Artificial intelligence Applications: An Approach to Developing Pre-University Education in Egypt

by

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Abstract:

The research aims to shed light on the concept of artificial intelligence, its importance, and the benefits of employing it in schools. Additionally, it highlights the advantages and disadvantages of utilizing AI applications in educational institutions, the ethical challenges facing these institutions, and presents numerous AI applications that schools can utilize to enhance administrative work and the educational process.

The most prominent results of the research were:

- Schools need to be properly equipped to effectively utilize AI applications.

- Teachers in schools fear that these applications may replace them, creating a culture that is hostile to the idea of employing them in the educational process.

- Utilizing these applications requires having a cybersecurity officer in schools to maintain the confidentiality of data and information.

- Literacy in AI for school principals and teachers is a necessity for utilizing these applications.

- NGOs play important roles in supporting schools to meet their needs (human, financial, and technical) related to utilizing these applications.

Keywords: Artificial Intelligence, Deep Learning, Algorithms, Natural Language.

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Introduction:

Several studies, such as those by (Ayala., 2023, Kolog et al., 2022, Xia, Nguyen et al, 2023, warith & Hashem, 2023, Fiok, et al., 2022, Mureşan, 2023, et al., 2022, Halagatti et al, 2023), have highlighted the importance of artificial intelligence and its applications in supporting administrative and educational processes, as well as the challenges facing its implementation in schools. According to the latest Global Education Monitoring Report, which focused on ''Technology in Education'', AI represents the most recent factor capable of revolutionizing educational systems.(UNESCO, 2023). While some advocate for AI's adaptability to the rapid technological transformations impacting education, others counsel caution about the utilization of technology, underscoring its advantages and disadvantages within the educational domains.

The current millennium has witnessed the beginning of the Fifth Industrial Revolution, which has largely centered around digital transformation, mobile internet, digital technologies, intelligent systems, and highly skilled computers, as well as the emergence of intelligent machines equipped with smart applications that mimic and even surpass human behavior, known as artificial intelligence.

There have been numerous definitions that refer to the concept of artificial intelligence. For example, (Akgun, & Greenhow,2022) define AI as "the combination of cognitive automation, machine learning, reasoning, hypothesis generation and analysis, neural network explosion, and intentional algorithm mutation producing insights and analytics at or above human capability, enabling the digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings, mimicking and exceeding the intelligent and creative person" (432-433).

The Organization for Economic Co-operation and Development (OECD) has stated that artificial intelligence "is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments, with varying levels of autonomy" (OECD, 2019). In other words, AI refers to the technology that builds thinking and acting systems that mimic humans, with the ability to accomplish the set goals, make predictions and recommendations, and make decisions that affect the work environment, while also possessing a degree of autonomy.

Khawaldeh (2019, p. 13) defined AI as "collective efforts made to develop computerized information systems in a way that enables them to act and think like humans. These systems can help learn natural languages and accomplish actual tasks in an integrated way. They can also use images and cognitive forms to rationalize Behavior, and at the same time, store and use accumulated human knowledge and experience to make decisions".

In other words, artificial intelligence refers to a package of intelligent computer applications and programs that help schools, teachers, and students store and employ human knowledge and accumulated experience, achieve specific school goals, generate insights, analyses, and recommendations, and provide decisions that affect the schoolwork environment. Thus, AI enables school-principals to accomplish their tasks related to administrative and educational work efficiently and effectively.

Although there is no single definitive definition of artificial intelligence, the main goal of artificial intelligence is to build systems that have the ability to think and act like humans, and to reduce dependence on humans for performing the complex processes that require high skills and knowledge.

Accordingly, there is an urgent need to use artificial intelligence applications in education in a way that contributes to making school management performance better and more appropriate to the needs and activities of education and society. Artificial intelligence helps to perform cognitive and routine tasks in a way that reflects the improvement of the administrative performance of school principals (Pedro, 2019, p. 18).

Given the widespread interest and spread of applications of artificial intelligence in education (AIED), it has become a pressing need to invest and benefit from it in the educational process in addition to utilizing it in anticipating and planning for the future (Al-Farani et al., 2020, p.٢١٨).

Based on the above, the forthcoming use of AI systems and applications in the Egyptian educational system will achieve complete automation of administrative and educational tasks in pre-university schools. This will help the Ministry of Education preserve accumulated human educational experiences by transferring them to expert systems and using them to solve educational problems quickly, accurately and efficiently. These applications can be employed to perform administrative tasks that involve complex details and require decisive and quick decisions that do not tolerate delay or error. They will also be used in decision-making in educational institutions or within their educational departments, as these systems can provide independence, accuracy and objectivity. Therefore, decisions taken will be free from errors, bias, and external or personal interference, which in turn will be positively reflected in improved institutional performance
 (NI et al., 2020, 972).

It has become impossible for countries to ignore the positive indicators of artificial intelligence and its impact on the emergence of computer vision technologies that allow analyzing and understanding videoclips and images in real time, the development of natural language processing algorithms that enable the creation of chatbots capable of conducting conversations similar to human conversations, and the advent of deep learning systems used in complex processes and many other applications (the National Strategy for Artificial Intelligence in Egypt, 2019).

The Human Development Report (2021) revealed that Egypt advanced to position (55) in government readiness for artificial intelligence. According to the Global Knowledge Index report, Egypt jumped from position (72nd) out of 138 countries in (2020) into position (53rd) out of 154 countries in (2021) (United Nations Development Program, 2021a; "Human Development Report," United Nations Development Program 2021b, "Global Knowledge Index Report".

Research Questions:

The current research seeks to answer the following questions:
- What is the historical development of artificial intelligence, its stages, and its classifications?
- What is the relationship between artificial intelligence and automation and technological singularity?
- What is the importance of utilizing artificial intelligence applications in education?
- What competencies should school principals and teachers have in order to effectively utilize artificial intelligence applications?
- What are the advantages and disadvantages of utilizing artificial intelligence applications in educational settings?
- What are the artificial intelligence applications that can be utilized to improve the administrative and educational process in schools?
- What are the challenges and ethical concerns of utilizing artificial intelligence applications in schools?

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123

Methodology:

To achieve its objectives, the research uses the descriptive method, which relies on "describing the phenomenon under study" (Creswell, 2012, 376). This method is considered appropriate for identifying artificial intelligence applications that support the development of public schools in Egypt.

Conceptual Framework:

- **Historical Development of Artificial Intelligence:**

The idea of artificial intelligence dates back to the 14th century AD, when Ramon Llull presented the idea that thinking processes can be linked to logic and implemented practically through an intelligent machine. One of Llull's most famous works was the book Ars agna, and the Ars refers to the principles, concepts, and questions that this machine provides (Jensen, 2018: 20).

