeholders.

3. Rationale for the Framework

The framework is justified by several key factors:

- The accelerating **technological transformation** in education and the urgent need to integrate smart applications in early learning environments.
- The **necessity of AI adoption** to improve learning quality and foster holistic child development.
- The **existing challenges** in early education such as limited digital resources and weak infrastructure.
- The need to **modernize educational practices** in alignment with Saudi Arabia’s Vision 2030 for digital transformation.

- The importance of **teacher capacity building** to adapt to the rapid educational shifts.
- The **predictive power** of AI in identifying and addressing future educational challenges.

4. Foundational Principles

The framework is built upon the following theoretical and practical premises:

- The **conceptual underpinnings** of AI in early childhood education and the study's empirical results confirming its significance.
- **Contemporary pedagogical and psychological principles**, focusing on creativity, problem-solving, and socio-emotional learning.
- **Alignment with national educational policies** of the Saudi Ministry of Education.
- **Availability of infrastructure and financial resources** to support smart technology integration.
- **Community-centered design**, reflecting the needs of students, parents, and society.
- **Continuous professional learning** and **institutional collaboration** between educational and technological entities.

5. Objectives of the Framework

The overarching goal is to establish effective mechanisms for integrating AI applications into early education to enhance teachers' foresight and innovation skills. Specific objectives include:

- Identifying the **requirements for AI implementation** in early childhood settings.
- Developing **assessment tools** that utilize AI to personalize learning.
- Improving teachers' **technological proficiency** and **professional growth**.
- Promoting **effective communication** between schools and families.
- Enhancing **learning quality** through interactive, child-centered digital experiences.
- Supporting **digital transformation** and **adaptive curricula** in early education institutions.

6. Target Beneficiaries

- **Ministry of Education:** For policy design and national implementation.
- **Early childhood teachers:** To enhance teaching quality and innovation.
- **Children:** To benefit from personalized, engaging learning experiences.
- **Parents:** To participate actively in the learning process.
- **Local communities and educational institutions:** To foster innovation and digital literacy.

7. Implementation Procedures

Step 1: Promoting a Culture of AI Adoption

- Conduct awareness workshops for teachers and parents.

- Launch social media campaigns highlighting AI benefits.
- Integrate AI-related activities into school schedules.

Step 2: Integrating AI into Early Education

- Embed AI concepts within curricula.
- Use AI tools for child assessment and adaptive learning.
- Develop interactive AI-based games and applications.
- Provide specialized teacher training programs.

Step 3: Innovative Curriculum Design and Public Engagement

- Hold community seminars to explain AI benefits.
- Involve parents in AI-related school initiatives.
- Promote success stories through media campaigns.

Step 4: Stakeholder Feedback and Evaluation

- Design and distribute surveys for teachers, parents, and administrators.
- Analyze data to refine implementation strategies.

Step 5: Monitoring and Performance Measurement

- Establish key performance indicators (KPIs).
- Conduct regular data-driven evaluations and improvement cycles.

8. Monitoring and Evaluation Mechanisms

- **Continuous assessment:** Ongoing review of AI implementation progress.
- **Annual report:** Documenting achievements and challenges.
- **Periodic review sessions:** Identifying strengths and improvement areas.

9. Anticipated Challenges and Mitigation Strategies**Challenges:**

- Limited awareness and resistance to change.
- Insufficient technical resources.
- Lack of professional training.

Solutions:

- Awareness and training programs.
- Infrastructure development.
- Continuous professional development.
- Institutional partnerships to provide technical support.

10. Recommendations and Future Research Directions**Recommendations:**

- Adoption of the proposed framework as a national model.

- Implementation of AI training programs for teachers.
- Strengthening educational–technological partnerships.
- Investing in digital infrastructure.
- Encouraging innovation and creative curriculum design.

Future Research Suggestions:

- The impact of continuous training programs on foresight skills.
- The role of infrastructure in AI adoption.
- Evaluating institutional collaboration effectiveness.
- Developing AI-based curricula and assessing their impact.
- Investigating challenges and barriers to AI integration.
- Studying the role of administrative and technical support in AI utilization.

