The role of Artificial Intelligence (AI) in Teaching in Higher Education Institutions' (HEIs)

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Abstract. **In recent years, Artificial Intelligence has brought significant changes to the field of education by promoting personalized learning through powerful educational experiences. Over the past decades, teaching approaches have been influenced by AI, utilizing educational tools that cater to the individual needs of students. Specifically, the educational process can leverage educational robots and smart systems within the framework of implementing interactive lessons that facilitate communication and active student participation. It is equally important to evaluate student performance, as in several cases, applications such as ChatGPT are utilized. A critical review of contemporary research is deemed necessary, as it contributes to the academic community in understanding how the adoption of AI can enhance the educational process at universities. The findings of this study highlight aspects that demonstrate, despite the benefits arising from AI, it is crucial to re-examine issues related to policy setting in the academic community to avoid negative impacts under ethical considerations.**

Keywords—Artificial Intelligence; Teaching; Universities; Students

I. INTRODUCTION

Artificial Intelligence (AI) allows for the adaptation of teaching approaches while simultaneously employing advanced technologies such as virtual reality and educational games to make learning more interesting and engaging (Lunenburg, 2010). In a broader context, AI systems assist educators in time management, preparation of educational materials, and adapting lessons to contemporary technological developments (Alimadadi et al., 2020).

However, there is a clear need to investigate the ethical issues involved, with an emphasis on protecting data privacy (Teng et al., 2023). Additionally, AI has currently sparked intense political and scientific interest globally. There is significant advertising as well as concern about its impacts on society and the economy at both national and global levels (Crawford et al., 2023). It is observed that

although the foundations of AI have been laid for several decades, recent technological discoveries accelerate what AI can achieve (Muresan, 2023).

The purpose of this scientific paper is to study and evaluate the role of artificial intelligence in the educational process through the presentation of data derived from contemporary studies. More specifically, it examines through a literature review what the utilization of AI and its achievements might mean for learning, teaching, and education. Efforts are made to understand how it can contribute to the enhancement of the educational process. Specifically, in the second section, the literature review focuses on the role of AI in education and teaching, analyzing the quality of education and its impact on universities. The third section presents the methodology followed for the implementation of this research, while the fourth section outlines the findings and results, the fifth the conclusions, followed by the limitations and suggestions for further research.

II. LITERATURE REVIEW

A. Artificial Intelligence in Education and Teaching

Concerning the definitions of artificial intelligence, most of them approach it as a machine that thinks, understands languages, and solves problems. Additionally, it has been characterized as a computer system capable of performing tasks typically associated with intelligent beings. However, it is now considered a scientific field that creates machines capable of functioning appropriately and predictively in any environment. Moreover, every aspect of learning or any other characteristic of intelligence can be presented in such a way that a machine can simulate it (McArthur et al., 2005).

The early programmers of artificial intelligence interpreted it as a mechanical processing of logical statements, defining human intelligence as the computation of various truth values. However, this interpretation was historically aligned with logical positivism and the efforts to standardize mathematics using purely syntactic means, raising significant questions about the philosophical foundations of artificial intelligence (Pokrivcakova, 2019). It is clear that technological changes promote both social and

cultural changes, which are reflected in lifestyle, standards, policies, social institutions, skills, and the content and forms of education (Vouloutsi et al., 2016).

The widespread availability of cheap computational power and vast amounts of data in recent years have led to impressive discoveries in machine learning, generating significant commercial and research interest in artificial neural networks. Specifically, emphasis is given to computational models based on the structure and functions of biological neural networks. Artificial intelligence offers benefits and opportunities in education, facilitating personalized learning, providing immediate feedback, and thereby improving the level of effectiveness in the evaluation process (Nkambou et al, 2018). Consequently, with proper handling, artificial intelligence has the potential to be integrated into online learning platforms, allowing content and activities to be tailored according to the needs and knowledge level of each student (Wong et al., 2020).