In 1937, Turing proposed a more modern vision of how to formalize thinking and intelligent computations in intelligent computing machines. Turing (1950) provided a detailed explanation of his ideas in an article titled "Computing Machinery and Intelligence", which became the basis for modern discussions of artificial intelligence, although he did not use the term artificial intelligence (AI).

Two years after his death, John McCarthy began a research project on artificial intelligence (Hrastinski et al., 2019: 429), which marked the starting point for this field.

Interest in the applications of artificial intelligence in education began in the 1960s, going through several stages: (Saudi Data and Artificial Intelligence Authority, 2023: 6)

- o **Phase 1 (1960-1970):** With the emergence of some programs that rely on natural language, such as the SCHOLAR program, in which the student asks questions about the geography of South America and provides immediate feedback on his answers in natural language. This program was considered at that time to be the first intelligent education system.
- o **Phase 2 (1975-1990):** Development of the MYCIN system to assist doctors. This system was the basis for intelligent education systems, and the first issue of the International Journal of Artificial Intelligence in Education was published during this phase.
- o **Phase 3 (1990-2010):** This phase began with the emergence of the Internet, which helped to spread e-learning and distance learning using artificial intelligence technologies. The development of machine learning and natural language processing techniques has helped to improve the interaction between individuals and intelligent education systems. Artificial intelligence techniques have also been used extensively in intelligent assessment, especially in the field of foreign language learning.
- o **Phase 4 (2010 to the present)**: Development of chatbots, machine learning techniques, and deep learning, as a result of which artificial intelligence has made great strides in generating text and images, and this has had a positive impact on education.
- - **Classifications of Artificial Intelligence:**

According to computer science, artificial intelligence has been classified into three types (**Dallio,** 2023: 211-212):

- o **Narrow AI:** It is a system designed to perform a specific task or set of tasks within a narrow system. Some of its most famous applications include Chat GPT and GEMINI, which are applications that interact with humans but do not understand or know what they are doing, meaning that they are not aware of their own existence or the existence of humans. It relies on data and context to make complex decisions and interacts with humans in a natural and purposeful way.

o **Artificial General Intelligence** (AGI): It is a system capable of performing any given intellectual task that a human can do. This indicates that it has the ability to learn, think, plan, and solve problems in diverse contexts in a flexible and creative way. Unlike narrow AI systems, it is also distinguished by its ability to understand and interact with natural language.

o **Artificial Super intelligence** (ASI): It is a future state of artificial intelligence in which it surpasses human capabilities in all their aspects. It is assumed to be capable of self-improvement, learning, and evolving on its own without any human intervention.

- Artificial Intelligence and Automation:

There are many differences between Artificial Intelligence and Automation. Automation is a system that relies on rules defined by programming and operates in a predetermined logical sequence within this programming, meaning that equation (C) will have result (D) and not another result, and so on. However, artificial intelligence is about teaching the machine to make its own responses, as encryption and coding are not explicit, but allow the machine a degree of independence (Mukhtar, 2022: 291).

- Artificial Intelligence and Technological Singularity:

Artificial intelligence is linked to technological singularity, as the invention of super AI will lead to a sudden surge in technological growth that is out of control, which in turn will lead to unimaginable changes to human civilization. As artificial intelligence will be able to improve itself without human intervention, it will enter an endless cycle of self-development, which will lead to the emergence of new generations of artificial intelligence that are more intelligent, causing what is known as the intelligence explosion, which results in an entity with intelligence that surpasses all human intelligence combined (Al-Lasamsa, 2022: 12)

- Artificial Intelligence, Algorithms, and Neural Networks:

Algorithms and neural networks are the essential elements and driving force of artificial intelligence. An algorithm is a set of rules or instructions that computers must follow in problem-solving processes to achieve the intended end goal. Algorithms include thousands of lines of code that represent the mathematical instructions that the computer follows to solve the intended problems (such as numerical calculations, image processing, and grammatical checking in an essay). Artificial intelligence algorithms are applied to human behavior to enable it to recognize speech and faces, visual perception, learning, and decision-making. In this way, algorithms can provide enhancements to any imaginable AI system and application (Boucher, 2020: 10).

Neural networks, on the other hand, are inspired by the structure and mechanism of the human brain. The interconnection of many nerve cells can create a biological neural network that can perform a specific function with great density and precision by receiving multiple inputs, processing them, and then generating outputs in response. These cells work like someone with a lot of experience, meaning they are simply a computer model of the brain (Reddy et al., 2022: 166).

The design of algorithms and neural networks varies depending on the students, teachers, and school principal. For the student, the design takes into account the learning capabilities of the students (such as IQ, memory, and learning speed), and the psychological characteristics of the students, particularly teenagers (such as emotional state and forgetfulness), as well as teaching requirements (such as the curriculum and the teaching objectives), and the reality of

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125

teaching (such as the environment of the class and the difficulty of test questions). Keeping students informed of their learning status at any time and also allowing them to review and practice, makes learning more beneficial and thus significantly improves learning efficiency (Xue & Wang, 2022:5).

This design also helps the school principal keep up with all the school's conditions, such as the staff archive and various statistics. At the same time, it can summarize and analyze data to provide a basis for making quick and wise decisions. It allows continuous monitoring of the teaching process by keeping up with the latest dynamic information of all links and elements of teaching to supervise and manage the teaching process and prevent potential educational problems arising from societal or environmental changes. Artificial intelligence relies on a large amount of information, which is presented to the school principal in a summarized form, in addition to educational statistics and scientific feedback provided to him in a timely manner. The algorithmic power of artificial intelligence is also used to create predictive and diagnostic models to support decisions and generate comments at the school level, enabling successful management of the educational process in a world shaped by digital technologies (Creely et al., 2023:1311).

In the design of algorithms and neural networks for teachers, artificial intelligence applications can support the teacher by providing information about practical lesson plans, appropriate educational programs, and test models that align with student characteristics, test result statistics, and models for expanding teachers' knowledge and self-development. All of this serves to reduce their workload and facilitates identifying their students' educational status at any time and achieving the desired professional development (Xue & Wang, 2022:5).

From the above, it has become clear that the power of artificial intelligence lies in algorithms and neural networks, which can completely change the current teaching situation and management in schools. It can fundamentally solve the problems of traditional management and teaching, resulting from information delays, resource waste, misuse, and other issues, which helps to improve the quality of teaching and management efficiency.

