



The Role of Artificial Intelligence in Distance Education

Saida Khedrane *

Laboratory of Political, Economic and Social Transformation in Algeria
Kasdi Merbah University Ouargla (Algeria), Saida.khedrane@univ-ouargla.dz

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Abstract:

Education is one of the most prominent sustainable development goals of the 2030 Plan, and the United Nations is interested in everything that can enhance this, as it confirmed that artificial intelligence is one of the tools that support the continuation and spread of distance education, which emerged in light of the global health crisis Covid-19.

The study aims to shed light on the topic of artificial intelligence and distance education, by revealing the interactive relationship between them and the role that artificial intelligence plays in supporting distance education, along with the most important challenges facing it, which prompts us to ask: *What is the role of artificial intelligence in Distance Learning and what are the challenges it faces?* And the answer to that. The descriptive approach was used, and the study was divided into: (Definition of Artificial Intelligence - Definition of Distance Education - The Relationship between Artificial Intelligence and Distance Education - Challenges of Artificial Intelligence in Distance Education).

The study concluded that artificial intelligence ensures the continuation of distance education for all with less effort and costs, and creates personalized educational experiences. However, it still faces many challenges, including poor infrastructure and lack of technological resources.

Keywords: Artificial intelligence; Artificial intelligence challenges; Continuing education; Distance education; Online education.

* Corresponding author



1. INTRODUCTION

The health conditions in the world due to Covid-19 have imposed the necessity of relying on artificial intelligence applications to ensure the continuation of the educational process remotely in compliance with the sustainable development goals. The United Nations has reported that artificial intelligence is considered one of the technological tools that support ensuring distance education. What has increased its importance is the readiness of countries, especially those who signed the 2030 Sustainable Development Agenda, for a future in which artificial intelligence becomes the basis of interactions. Especially after the Covid-19 global health crisis, which transferred reliance on it from an option to a requirement.

The world today has become known as the age of technology, in which machines and artificial intelligence technologies have become a partner and driver of all dimensions of life, including education. Artificial intelligence can solve the problems that traditional face-to-face education suffers from by moving to distance education, which improves the learning process. This is due to its ability to create special educational models, provide huge data, and manage the educational process with less time and effort and in any place, which prompts us to be interested in using artificial intelligence in distance education. (Murat Ertan , Tulay, & Aras , 2023, p. 1).

Depending on artificial intelligence techniques in distance education, and the world's move towards digital transformation, the evaluation and classification standards for education systems in the world have changed.

Distance education depends on human-machine interactions, so we need to use artificial intelligence techniques to address education issues (Mansor & Tengku , 2008). Artificial intelligence introduced different methods that were not present in face-to-face education, which improved the level of education (Fan, Luyi , & Pengcheng , 2022, p. 7893) .

Accordingly, The study aims to shed light on the topic of artificial intelligence and distance education, by revealing the interactive relationship between them and the role that artificial intelligence plays in supporting distance education, along with the most important challenges facing it, which prompts us to ask: ***What is the role of artificial intelligence in Distance Learning and what are the challenges it faces?***, The descriptive approach was used, and the study was divided into:

(Definition of Artificial Intelligence - Definition of Distance Education - The Relationship between Artificial Intelligence and Distance Education - Challenges of Artificial Intelligence in Distance Education).



2. Definition of Artificial Intelligence:

The Internet played a prominent role in the emergence of artificial intelligence applications until it became part of all areas of life (Huawei Technologies Co., 2022, p. 1). Researchers define artificial intelligence as “A branch of computer science that makes computers mimic human behavior to help perform better in science and technology” (Moumita & Thirugnanam , 2021, p. 23). Defined as “Machine-based systems that are guided by human-defined goals make predictions, make recommendations, and make decisions based on them that affect them in a real or virtual context” It defined as “ Computer systems have the ability to integrate processes that mimic human intelligence, such as learning, adapting, analyzing, adjusting, correcting, and using data to address complex issues” (Patricia & Joan , 2024).

It is clear from the definition that artificial intelligence is primarily based on human intelligence and attempts to simulate its functions, as it works to “Replicating human intelligence to process big data,, create machines that can perform tasks that require human intelligence, and design a self-learning system” (Moumita & Thirugnanam , 2021).

The development in artificial intelligence technologies is considered a support tool for distance learning and a continuation of the educational process (Gulnora, Farida , & Sayidolim , 15-22/12/2022).