B. The Quality of Education

The quality of education is a particularly important issue that affects the development of individuals and society as a whole and is largely determined by educators who must possess adequate knowledge and skills, which they in turn transmit to students. Additionally, a significant factor in enhancing educational quality is the ability to utilize updated and modernized educational content. Moreover, the use of technological means contributes to quality improvement, as many researchers argue that the quality of education requires continuous evaluation of teaching methods and their outcomes (Sayeda et al., 2010).

It is essential to employ various teaching methods to meet the needs and expectations of students and to encourage creativity and critical thinking. Generally, collaboration between educators and students, as well as within the broader academic community, contributes to strengthening education and its quality (Thapa, 2011).

A crucial parameter is ensuring all these elements to provide high-quality education, which can enhance skill development, contributing to better preparation of students for the labor market. Finally, emphasis is placed on developing modernized plans and goals, combined with the adoption of a digital culture by the academic community (Mehta and Degi, 2019).

C. The Impact of Artificial Intelligence on the Quality of Education and Teaching

Artificial Intelligence (AI) enhances teaching strategies by offering students a distinct educational experience. Through AI interactions, students can access materials outside the classroom and receive real-time feedback, creating new opportunities for learning and development. Furthermore, AI has emerged as a powerful factor, playing a pivotal role in reshaping the academic landscape. AI's ability to address critical challenges in the education sector, from promoting innovative learning to advancing towards UNESCO's Sustainable Development Goal 4, is considered highly promising. However, it is crucial to recognize the risks and challenges accompanying it, which are beyond the control of existing policies and regulatory frameworks (Song et al., 2017).

The integration of Artificial Intelligence in education brings undeniable value, and it is vital to exercise caution in closely monitoring its development and understanding its overall impacts. In recent years, educational technologies based on AI continue to evolve, but there is also growing concern about the potential displacement and reduction of academic staff.

It appears that AI can automate certain administrative tasks and provide complementary support, but it cannot replace the invaluable role of educators in cultivating critical thinking, emotional intelligence, and reflection among students (Tarus et al, 2018). Consequently, it is particularly important to strive for a balance between the integration of AI and the preservation of the human factor in education, encouraging the development of tools that leverage AI by educators.

D. Artificial Intelligence and Its Role in University Teaching

Artificial Intelligence (AI) has significantly influenced higher education by introducing innovative approaches and tools that enhance the learning and teaching process through the redesign of courses (Alimadadi et al., 2020). In recent years, there has been a complementary interaction between AI and higher education, causing huge impacts across various scientific fields, from reshaping educational content to evaluating student performance (Sollosy and McInerney, 2022). Specifically, the application of AI in higher education has created four main pillars:

- **Reshaping Learning:** The presence of AI allows for the creation of personalized curricula tailored to the needs and abilities of each student. This is achieved through the use of machine learning algorithms, which can analyze data about student progress and offer personalized learning suggestions.
- **Enhanced Teaching:** Educators use AI tools to improve their teaching by providing automatic assessment of assignments and suggesting customized content to facilitate the collection of data on student learning outcomes and retention in the course.
- **Specialized Applications:** Educational games based on AI help students learn complex subjects through interactive processes, simultaneously increasing student satisfaction.
- **Research and Data Analysis:** AI allows for the analysis of large volumes of data generated in

the field of higher education. Using machine learning algorithms and other techniques, this data can be analyzed to extract valuable academic information. This process significantly supports research in education and the development of new teaching and learning methods.

Additionally, data analysis contributes to addressing various issues and challenges in higher education. For example, it can be used to predict student performance, monitor the progress of educational policies, and detect patterns and trends in the educational process.

AI can be applied in the development of tools that assist in analyzing course content and creating personalized suggestions to improve the educational experience. This way, the educational process can become more effective.

Finally, data analysis in higher education can lead to new discoveries and research findings that contribute to the continuous improvement of educational practices and the quality of learning. In a broader context, the utilization of AI in higher education creates a more dynamic and advanced future globally (Crawford et al., 2023).