Based on the above, It can be concluded that artificial intelligence is:

o A machine provided with numerous commands and instructions and whose work is linked to complex algorithms and neural networks, which are the driving force behind it.

o This machine teaches itself, and therefore, its responses are different, innovative, and unconventional.

o The work of this machine mimics the human being, is characterized by critical and creative thinking, and sometimes even surpasses him".

The Importance of Utilizing Artificial Intelligence Applications in Education

The significance of utilizing artificial intelligence (AI) in education lies in its penetration into all educational practices as it provides teachers and students with a variety of learning opportunities that enable them to achieve development and self-growth.

AI applications have personalized the learning process, playing a significant role as a smart teacher, coach, or educational advisor, in addition to automatic assessment and designing educational programs related to adaptive and personalized learning. They also offer opportunities for collaborative learning through asynchronous discussion groups and provide automated support for inquiries and instant feedback anywhere and anytime (Nguyen, 2023:4223).

International Journal of Recent Education   *http:/ijrer.journals.ekb.eg*
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126

These applications have provided the principal, teachers, and students with various opportunities for self-development and growth, which will be listed as follows:

1- The Importance of Utilizing Artificial Intelligence Applications for the Principal

The use of AI applications by the school principal saves a lot of the principal's time and effort and provides them with a wealth of data and information for analysis and processing to make decisions. This is detailed as follows:

- **Improving the performance of management platforms**: AI has significantly enhanced the work of management platforms, making them more secure by adding face authentication functions during tests, scheduling training courses, and staff data, and increasing the engagement of officials.

- **Supporting evidence-based decision-making**: AI has provided accurate data analysis, aiding the principal in making informed decisions based on comprehensive information. AI applications have given management teams evidence to support their decision-making. With the vast data stored by AI and its processing, it is possible to predict the likelihood and rates of student dropout, understand factors affecting their educational performance, and help them choose their educational path by analyzing student preferences. Thus, AI can provide the necessary information for making sound administrative decisions based on evidence (Xiong, 2023, 499-502).

- **Improving the administrative performance of school principal**: AI applications save time and effort and direct attention to necessary tasks, such as providing customized academic and non-academic recommendations, presenting models of study schedules proficiently and flexibly, tracking students' educational levels, providing data to parents, managing available school resources, and thus improving the efficiency of school processes and the quality of performance (Chiu et al., 2023: 9-10).

- **Speeding up and automating administrative tasks:** The AI-powered administrative system can be a more dynamic solution for the school principal to decide on organizing administrative and educational processes to improve student learning (Annuš, 2023: 3).

- **Improving communication with the school community**: By utilizing AI applications in preparing customized reports and messages for students, faculty, administrators, and parents, it can also be used to respond quickly and efficiently to inquiries from students and staff, especially those related to routine administrative tasks (Arab Authority for Data and Artificial Intelligence, 2023: 13).

2- The Importance of Utilizing Artificial Intelligence Applications for teachers

Artificial intelligence applications act as a smart teacher, coach, or educational advisor and play a significant role in providing automatic assessment and designing educational programs related to adaptive and personalized learning. They also offer opportunities for collaborative learning through asynchronous discussion groups and provide automated support for inquiries and instant feedback anywhere and anytime (Nguyen, 2023:4223). This role can be clarified as follows:

- **Effectiveness of the administrative tasks assigned to teachers**: AI applications are characterized by their powerful and rapid data processing capabilities, providing feedback on student work, detecting plagiarism, evaluating learning-related activities, and assessing students' responses in various subjects. This allows teachers to receive quick and detailed feedback on student performance, provide customized interventions based on the individual needs of each student, and even save time and resources (Tyson & Sauers, 2021: 274).

- **Teachers completing their teaching tasks with high quality**: Teachers' use of AI stems from their conviction that the attached smart applications save them a lot of time which in turn makes them active members guiding the learning process. AI will not replace the teacher but may change the nature of his role. Teaching is a complex profession, where teachers make dozens of decisions everyday related to classroom teaching processes, interactions with students outside the classroom, working with colleagues, and administrative duties they perform.

- **Serving as a temporary substitute teacher**: It is difficult for AI applications to act as an absolute substitute teacher, which requires students to have the ability to learn independently, master AI applications, and the skills associated with using these applications effectively. However, students' innate needs make them require external support from a teacher, which is difficult to replace. These applications can serve as a "facilitator," engaging students actively in processing and assembling information and concepts, which stimulates critical and creative thinking (Chiu et al., 2023: 27).

- **Achieving the desired professional development for teachers: through**:

  o **Pre-service teacher preparation**: By providing professional development opportunities, such as those offered in teaching halls. AI applications not only prepare teachers efficiently but also inform them of the new risks they may encounter when using these technologies and equip them with the necessary tools to avoid the pitfalls of AI.

  o **Making professional development for teachers more effective:** Artificial intelligence applications provide real opportunities for development through classroom simulation tools where teachers can practice their skills in realistic situations. The AI algorithm suggests highlights of the classroom discussion worth reviewing with a professional development coach and offers a realistic simulation that includes examples of teaching from a real classroom while changing the faces and voices of the participants so that teaching situations can be shared and discussed among teachers without revealing their identities, in away helping their professional development (Cardona et al, 2023, 29-30).

- **Predictive analytics:** Machine learning algorithms are used to analyze data and make predictions about future trends and patterns in education. Predictive analytics can be used to predict student performance, dropout rates, and success in specific courses. This information allows teachers to determine educational pathways for students, early intervention to support students at risk of lagging behind their peers, support their strengths, and respond quickly to their changing needs, helping them make wise decisions, provide assistance to students and intervene at the right and effective time.

- **Automated assessment:** AI algorithms help in assessing student assignments and tests. Automated assessment with AI is a powerful tool that helps teachers improve the student assessment process, offering several benefits, including:

  o **Time-saving:** It can help teachers save time and effort by automating routine assessment tasks such as grading tests and providing feedback.

  o **Improved assessment accuracy**: It helps improve the assessment process by providing an objective and fair evaluation of students.

  o **Personalized learning:** It helps provide actionable information about each student's strengths and weaknesses, aiding in the personalization of learning for Students.

- o **Enhanced communication with parents:** AI algorithms enhance communication with parents by providing comprehensive progress reports that are easy for parents to understand. This is a time-saving and effective method for teachers, allowing them more time to interact with their students and provide them with accurate and quick feedback that helps them identify and address weaknesses quickly and participate in self-directed learning (Cardona et al., 2023: 3, 26).

- **Creating a professional working environment for teachers**: that helps in dealing with struggling students: AI assists in delivering specialized learning in various ways, in addition to providing feedback on struggling students. Through the dual-teacher model, where the teacher collaborates with a virtual teacher who takes on the traditional teacher's role in delivering lessons to students using AI, this saves a lot of the teacher's time to develop remedial strategies for struggling students (Halagatti, 2023 266).