Artificial intelligence includes many branches of learning, the most important of which are:

- **Machine learning:** “It expresses algorithms that use educational data to identify patterns through successive training” (Sdenka Zobeida , Kejiang , & Xinyun , 2023, p. 2), that is, it relies on the machine to repeat data and distinguish between its patterns (Patricia & Joan , 2024).Automation is a technological means that provides answers and solutions to daily problems and educational problems, helps achieve learning speed and response, improves the level of performance and learning efficiency (Rahman , et al., 2023, p. 52573).
- **Deep learning:** It is an advanced stage of learning that goes beyond machine learning and goes deeper into using “large data sets to simulate and predict educational outcomes” (Sdenka Zobeida , Kejiang , & Xinyun , 2023). Deep learning plays an important role in the success of distance education because it performs several processes such as: “organizing and arranging many forms of knowledge. Deep learning involves focusing on fundamental importance. It is also related to the use of analytical abilities, cross-referencing, imaginative reconstruction, and free thinking” (Rahman , et al., 2023, p. 52754).
- **Natural language processing:** Natural language processing means “the ability of computers to understand, interpret, and generate human language, including speech and texts” (Abdulaziz , Abdel Magid , & Khalifa N. , 2023, p. 2).
- **Computer vision:** Computer vision means “the ability of a computer to analyze and interpret visual information such as images and video” (Abdulaziz , Abdel Magid , & Khalifa N. , 2023, p. 2).



Figure. Depicts AI technologies



Source: (Abdulaziz , Abdel Magid , & Khalifa N. , 2023, p. 2)

From the above, it is clear that artificial intelligence can solve many complex issues accurately, quickly, and effectively. Studies have shown that the use of artificial intelligence is programmed from several fields that enhance its ability to simulate human intelligence, most notably mathematics, biology, philosophy, psychology and neuroscience, statistics and computer science, as these sciences are used in: "developing algorithms, studying the human mind and its behavior, big data, operating... Algorithm and Concept Implementation" (Moumita & Thirugnanam , 2021, p. 24).



3. Definition of Distance Education:

In recent years, the world has witnessed the spread of a new style of education that differs from the approved face-to-face modes of education, known as distance education. It was limited to a number of countries because it requires requirements that are often expensive and require great preparation, infrastructure, and awareness of how to deal with distance education technologies. Distance education was an alternative or complementary option to traditional education, which relies primarily on face-to-face teaching. However, the world began to adopt it because of global policies pushing towards the adoption of technology in education to facilitate access to knowledge and the possibility of education for all. Distance education has witnessed development due to its flexibility. The emergence of various platforms such as learning management systems has led to the spread of distance education, which has expanded the circle of interaction between the elements of the educational process "the teacher, the student, and the educational content". (Anderson , et al., 2021, p. 1).

It is worth noting that distance education was limited to certain countries before the Covid-19 pandemic and was optional, then it turned into a necessity after it as a preventive solution to stop the spread of the epidemic, and since that time it has become a system approved by all countries alongside traditional face-to-face education (Magdalena, Magdalena , & Klaudia , 2023, p. 1).

Researchers define the distance education system as "education that uses computer technologies and learning platforms to provide education to students virtually and support regular interaction without bias between students and teachers, synchronously or asynchronously" (Patricia & Joan , 2024). He is required to be connected to the Internet.

It is clear from the definition that the distance education process includes features that improve the educational process and ensure its continuity and the possibility of benefiting from it on a large scale, allowing a large number of students to benefit from educational opportunities regardless of geographical and financial restrictions (Gulnora, Farida , & Sayidolim , 15-22/12/2022).

Distance education includes two main types (Magdalena, Magdalena , & Klaudia , 2023, p. 2):

- **Asynchronous distance education:** is a style of distance education that depends on interaction between the teacher and the learner at any time. The interaction is not limited to being present during official work time or in the classroom. Rather, the interaction appears on education platforms, in chat rooms, or through recording lectures or visual educational programs.
- **Synchronous distance education:** requires interaction at the same time, such as entering educational platforms and rooms at the specified time to attend live lectures via the Internet.

In fact, there is a third style that is common all over the world, especially in countries that have recently transitioned to distance education, which is a hybrid style between synchronous and asynchronous.

4. The Relationship between Artificial Intelligence and Distance Education:



Studies have proven that artificial intelligence plays a role in supporting distance education. This does not mean that it does not have a negative impact on the distance learning process, which is what we are trying to clarify in this element.

Based on the above, we find that the concept of artificial intelligence and its capabilities in quickly solving complex problems in all areas of human life and simulating human intelligence, especially in educational functions, has contributed to making distance education an effective method in education. Especially with the emergence of machine learning and artificial intelligence applications (Utku , 2018).

Its forms varied from synchronous, asynchronous and hybrid. Artificial intelligence has become a major player in the fields of life. In education, we can say that applications of artificial intelligence continue to evolve to produce the best and highest quality educational opportunities. “Advancements in artificial intelligence are likely to create new ways of learning, such as using learning analytics to track and support students via data captured in learning management systems” (Amara , Meena, Deborah, & Ayse , 2021, p. 3).