III. METHODOLOGY

In this study, the researchers opted to utilize literature, which refers to a systematic method of reviewing, critiquing, and summarizing existing literature or scientific research concerning the scientific field under examination, aiding in determining current knowledge, gaps, and future research directions.

Specifically, a systematic search was conducted in databases, libraries, electronic repositories, and other credible scientific sources to collect research related to the topic under investigation concerning the use of artificial intelligence in the educational and learning process, with the ultimate goal of assessing its potential and possible improvements.

The literature sources were then evaluated for quality, reliability, and their contribution to the topic. After this process, the findings were organized, and a critical review was compiled based on the effort to present the most significant findings and potential directions for future research.

In this context, an attempt was made to synthesize and compare findings from various sources, highlighting common trends, contradictions, and the contributions of each study. Overall, the research method of the literature review provided the ability to understand existing research situations and identify research gaps that require further investigation.

The researchers focused on the decade from 2013-2023, searching the Google Scholar bibliographic database with keywords: 'Artificial

Intelligence (AI) in Education' and 'Artificial Intelligence in Tertiary Education'.

IV. FINDINGS – RESULTS

A total of 220 studies were found in the field of "Artificial Intelligence in Tertiary Education", of which 29 were most relevant to the issues under examination in this study.

Table 1. *Exploration of the Literature for the Topic Under Examination*

Keywords	Google Scholar
«Artificial intelligence (AI) in Education»	220 papers
«AI in Tertiary education»	29 papers

The assessment of the impact of artificial intelligence (AI) on education was determined through a preliminary analysis, which focused its scope on the effects of AI on administration, teaching, and learning. A qualitative research approach was utilized, leveraging a literature review as both the research design and approach. This facilitated the effective achievement of the study's goals. Specifically, AI is presented as a field of study, and the subsequent innovations and developments in computers, machines, and technological applications have exhibited intelligence similar to human intelligence, characterized by cognitive abilities, learning, adaptability, and decision-making capabilities (Chen et al., 2020).

AI has been extensively adopted and used in education, particularly by university institutions, in intelligent online educational systems, and ultimately through the use of integrated computing systems, along with other technologies, including humanoid and online robots (Nkambou et al., 2018; Alimadadi et al., 2020; Rangel-de Lázaro and Duart, 2023). Using these platforms and tools, it is supported that educators can perform various administrative functions, such as examining and grading student assignments more effectively and efficiently, simultaneously achieving a higher quality in their teaching activities, thereby enhancing the quality of the educational process (Crawford et al., 2023). With the use of AI, the curriculum and content have been adapted and personalized according to the needs of the students, which is considered to have favored their assimilation and retention, thus improving their experience and the overall quality of learning (Chen et al., 2020).

In a related study, it was highlighted that in the era of the internet, education faces several new challenges, emphasizing the lack of deep integration of artificial intelligence and the relatively low quality of online teaching (Sharma et al., 2019). Based on this, the entropy weight method and grey cluster analysis were introduced to assess the quality of online

teaching in primary education. Based on the proposed model of the study, various strategies for improving the quality of electronic teaching in primary education were subsequently proposed (Li and Su, 2020).

The results of the research are considered particularly significant for the application of electronic teaching and AI. It is noted that it is necessary to investigate the purposes, expected outcomes, and potential risks of artificial intelligence technology, so as to emphasize its integration (Chassignol et al., 2018). It is also important to make known the ways in which the technology meets the needs of students and educators and whether it impedes or does not impede the quality and effectiveness of tertiary education (Pokrivcakova, 2019). However, the researchers of this scientific work focused on 5 works which they considered to be a starting point for further research.