- **Supporting collaboration between AI developers and teachers**: To prevent AI systems from having complete freedom and autonomy in education, the study of (Celik et al., 2022,624) highlighted the school principal's support for the reciprocal relationship between AI developers and teachers. The teacher plays certain roles that feed AI systems, which in turn helps them accomplish three basic processes related to assessment, implementation, and planning.

3- **The Importance of Utilizing Artificial Intelligence Applications for Students**: In the era of artificial intelligence, these smart machines surpass the mental capabilities of students, allowing them to use them to develop unique human intelligence abilities such as innovation, creativity, imagination, problem-solving, communication, and other important skills to keep up with this era. The school principal supports the classes with artificial intelligence applications, which offer many advantages to the student, including:

- **Virtual guidance**: Artificial intelligence can be used to create educational programs and interactive virtual assistants, systems that can answer students' questions, provide additional explanations, and guide students in real-time during the learning process. Thus, through educational programs and virtual assistance, students can benefit from additional support, learn at an individual pace, and receive real-time guidance to support the learning process (Mureșan, 2023: 82).

- **Efficient use and investment of students' time**: Through educational platforms based on artificial intelligence applications, students can receive the desired education at any time without being restricted by class times, in addition to saving the wasted time going to school. They also provide students with the immediate feedback they need in the form of comments from the virtual teacher (Mukhtar, 2022: 298).

- **Providing students with information and support**: Through Chabot's and other applications and virtual assistants, which are computer programs that use artificial intelligence algorithms to provide students with quick access to information and answer frequently asked questions very quickly,

- **Personalized education:** is a teaching method that tailors educational content to students based on their strengths, weaknesses, interests, and learning styles. Artificial intelligence applications can precisely identify the curriculum and the student's weak points and when exactly these points appeared, through analyzing the student's formative data during actual teaching, making it capable of providing a personalized educational experience that suits their specific needs (Al Ka'bi, 2023: 68-69).

- **Enhancing the students' learning experience:** Artificial intelligence provides the possibility of changing the method of teaching and learning, by personalizing learning, adapting content to meet the individual student's needs, and also automating administrative tasks such as grading and scheduling, allowing teachers more space to focus on regulations. Moreover, artificial intelligence can contribute to identifying students' behavioral patterns, which in turn allows teachers to intervene as soon as possible when students face problems (Tkhayneh et al., 2023,106), all of which help to improve the quality of the educational process and support students' learning in schools.

- **Providing various learning styles: these applications offer smart education through:**

o **Machine Learning (ML):** which uses data and algorithms to perform tasks that humans usually do, through computers that perform their work without being given any step-by-step instructions. The mechanism of machine learning involves exposing the learning model to abundant quality data, analyzing and compiling it, through which a model is built to excel in the task or tasks assigned to the student, and then enabling him to successfully reach the desired results without teacher's intervention (Seldon et al., 2020:4).

o **Deep Learning (DL):** This type of machine learning uses a complex structure of artificial neural networks to mimic the human brain, and to understand different patterns and behaviors and their dimensions in normal situations or even with various sources of confusion such as noise, missing details, and other sources of confusion. In this learning style, artificial intelligence applications continuously refine the responses of previous layers, which is called forward propagation, in addition to another process called backpropagation, which identifies errors in computational processes, assigns them a degree of importance, and sends them back to previous layers for refinement. Image and voice recognition systems are also used, where the difference between machine learning and deep learning is that deep learning can recognize images and speech for the daily needs of the learner, and it is a fundamental component of many advanced artificial intelligence systems (Technology World, 2023, and Al-Khawaldeh, 2019: 112).

o **Natural Learning (NL):** Human language is one of the basic capabilities of artificial intelligence, where these smart devices are equipped with a huge amount of big data that helps them provide information in natural language. This is done through the interaction of computers with the natural languages of students, where artificial intelligence applications can understand this language and analyze it which helps students have a greater understanding of these technologies and motivates them to further explore their innovative capabilities (Alqahtani et al., 2023: 1236-1237).

o **Collaborative Learning:** Artificial intelligence applications also provide an important type of learning for students, which is collaborative learning. Artificial intelligence applications succeed in this learning style by suggesting groups of students most suitable for certain group work tasks, based on individual student models and making smart connections between them (including knowledge about the students' previous learning experiences, what the students are learning in other classes, their personalities, and more). It also classifies students into groups of varying abilities or similar abilities, or groups that avoid personal conflicts or mood swings, etc., enabling the teacher to quickly and easily deal with the tool's suggestions. Artificial intelligence also acts as a facilitator or expert mediator, monitoring students' collaborative activities, and providing targeted support when students have difficulty in understanding shared concepts. In addition, it may include a virtual agent (acting as a virtual peer) that actively contributes to group discussions or conducts dynamic communications (discussions conducted by other groups in the same classroom) (Holmes et al., 2023, 622-623)."

Competencies Required for Utilizing Artificial Intelligence Applications

In order to easily utilize artificial intelligence applications, those who use these applications in the school, whether the principal, teachers or the students, should have a set of competencies, which are as follows:

1. Learning Competencies: which is a combination of:

- **Cognitive Competency:** This refers to the awareness of school administrators / teachers of the social risks associated with technological changes and their ability to possess 21st-century skills focused on critical and creative thinking and problem-solving to deal with and cope with these changes which may produce aggressive behaviors against them. In addition, possessing these competencies makes administrators and teachers more willing to deal with the computers and smart devices in the school, because they are aware of their capability of achieving tasks very quickly which enhances their understanding of the concepts behind artificial intelligence algorithms and applications and their role in administrative work (Sanusi et al., 2022: 3).

- **Self-Learning Competency**: Self-learning is simply the situation in which the principal and the teacher learn on their own without the intervention of others, because they independently control what they learn, when they learn it, and how they learn it. Therefore, they determine the scope of learning, its goals, and sources of learning. Self-learning allows the learner to participate in forming his knowledge and improving his cognitive skills in education and in the workplace. Their self-competence also positively affects their self-learning expectations, based on the perceived role of self-learning by allowing learners to participate, which supports them in their attempts to acquire knowledge of artificial intelligence (Olaleye et al, 2021: 5514).

2. Competencies of the Work Team: these competencies can be acquired through:

- o **Teamwork Competency:** which is, "in its minimum level, the acquired ability to interact with team members". Today educational institutions increasingly rely on reorganizing their operational processes based on the theory of teamwork, which enhances participation, responsiveness and improves the performance. This competency is not limited to the school principal and teachers only, but it also helps students to become adaptable thinkers, able to cooperate to eliminate technological illiteracy, solve problems, think critically, lead their team colleagues, and implement corrective educational practices.