Therefore, the study in this component explores the contribution of artificial intelligence to distance education.

Artificial intelligence supports distance education by “employing intelligent teaching systems, intelligent agents, and intelligent collaborative learning systems, and it requires an interdisciplinary approach to integrate many fields” (Sdenka Zobeida , Kejiang , & Xinyun , 2023, p. 2).

On the other hand, artificial intelligence contributes to the speed of decision-making for teachers because of artificial intelligence technologies providing algorithms and software that provide the ability to report the classroom situation in real time and respond to students’ needs via the educational platform (Patricia & Joan , 2024). Without forgetting the capabilities of artificial intelligence in machine learning, deep learning, etc. Which can increase the efficiency of the educational process and ensure continuous education for all with less effort, time and cost.

Many studies have confirmed that artificial intelligence, in all its branches and technologies, creates flexible educational environments that allow dogs to choose the appropriate time and educational style for them, which gives everyone an opportunity to continue education and adapt it according to their burdens.

Studies have shown that artificial intelligence contributes to the student learning process through: First: Direct teaching means transferring knowledge to the student while playing the role of teacher. Second: Supporting teaching through support and cooperation with students while they are learning. Third: Empowering the learner through the teacher directing the students towards solving a complex problem (Suresh, Rajprasath, Elantamilan, & Arghya , 2023, p. 1). Which raises the level of learning and develops students’ abilities.

Artificial intelligence has many systems that support distance education, the most important of which are:

- **Intelligent teaching system:** means intelligent teaching systems “that adapt and attempt to



emulate the benefits of human self-teaching” (Ismail, Muhterem, Hanni , & Sanna , 2022, p. 625). So it can create a personalized learning experience using a set of algorithms that analyze a large number of education data, and monitor the student’s performance and learning style choices. It thus contributes significantly to distance learning, and thus “is considered an auxiliary research area for distance education” (Changling, Xuanyu, & Shuai , 2022, p. 1148). With content adaptation according to students’ needs and data analysis (Ismail, Muhterem, Hanni , & Sanna , 2022, p. 625).

- **Gamification:** It is considered one of the artificial intelligence systems that contribute to enhancing distance education. “Games use reasoning techniques and data analysis while playing the game with the intention of improving the player’s skills” (Magdalena, Magdalena , & Klaudia , 2023, p. 1).

This system can stimulate students’ participation in the distance education process and give them an interactive atmosphere that reflects cooperation and increases the results of distance education. In other words, artificial intelligence has played an important role in adopting and advancing education through:

- **Access to advanced educational resources:** Artificial intelligence provides access using cloud platforms from anywhere, which makes it easier for the learner to access the educational material provided that the Internet is available (Magdalena, Magdalena , & Klaudia , 2023, p. 12).
- **Personalized Learning:** This allows students to learn at their own pace and receive additional support in the areas they need, enhancing their learning (Ismail, Muhterem, Hanni , & Sanna , 2022, p. 617). Enables a more efficient and effective learning experience (Magdalena, Magdalena , & Klaudia , 2023, p. 11).
- **Immediate feedback:** “Feedback is an essential element in the teaching and learning process because it allows students to identify gaps and evaluate their progress in learning” (Anderson , et al., 2021, p. 11), which supports speed and objectivity in education allows students to identify areas of error and gives them the ability to at the same time, correction is possible.

In this regard, it can be said that artificial intelligence is no longer just a machine or technology, but has become an essential and pivotal part of human life, and a major component of the educational process. Today, we cannot progress or compete without possessing artificial intelligence tools, which have opened wide horizons in distance education and have changed many of the characteristics of education. We now deal with tablet devices instead of papers, write by touch and voice instead of pen, adapt education according to our needs, and have personalized educational experiences instead of traditional patterns the one.

In addition, scientific research in the era of artificial intelligence is witnessing a great intensity because of the availability of many references, sources, digital libraries, and many applications that direct the student or learner towards reliable sources, which shortens research for long periods. It also protects, in return, the rights of researchers, which provides a safe and encouraging distance learning and research environment. It can be said that artificial intelligence in distance education



came to automate educational tasks.

Active learning and decision-making in scientific educational management are enhanced using artificial intelligence techniques (Gulnora, Farida , & Sayidolim , 15-22/12/2022). Therefore, as technology continues to advance, we may see more effective use of artificial intelligence in distance education in the coming years (Magdalena, Magdalena , & Klaudia , 2023, p. 1).

Despite the positive role of artificial intelligence in distance education, it has negatives. UNICEF has expressed that there are concerns about its use, especially on children, as shown in Table 1.