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دور تطبيقات الذكاء الاصطناعي في تعزيز مهارات استشراف المستقبل

لدى المعلمات في مرحلة الطفولة المبكرة

د/ نجلاء محمد علي إبراهيم^(١)، أشواق عبيد ماجد الرشيد^(٢)، عبيد عبيد ماجد الرشيد^(٣)

^(١) قسم الطفولة المبكرة - كلية العلوم والآداب بالقريات - جامعة الجوف

^(١) قسم الطفولة المبكرة - كلية التربية النوعية - جامعة بنها.

Email: nmali@ju.edu.sa, <https://orcid.org/0000-0002-7945-9011>

^(٢) حاصلة على الماجستير في التربية - طفولة مبكرة - كلية التربية - جامعة حفر الباطن

Email: ashoq_11@icloud.com, <https://orcid.org/0009-0006-0851-7380>

^(٣) حاصلة على درجة الماجستير في التربية - طفولة مبكرة - جامعة حفر الباطن

Email: ab26er@gmail.com - <https://orcid.org/my-orcid?orcid=0009-0004-0276-479X>

ملخص البحث:

هدفت البحث إلى التعرف على دور تطبيقات الذكاء الاصطناعي في تعزيز مهارات استشراف المستقبل لدى معلمات مرحلة الطفولة المبكرة، واعتمدت الدراسة على المنهج الوصفي التحليلي، وتم جمع البيانات باستخدام الاستبانة التي طبقت على عينة مكونة من ١٢٠ معلمة في مرحلة الطفولة المبكرة بمحافظة القريات، وأظهرت نتائج "المحور الأول" أن المعلمات يمتلكن رؤية إيجابية حول استشراف المستقبل للمحور ككل بمتوسط (٤.٢) وهو مرتفع، وجاءت في المرتبة الأولى عبارة "أطور مهاراتي باستمرار لمواكبة التغيرات المستقبلية، ويليها عبارة "أستطيع التكيف مع التغيرات التكنولوجية في مجال التعليم"، وفي "المحور الثاني" أظهرت النتائج أن المعلمات يستخدمن التكنولوجيا لتعزيز مهاراتهم للمحور ككل بمتوسط (٤.٣) وهو مرتفع، وجاءت في المرتبة الأولى عبارة "الذكاء الاصطناعي يساعد في توفير وقت المعلمة"، ويليها عبارة "أستخدم تطبيقات الذكاء الاصطناعي لتطوير خطط دراسية مبتكرة" وفي "المحور الثالث" أظهرت النتائج للمحور ككل أن المعلمات يواجهن تحديات في استخدام تطبيقات الذكاء الاصطناعي بمتوسط (٤.٣) وهو مرتفع، وجاءت في المرتبة الأولى عبارة "هناك نقصاً في الموارد التعليمية المتعلقة بالذكاء الاصطناعي" ويليها عبارة "البنية التحتية التقنية غير كافية لدعم استخدام الذكاء الاصطناعي"، وفي "المحور الرابع" أظهرت النتائج أن هناك نسبة موافقة مرتفعة على المقترحات للمحور ككل بمتوسط (٤.٤) وهو مرتفع، وحصلت عبارة "توفير برامج تدريبية مستمرة حول استخدام الذكاء الاصطناعي" ويليها عبارة "تعزيز التعاون بين المؤسسات التعليمية والتقنية سيسهم في تطوير مناهج تعليمية متكاملة تشمل تطبيقات الذكاء الاصطناعي، وبناءً على هذه النتائج تم وضع تصور مقترح يهدف إلى تحسين جودة التعليم من خلال تطوير مهارات المعلمات وتمكينهن من مواجهة التحديات المستقبلية بفعالية.

الكلمات المفتاحية:

استشراف المستقبل، الذكاء الاصطناعي، التعليم، معلمات الطفولة المبكرة