AI applications encourage this cooperation, which is the focus of this competency, through which problems are identified, discussed, and sound solutions are reached, which helps to create a good social environment based on teamwork. (Kit Ng et al., 2023: 150)

- o **Human-Machine Collaboration Competency:** teachers and principals have long collaborated to solve problems within the school and achieve effective student learning. With technological advancement, collaboration between individuals and AI-powered tools has become inevitable as one of the effective ways in the learning process and providing an enhanced learning experience for students and teachers. This collaboration has also facilitated the enhancement of the social and cognitive efficiency of students with learning difficulties through 3D educational games that have helped to attract these young learners and achieve their primary goal of integration and improve cognitive competence (Nuci et al., 2021: 91220–91221).

International Journal of Recent Education   *http:/ijrer.journals.ekb.eg*
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131

3. Cognitive Competency: which consists of two competency components:

o **Skills Competency:** Skills competency is the mastery of a specific set of acquired abilities necessary to perform specific tasks. This competency is an important factor for enabling principals and teachers to learn how to use AI (Djoub, 2021: 20).

o **Cultural Competency:** Cultural competency primarily refers to the principal's understanding of the diverse cultural backgrounds and human ideas of teachers and students, which are significantly affected and developed by the use of AI applications and technologies. This is done through the perspective of knowledge generalization, emotional management, value appreciation, and interest development - which enables them to correctly appreciate the importance and value of AI (Huang, 2021: 5135-5136)

4. Human and Motor Competencies: These competencies are related to the role of the school principal and the teacher in supporting students to acquire these competencies. The teacher should work with his students in the classroom and does not leave them use the machine independently while learning and provides them with immediate feedback and guidance, so that AI tools do not replace the role of the teacher in providing personalized support and feedback to students. Furthermore, teachers should prioritize teaching fine and gross motor skills, such as handwriting, that AI cannot replicate. By reinforcing and practicing these skills in the classroom, teachers can ensure that their students are developing the unique qualities that make them human, not machines, which helps in shaping their future thinking skills (Ayala, 2023: 894-895).

Accordingly, it has become clear that entering the era of artificial intelligence and coping with the new applications requires a set of competencies that the school principal must acquire and instill in teachers and students, whether they are cognitive competencies, teamwork competencies, learning competencies, or human and motor competencies, all of which make the principal, the teacher and the student aware of these smart applications and ways of utilizing them effectively, which has a positive impact on shaping and building human resources in society.

Advantages and Disadvantages of Using Artificial Intelligence Applications in Education:

Based on the foregoing, it is evident that despite the tremendous opportunities that artificial intelligence offers school administration and the principal's endeavors to support teachers and students towards utilizing and using artificial intelligence applications, its use may also come with some potential risks. Artificial intelligence has the potential to be the best or worst thing that can happen to humanity. An example of this is that due to the ongoing coronavirus pandemic and budget cuts, officials may consider replacing the management of the educational process with artificial intelligence. The increasing use of artificial intelligence in schools may also have other implications. Therefore, the following lines will clarify the advantages and disadvantages of using artificial intelligence in schools.

1. **Advantages:** Artificial intelligence applications are distinguished by many features that make their utilization a pressing need to effectively accomplish tasks whether administrative or educational. These advantages are as follows (Bouyeha, 2022: 96-97):

o Analyzing a large and enormous amount of information related to the school's financial and human capabilities enables school administration to make sound decisions.

- o Observing and analyzing similar data in ways better than the human mind, and with great speed.
- o Employing its cognitive ability to find unconventional solutions to problems.
- o Providing outputs that meet the needs of the school community in light of the inputs that have been entered.
- o Employing the learner's old administrative experiences in new situations.
- o Providing outputs that meet the needs of the learner in light of the inputs that have been entered.
- o The learning process is automated and self-directed, thus giving the learner a great deal of privacy.

A study by (Bhbosale et al., 2020, 228) mentioned some of the advantages of artificial intelligence systems, including:

- o These systems do not require a specific time to work like humans.
- o These systems can be reprogrammed to work for long periods without fatigue or boredom.
- o These systems can be deployed quickly within educational institutions, whether for administrative or educational work.
- o They have the ability to self-write and self-edit and other administrative burdens that the principal and teacher always bear.

A study by (Khanzode & Sarode, 2020: 34) indicated that the endeavor of institutions to use and apply artificial intelligence is due to the following advantages:

- o Completing the task faster, whether it is performed by the principal, the teacher, or the student assigned to it.
- o Completing strenuous and complex administrative and educational work with ease.
- o Shortening the time taken to complete difficult administrative work efficiently.
- o Enabling the principal and teacher to perform many different tasks at the same time.
- o High success rate and low error rate.

Disadvantages of Artificial Intelligence:

Despite the vast opportunities that AI offers, it may also come with some potential risks. The main disadvantages of AI in Education are as follows (Sawant & Vaghela, 2022: 513):

- o **Human interaction decreases,** especially for the student who interacts heavily with the machine and not the teacher, which creates an academic gap between them.
- o **Unemployment of teachers:** It may make people rely heavily on it as an alternative to the teacher, which leads to increased teacher unemployment.
- o **Financial problems:** Applying these systems may require financial resources, due to their high cost.
- o **A lack of emotional intelligence** that brings together the school principal, teacher, students, and parents.
- o **Artificial intelligence data problems and the possibility of its dissemination without privacy,** which exposes the school principal to many problems.

International Journal of Recent Education   *http:/ijrer.journals.ekb.eg*
Online ISSN:3009 – 710X   *Print ISSN:3009 - 6642*

133

o **The communication barrier decreases** within the school, especially between the school administration and the students in the classrooms, which can expose students to some psychological problems resulting from isolation.

o **Maintenance problems** resulting from the scarcity of artificial intelligence maintenance engineers.

o **Educational problems that lose the school's prestige within its community:** The most prominent of which is the student's use of artificial intelligence applications at anytime and anywhere which affected negatively the school's status.

Based on the foregoing, it can be concluded that there are disadvantages in utilizing artificial intelligence in the school. These disadvantages are due to the lack of the privacy of the data and information stored and the possibility of its disclosure anytime, the lack of the emotional aspect between the school principal, teachers, and students, the maintenance problems, and the high cost that the school administration incurs to obtain it. In addition to the weak communication links it caused, especially with students as a result of feelings of isolation which will expose them to many psychological diseases and other problems that can negatively affect the educational system and its outputs.