Table 1: Key risks and concerns about using Artificial Intelligence	
Discrimination and exclusion through bias	Systemic bias in Artificial Intelligence systems, especially against children.
	Causes of bias include biased training data, context blindness, and lack of human oversight.
	Attributing data alone for the problem of bias is insufficient.
	Bias also results from the social context of Artificial Intelligence development and use.
	The lack of regulations of Artificial Intelligence can perpetuate discrimination against children.
Constraints on children's prospects from Artificial Intelligence profiling	Artificial Intelligence-based profiling can perpetuate biases and limit opportunities.
	Relying on inconsistent data can restrict personal development.
	User profiles may reinforce stereotypes and negatively impact self-esteem.
	Profiling threatens children's privacy and freedom.
Violation of data protection and privacy rights	AI's use of private data challenges data protection principles.
	Children who may not grasp data risks require special protection.
	Parents often lack the means to ensure their child's privacy.
	Unforeseen data uses compound privacy concerns.
Exacerbation of the digital divide	The digital divide disproportionately affects marginalized communities and children.
	Unequal access to technology and limited digital skills widen the gap.
	Variations in technology access and education influence Artificial Intelligence engagement.
	Developed regions benefit most from Artificial Intelligence, leaving others behind.
	The International Telecommunication Union emphasizes the impact on under-resourced areas.

Source: (Patricia & Joan , 2024, p. 7)

5. Challenges of Artificial Intelligence in Distance Education:



Despite the clear positive role of artificial intelligence systems and the recognition of facilitating relationships between individuals in the distance educational process due to the unparalleled support they provide, at the same time there are still concerns related to the security and privacy of information. Elements of the educational process, and the ethics of its use.

In addition, there is a weak level of awareness of the importance of interaction between students and teachers, knowing that interaction is a key driver in the distance learning process and is a determinant of measuring learner satisfaction and response, which helps artificial intelligence systems identify problems and solve them according to the student's specific needs (Kyoungwon , Joice, Ido, Sidney , & Dongwook , 2021, p. 24). In view of this, it can be said that artificial intelligence faces several challenges in distance education, the most important of which are:

- **Lack of knowledge and training:** Lack of knowledge of technological techniques and the basics of automated learning poses a major challenge to the success of interaction between the learner and teacher and receiving educational content, and thus the failure of distance education.
- **Weak infrastructure:** If the technical infrastructure is not available (Ismail, Muhterem, Hanni , & Sanna , 2022, p. 625) and equipped to use distance education, then artificial intelligence techniques cannot do anything, because the technical infrastructure and the availability of the Internet are a basic condition for the process of distance education to take place after. If this structure is not available in high quality, it will affect the level of adoption of artificial intelligence.
- **Data privacy and security:** The problem is determined by the extent to which artificial intelligence systems are able to protect the privacy of the learner and teacher, as artificial intelligence systems collect and process their data, and therefore any violation of this privacy affects the distance education process. In addition, “weak data quality leads to inaccurate or biased results, and lack of data leads to the inability to predict accurate results” (Abdulaziz , Abdel Magid , & Khalifa N. , 2023, p. 1).
- **Ethics of using artificial intelligence:** Despite the positive aspects of artificial intelligence in distance education, it has risks related to ethical issues, most notably privacy, monitoring students' thoughts through learning applications, which reduces the ability to control their learning because algorithms predict their actions based on inputs and thus reduced independence, in addition to the risk of Bias, plagiarism (Patricia & Joan , 2024, p. 7).



6. CONCLUSION

The study concluded that artificial intelligence plays a major role in the success of distance education, as the relationship between them is mostly positive, while the negative is due to weak technical capabilities and the low level of training in using artificial intelligence techniques, which has spread to all aspects of life, which has increased the importance of artificial intelligence. In distance education, the Covid-19 pandemic forced all countries in the world to adopt distance education.

Artificial intelligence has played a major role in the process of spreading and adopting distance education in the world. New patterns have emerged to the world that we have not seen before, such as smart and adaptive education that creates personalized educational experiences that adapt to the learner's needs, learning preferences and abilities, and creates an interactive role-playing environment, so that the learner is no longer in a role. This is not limited to the recipient alone, but he can now manage the educational process and participate in it effectively. In addition, artificial intelligence has expanded the learning space for the largest possible number of learners from different places and levels without being obligated to attend classrooms in schools and universities. Rather, they can learn remotely via the Internet and through virtual classrooms, which has achieved a qualitative leap in the development of education systems in the world. The principle of the right to education for all can be achieved easily and flexibly, in accordance with the sustainable development goals.

To ensure the continuation of this progress, countries must make more efforts towards strengthening the technical infrastructure and increasing the spread of the Internet, in addition to preparing programs to train learners and teachers across the education sectors in the use of computers and artificial technologies. Intelligence techniques.



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