Table 2. *Artificial intelligence in Tertiary education*

Studies	Key points
Mapping out a research agenda for generative artificial intelligence in tertiary education (Lodge et al., 2023)	Key areas of tertiary education are influenced by large language models and related applications such as ChatGPT, which require a more holistic approach.
New Era of Artificial Intelligence in Education: Towards a Sustainable Multifaceted Revolution (Kamalov et al., 2023)	ChatGPT has introduced many standardized academic tests and potential negative impacts with ethical issues.
Transforming Education: A Comprehensive Review of Generative Artificial Intelligence in Educational Settings through Bibliometric and Content Analysis (Bahroun et al., 2023)	AI affects student learning outcomes through ChatGPT, which has emerged as a dominant tool.
Artificial Intelligence in Education – Emerging Trends, Thematic Analysis & Application in Lifelong Learning (Alimadadi et al., 2023)	AI has created a new landscape in university education and lifelong learning. However, readiness on ethical issues remains a dominant and serious concern within the university community.
Potential Benefits of Information Technology Trends in Nigerian Tertiary Institutions (Jibrin et al., 2023)	The use of ChatGPT, and virtual and augmented reality (VR and AR) is increasingly conquering a part of the educational process.

Studies from Table 2 revealed that students have the ability to access relevant material and resources

according to their individual needs and expectations, particularly through learning environments that use artificial intelligence (Kamalov et al., 2023), utilizing modern language models. Additionally, it is supported that virtual reality can help encourage their engagement in the course, while tools such as social media can be used to connect the entire academic community and enhance teamwork (Bahroun et al., 2023; Jibrin et al., 2023). Furthermore, artificial intelligence can be used to create interactive virtual systems. In this way, students receive additional support and learn in a personalized manner, receiving the necessary guidance in real-time from the teaching staff. However, alongside the increasing trajectory regarding the application of AI in university institutions, the existence of an ethical and deontological support framework is deemed necessary (Lodge, et al., 2023; Misra et al., 2023).

V. CONCLUSIONS

From this research, it has become apparent that artificial intelligence (AI) is increasingly gaining ground in tertiary education through the development of systems and machines capable of simulating intelligent human behaviors. Learning, reasoning, and problem-solving are critical issues directly associated with artificial intelligence. Its dynamism is derived from the inexhaustible use of algorithms and complex mathematical models, enabling machines to learn and enhance their functions.

This fact has had a pivotal impact on the academic community, as AI is used by teachers, students, and researchers worldwide. However, various ethical and research issues have arisen which require assessment and thorough examination of any negative effects, and it is crucial that educational bodies delineate policies and unified guidelines.

According to the findings of this scientific work, it is understood that in recent decades, artificial intelligence has increasingly appeared in many sectors and sciences, having a significant impact, including on education. The educational sector has seen various changes due to the exploitation of artificial intelligence, bringing opportunities for transformation and adaptation in how educational processes are conducted. It is evident that there is a clear need to investigate the impact of artificial intelligence on tertiary education, utilizing tools such as virtual reality, for a more experiential and collaborative learning that creates conditions for a quality educational process, enhancing the dyadic relationship between teachers and students.

VI. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This research made a systematic effort in the examined field, however, as with most studies, there were limitations due to its focus on literature review, having limited scope for the needs of the scientific

conference. Additionally, there were time and methodological constraints, quantitative (no questionnaires used for teachers and students) and qualitative (no interviews and observations conducted). Furthermore, the development and application of Artificial Intelligence requires further investigation of corresponding studies, aiming to understand the application, impacts, and prospects at university institutions to improve the quality of education, increase student engagement, and enhance their knowledge and skills.

Equally important is the investigation of teachers' attitudes and perceptions about artificial intelligence and its integration into the academic environment as a supportive tool for teaching and enhancing the quality of tertiary education. Finally, apart from the tool of ChatGPT, it is reasonable to examine virtual and augmented reality (VR and AR) in order to have a more holistic approach to similar tools used in the global academic community, raising researchers' interest for more extensive studies around Artificial Intelligence.

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