Artificial Intelligence Applications that can be Utilized to Support the Administrative and Educational Process in the School

First: GPT Chat Application, website link: https://openai.com

Benefits of GPT Chat for Upgrading the School's administrative Process:

o **Instant Analysis of Educational Performance:** It is used to analyze the students' test results and provide recommendations for improving performance.

o **Personalized Education:** The ability to provide personalized learning experiences for each student based on his own abilities and needs.

o **Developing Interactive Curricula:** Creating interactive and engaging learning materials that enhance learning and motivate students.

o **Facilitating the Teaching Process:** Providing resources and tools for teachers to facilitate the teaching process and improve their efficiency.

o **Managing Internal and External Communication:** Improving communication with teachers, students, and parents through quick and effective responses.

o **Continuous Evaluation and Improvement:** Using data and analytics to evaluate and improve educational and administrative processes.

o **Supporting Special Learning Needs:** Providing learning materials and strategies designed to support students with special needs.

o **Continuous Teacher Learning:** Providing professional development and continuous learning opportunities for teachers.

o **Student Guidance and Counseling:** Providing support and advice to students in areas of study and personal development.

o **Financial Resources Management:** Analyzing and estimating the school budget to improve financial efficiency.

o **Improving School Reputation:** Using advanced technology as a tool to improve the school's image and attract more students.

- **Providing Psychological Support for Students:** By providing support and advice to students on mental health issues.
- **Responding to Educational Changes:** Keeping up with the latest trends and developments in the field of education.
- **Risk Management:** Anticipating potential challenges and developing proactive plans to address them.
- **Promoting Collaborative Learning:** Encouraging collaboration among students through digital learning platforms.
- **Achieving Educational Inclusiveness:** Ensuring equal educational opportunities for all students.
- **Providing Academic Counseling:** Helping students choose educational and career paths.
- **Analyzing Educational Market Trends:** Understanding market dynamics to make strategic decisions.
- **Enhancing Innovation and Creativity:** Encouraging students and teachers to think creatively and adopt innovative approaches to education.

Second: Gemini AI Application, website link: https://gemini.google.com/chat

This application can improve the work efficiency in the school by:

- Creating and distributing class schedules to teachers.
- Preparing financial and administrative reports.
- Communicating with parents and students.
- Developing new and innovative educational programs.
- Solving complex administrative problems.
- Enhancing the student's educational experience.
- Creating discussion forums and collaboration platforms between teachers and students.
- Providing support for students with special needs.
- Analyzing the students' performance data.
- Tracking the results of educational programs.
- Planning the school budget.

Third: Copilot Application, website link: https://www.bing.com

This application is a daily AI companion developed by Microsoft. It can help the school principal to improve the school's performance in administrative, technical, and educational issues through the following:

- Preparing the strategic plan of the school that defines the vision, mission, goals, indicators, initiatives, and resources.
- Encouraging the culture of continuous learning and professional development for teachers, students, and staff.
- Implementing an effective and integrated school management system that facilitates administrative, financial, and academic processes.

o Strengthening communication and cooperation between all members of the school community and beyond.

o Using modern technology to improve the quality of education, evaluation, and follow-up.

o Implementing educational, social, cultural, and sports programs and activities that develop students' skills, abilities, and talents.

Fourth: Claude AI Application, website link: https://claude.ai/chats

This application helps to enhance the school's administrative process by:

o Helping the school principal write speeches and presentations quickly and accurately.

o Answering questions and providing advice on school policies and procedures.

o Summarizing the content of books and educational articles quickly to help the school principal.

o Summarizing educational data and reports and analyzing trends to support decision-making.

o Helping the school principal prepare budgets and forecast costs.

o Understanding and responding in Arabic to student and parent inquiries.

Fifth: Canva Application, website link: https://www.canva.com

This application offers many practical benefits for enhancing the school's administrative process:

o **Designing attractive educational materials:** such as educational posters, charts, and presentations.

o **Improving communication with parents:** Canva can help prepare newsletters, invitations to school events, and promotional materials for effective communication with parents.

o **Organizing school events:** Canva can be used to design invitations, cards, and posters for school events such as parties, trips, and competitions.

o **Preparing reports and presentations:** for educational conferences and meetings with the board of directors.

o **Motivating students and teachers:** by creating certificates of appreciation, awards, and motivational posters for students and teachers.

o **Facilitating distance learning:** In the context of e-learning, Canva can be used to create digital educational materials and interactive presentations that support distance learning.

o **Promoting the school:** The school principal can use Canva to design promotional materials for the school, such as advertisements, posters, and print materials to attract the attention of the local community and potential students.

o **Organizing administrative content:** Canva can help organize and design schedules, lesson plans, and class schedules in a clear and organized way.

o **Training and developing professional skills for teachers:** Canva can be used as a tool to train teachers on designing educational and promotional materials, which enhances their professional skills in technology and design.

Sixth: Taskade Application, website link: https://www.taskade.com

Taskade offers helpful tools for school principals to improve organization, collaboration, and effective management of resources and educational activities.

- o **Organizing administrative and educational tasks and projects, distributing tasks and tracking progress**.
- o **Team collaboration** among administrators and teachers by easily sharing work and documents.
- o **Schedule management:** The tools available in the application make it easy to manage classroom schedules and extracurricular activities.
- o **Improving communication:** The chat and video conferencing options in the application help to improve communication between management and teachers.
- o **Developing educational plans and strategies** through the tools available in the application.
- o **Organizing educational resources:** making it easy for teachers and administrators to access them.
- o **Tracking academic progress:** Taskade can be used to track academic progress, do evaluations and write reports.
- o **Organizing meetings and events:** It helps organize and track administrative meetings and school events.

Seventh: Socrative Application, website link https://www.socrative.com/

Socrative provides valuable tools to enhance educational interaction, improve assessment, and save teaching time, by:

- o **Instant assessment and interaction with students:** Socrative application provides an effective way to monitor and assess learning in real time, with immediate feedback.
- o **Creating customized learning activities:** Teachers can create different types of activities such as quizzes and surveys, with multiple options for customization.
- o **Saving teaching time:** Because quizzes in Socrative are automatically graded, teachers spend less time grading assignments and more time teaching.
- o **Compatibility with all platforms:** Socrative apps are available for download on all major digital devices, allowing them to be used on smartphones, tablets, laptops, and computers.
- o **Free for students:** Students can use Socrative for free on all devices.
- o **Promoting engagement and differentiation in teaching:** Socrative helps to motivate students and provide diverse learning tools to suit their different needs.
- o **Instant feedback:** Teachers can quickly get an understanding of how well students are comprehending the study materials through instant questions and adjust their teaching based on the results.
- o **Ease of creating and uploading quizzes:** Socrative makes it easy to create and upload quizzes, allowing them to be reused at different times.

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137

Eighth: TeacherKit Application, website link https://www.teacherkit.net/?lang=ar

TeacherKit offers a comprehensive set of tools that help school principals and teachers improve classroom management, enhance communication, and track students' academic progress, by:

- o **Managing classrooms effectively s**moothly and clearly.

- o **Tracking attendance and behavior:** Teachers can efficiently record and track student attendance and behavior.

- o **Communicating with students and parents:** The application facilitates communication between teachers, students, and their parents.

- o **Analyzing and sharing information:** TeacherKit provides tools for analyzing and sharing educational data, which enhances the educational process.

- o **Monitoring student progress:** The application helps to effectively monitor student progress.

- o **Suitable for different stages of education:** It can be used in different stages of education, from the primary to the higher education.

- o **Saving time and effort:** TeacherKit reduces the time required for routine tasks such as tracking attendance and behavior, allowing teachers to focus more on teaching.

- o **Using multiple languages and compatibility with multiple platforms:** it uses multiple languages and can be used on different operating systems such as iOS, Android, and MS Windows.

- o **Suitable for school principals:** the application helps school principals supervise classrooms and improve the overall educational process.

Ninth: Remind Application, website link https://www.remind.com/

The Remind application provides a comprehensive solution to improve communication within the school, which helps to effectively strengthen the educational and administrative environment, as follows:

- o **Enhancing communication between the school and families** in a way that strengthens community partnership.

- o **Supporting multilingual communication:** It provides translation services for over 90 languages allowing effective communication with families from diverse linguistic backgrounds.

- o **Managing communication at the classroom and school level:** this application allows for communication to be organized at the classroom level as well as at the school level.

- o **Providing privacy and security** by not sharing personal phone numbers and following the highest security standards to protect data.

- o **Communication in emergencies:** The application sends instant notifications in emergencies or urgent events.

- o **Ease of use and wide adoption:** It is characterized by its ease of use and adoption by teachers, students, and parents.

- o **Facilitating administrative communication** which improves administrative efficiency.

- o **Supporting academic engagement:** The application helps support learning and teaching through effective and ongoing communication.
- o **Effective communication with students:** Two-way text messages can be used for immediate communication with students, which enhances Student engagement and participation.

Tenth: Timetabler Application, website link: https://www.timetabler.com/

This application offers powerful and effective solutions for managing school schedules, helping school principals improve the academic and technical management of their schools through the following:

- o **Simplifying schedule creation:** Timetabler makes it easy to create schedules saving time and effort.
- o **Flexibility in curriculum planning:** It allows school principals to customize schedules to suit the needs of the school and students.
- o **Improving educational efficiency:** It helps in achieving the optimal distribution of resources and teachers, which enhances the educational process.
- o **Reducing conflicts and clashes in schedules:** This application provides solutions to common scheduling challenges.
- o **Managing special requests for teachers:** It allows the management of special requests such as part-time work and vacations.
- o **Integration with administrative information systems:** It integrates with administrative information systems in schools to facilitate administrative processes.
- o **International compatibility:** This application is used in over 90 countries, reflecting its flexibility and global effectiveness.
- o **Comprehensive support and training:** it provides technical support and training materials for users.

Ethical Concerns of Utilizing AI Applications in Schools

- o **Data security and privacy concerns:**

   One of the most prominent ethical concerns facing educational institutions and raising concerns of the school principal is how to maintain the security of data and personal information for each student, teacher, and all school employees. The use of AI applications in education requires the collection and processing of personal data for students, teachers, and all employees. This can raise privacy issues and ethical concerns, especially if data is not handled and protected properly. Any technological development should not be achieved at the expense of the privacy of the school community. The school principal should strive to enhance data management and protection through legislation to reduce the likelihood of data leaks (MAN, 2021:5) and there should be anti-hacking programs for these systems.

- o **Decision-making and bias concerns:**

   There are also concerns about decision-making and selecting the best alternatives using these smart applications. These systems are characterized by independence and a lack of human ability to control their decisions, which may benefit the educational institution, but at the same time may harm the surrounding community that the decision works for. (Rosseta, 2023: 713).

o **Academic integrity and plagiarism concerns:**

Despite the many advantages offered by natural language (human) AI applications, they may pose many ethical concerns that affect the management of the educational process. These concerns stem from the fact that students may use the available learning models to make their assignments or find answers to tests, instead of engaging in real learning, (Alqahtani et al., 2023:1237). Therefore, learning using these applications should be carefully managed and complemented by strategies that encourage real understanding and critical thinking, in addition to creating an educational environment that values academic integrity and prevents the misuse of such applications.

o **Algorithmic and a lack of transparency concerns:**

There is an ethical issue related to AI algorithms and a lack of transparency, to the point that even those who created the algorithm cannot explain how the variables come together to produce the resulting prediction. This lack of transparency is why some algorithms are referred to as "black boxes" (Anyman, 2022). This is what has led some legislatures at the present time to work on putting some controls in place, so that educational institutions are not put at risk in light of the weak ability of human intervention and the subjectivity of AI systems.

o **Cultural inappropriateness and bias concerns:**

One of the most important ethical concerns of using AI applications within educational institutions is related to the cultural dimension. AI systems rely heavily on the educational context associated with the cultural aspects of a particular country, which makes it difficult to use them in educational institutions with different cultural environments (Celik et al., 2022: 616, 625).

o **Social isolation and a lack of interaction concerns:**

These applications may also lead to weakening the social cohesion in the long term, as their use in education whether in meetings or data processing as well as in the management of the educational process, which is based on independent learning and allows the student to acquire knowledge at anytime and anywhere, all of which lead to weakening and reducing interaction between the school principal, teachers and students, between students and teachers, and between students with each other, which in turn leads to the loss of school and academic communication, and a lack of social interaction and isolation, which affects negatively the personal development of students. (Tkhayneh, 2023: 106).

Challenges Facing Schools when Utilizing AI applications:

Many studies have focused on the challenges facing school principals, teachers, and students when utilizing AI applications. These challenges include:

o **AI illiteracy:** The perplexing question is how to apply AI while a large percentage of teachers, school principals, and even students lack sufficient knowledge of AI skills, concepts, practices, and ethics. Such knowledge is essential before using AI, as emphasized by UNESCO (2021) when highlighting the need to "promote the development of skills for life in the age of AI, including teaching how AI works and its impacts" (Adams et al., 2023: 6-7).

o **Teacher concerns about AI applications:** Combining computer-assisted instruction with AI applications can help teachers manage the teaching process in classrooms. However, this can lead to a decrease in their self-efficacy, which negatively affects teachers' use of artificial intelligence applications in classroom teaching (Chiu et al., 2023, 9).

o **A lack of feedback from these systems:** Despite the adaptive and personalized feedback provided by these programs, they are not always able to provide different types of feedback based on students' needs. Therefore, they may not meet teachers' needs for effective feedback (Tkhayneh et al., 2023: 106).

A study of (Annuš, 2023: 3) has identified some of the challenges facing educational institutions, including:

o **High costs:** Developing and implementing AI technology may be expensive for educational institutions, especially in the developing countries. This makes it difficult to disseminate the use of these applications.

o **AI biases:** AI algorithms sometimes rely on biased data, which can lead to bias and discrimination in education. In addition, student data that is inappropriately controlled and filtered can be biased in a way that either misleads the learner in the learning process or provides inaccurate predictions.

o **The digital divide:** Another challenge related to the use of AI is its ability to widen the digital divide, as not all administrative and educational staff, including principals, teachers, and students, have equal access to technology or the internet. This may result in disparities in their ability to benefit from AI-powered tools and resources (Ayala, 2023:895), such as providing access to technology and internet resources, especially in underserved and marginalized communities.

A report issued by UNESCO (2019) discussed some of the challenges facing AI applications in education, and the most prominent of these challenges were (Pedró et al., 2019: 25-32):

o A lack of comprehensive vision for public policy on AI for sustainable development.

o New technological, economic, and social disagreements as AI develops.

o Poor teacher preparation for AI-based instruction:

o Few opportunities to develop high-quality and comprehensive data systems.

Results of the Research:

- Various artificial intelligence applications empower school administrators to manage both administrative and educational tasks within the school.

- AI applications motivate teachers to perform predictive analyses for students and their learning paths, automated assessments, and create a more professional environment for working with struggling students and those with special needs. Additionally, they expedite administrative tasks and provide pre-service and in-service professional development opportunities for teachers, enhancing their professional growth.

- The strength of AI applications lies in accelerating administrative tasks, supporting evidence-based decision-making, and providing diverse administrative services, including academic and non-academic recommendations, school scheduling, student tracking, and

timely communication with parents. These contribute to improving overall school processes.

- Effective AI applications require developing an ethical code between schools, teachers, and AI developers to safeguard the confidentiality of human data and information within the school.

- Artificial intelligence is closely linked to technological singularity, which could allow these machines to self-improve, potentially leading to unprecedented changes in human civilization—a phenomenon known as the AI explosion.

- AI applications in educational institutions align significantly with the Fifth Industrial Revolution, which has been emerging at the beginning of the current decade.

- AI-supported administrative platforms are secure tools for school management and educational officials, especially during examinations.

- It is essential for school principals to maintain control over classrooms, ensuring that students do not rely solely on smart applications for learning. This helps bridge the academic gap caused by the use of such smart machines in education and maintains students' emotional and psychological balance.

- While these applications do not directly make school decisions, they can provide alternative options that assist in making informed decisions.

- Partnerships with international and local organizations are crucial for enhancing AI literacy among school principals, teachers, and students.

- Principals should hold awareness seminars and meetings for parents about the importance of AI applications, encouraging their children to utilize these tools.

- Principals should actively monitor classroom practices, motivating teachers to implement what is included in the feedback and learning reports generated by students, thus enhancing teachers' effectiveness.

- Using encryption programs is essential to protect data and information from hacking and privacy breaches.

- Leveraging AI applications during meetings and interviews for data refinement and editing maximizes their utility.

- Principals act as intermediaries between teachers and AI developers, ensuring that these applications complement rather than replace teachers, enhancing their effectiveness.

- AI system development is not limited to the current work environment; yet its strength lies in the predictions and recommendations it provides.

- Artificial intelligence has three types: narrow AI, general AI, and super intelligent AI.

- The design of algorithms and neural networks enables AI applications in education to support school principals, teachers, and students. These designs vary based on the human element using them.

Discussions

Artificial intelligence applications in education have become essential in Egyptian public schools due to successive technological changes. These applications support technological advancements and enhance both administrative and educational performance. However, they also raise ethical concerns and challenges, particularly related to privacy and safeguarding school-related data and information. Additionally, teachers may resist these

applications for fear that they will eventually displace them. Therefore, raising awareness about the importance of AI applications in supporting both administrative and educational processes is crucial. Training educators on the specific applications to be utilized and holding seminars for parents can help disseminate awareness. It is expected that within a few months, these applications will be utilized in schools so as to enhance the quality of the educational and administrative processes.

Conclusions.

AI applications are significant for school administrators, teachers, and students, whether applied in administrative tasks or educational contexts. In administration, they alleviate administrative burden, provide high-quality educational services, facilitate informed decision-making, and optimize course and class distribution among teachers based on their abilities and experiences. Furthermore, they contribute to professional growth through training programs offered by administrative platforms.

On the educational front, AI applications allow teachers to collaborate with developers, reducing the autonomy of these applications in the teaching process. They create a more professional environment for teachers to interact with struggling students, simplify assessment through automated evaluation, and enable predictive analytics for timely educational decisions.

For students, these applications offer various learning modes, including specialized, deep, natural language-based, and collaborative learning. All of these approaches rely on AI algorithms and artificial neural networks, providing high-quality education tailored to individual needs, time, and available resources. This fosters a distinctive learning experience, helping students adapt to the demands of the modern era.

However, an ethical code must be developed to govern the use of these applications to prevent them from completely replacing human roles. They should remain supportive tools for both administrative and educational processes within schools. Additionally, using encryption programs is essential to protect data and maintain privacy.

Recommendations:

o **Inclusion in Curricula:** It is essential to incorporate artificial intelligence applications into educational curricula at all levels tailored to students' age groups.

o **Teacher Training Programs**: There is a need for developing training programs for teachers and school administrators to enhance their artificial intelligence literacy, enabling effective use of AI applications.

o **Infrastructure Readiness**: It is necessary to provide the requisite technological infrastructure in schools to effectively deploy artificial intelligence applications.

o **Collaboration and Partnerships**: It is essential to make partnerships between the Ministry of Education (MOE) and Information Technology companies to develop AI applications designed for educational purposes.

o **Research and Assessment**: There is a need for conducting specialized studies and research to investigate the impact of AI applications on improving the educational process and enhancing student achievement.

o **Ethical and Secure Use**: It is necessary to develop policies and mechanisms to ensure ethical and secure utilization of AI applications in education, considering privacy and intellectual property rights.

o **Community Awareness**: There is a need for increasing public awareness about the importance of AI applications in educational settings through awareness campaigns and educational seminars.

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143

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