The use of Artificial Intelligence and Natural language processing In E-learning Platforms: An Exploration of Potentials and Limitations

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Abstract— **The noticeable rise of digitalization in various sectors, particularly in education, has been undeniable in recent years. Online learning platforms such as Moodle, Canvas, Claroline, Open edX, and Blackboard have been instrumental in enriching the learning process, providing greater flexibility and efficiency for learners. However, despite their advancements, these platforms often fall short of fully addressing the diverse needs of learners and educators. This shortfall is primarily attributed to pedagogical content's static design and presentation. Fortunately, recent strides in Artificial Intelligence (AI) and Natural Language Processing (NLP) present promising solutions to this challenge. Leveraging techniques such as text analysis, automatic content translation, text classification, sentiment analysis, voice recognition, and recommendation systems, AI and NLP can customize the content, navigation, and presentation to cater to the unique preferences of each learner. This study explores the impact of AI technologies on higher education, examining both their benefits and challenges. A key aspect of the investigation is the incorporation of NLP into educational platforms, underscoring its role in improving content creation for educators and streamlining the learning experience for students. By highlighting these developments, the aim is to lay the groundwork for a more responsive and efficient digital learning environment within higher education.**

Index Terms—**E-learning, Natural Language Processing (NLP), Artificial Intelligence (AI), Information and Communication Technology (ICT), Covid-19, online learning platforms.**

I. INTRODUCTION

In today's rapidly evolving educational landscape, there is a notable surge in the adoption of Information and Communication Technologies (ICT) within the sector, all geared towards enriching the teaching and learning experience. The global COVID-19 pandemic has acted as a catalyst, expediting the integration of online learning into educational practices, whether as a supplementary or primary mode alongside traditional face-to-face instruction. This paradigm shift has prompted a vast array of higher education institutions to embrace an assortment of interactive tools and online learning platforms, including but not limited to Moodle, Canvas, Claroline, Open edX, Blackboard, and Google Classroom.

While these digital platforms offer undeniable benefits such as an abundance of resources and user-friendly accessibility, they are not without limitations. One significant drawback lies in their static nature, which hinders their ability to adapt to the diverse needs and preferences of individual learners. Factors such as economic circumstances, learning styles, preferences, and objectives often go unaccounted for, leading to inequalities in access to educational resources and diminished learner motivation when engaging with digital tools. This discrepancy underscores the urgent need for innovative solutions that prioritize personalized learning experiences and equitable access to knowledge in the digital realm of education.

The future of education is intricately intertwined with the rapid advancements in computing and processing techniques. The integration of Artificial Intelligence (AI) within the educational sphere heralds a new era, promising significant enhancements to the quality of both teaching and learning experiences [1]. At its core, AI endeavors to create systems that mimic human cognitive processes, thereby revolutionizing various aspects of educational delivery.

AI encompasses a vast array of theories and techniques aimed at empowering computer programs to emulate key facets of human intelligence. Through AI, computers can tackle cognitive challenges traditionally associated with human intellect. The application of AI in education has garnered considerable attention, leading to the development of diverse tools and applications such as intelligent tutoring systems, smart learning, teaching robots, and adaptive learning systems [2].

A systematic review of research, as identified by recent studies, has delineated four primary applications of AI in higher education [3]: profiling and prediction, intelligent tutoring systems, measurement, and evaluation, alongside adaptive and personalized systems. These applications serve as catalysts for the emergence of innovative teaching and learning practices, enabling educators to tailor the instructional process and platforms to cater to learners' distinct profiles and needs.

AI, equipped with machine learning, deep learning, and

Natural Language Processing (NLP) technologies—sitting at the confluence of linguistics, computer science, and AI—holds immense potential in addressing the myriad challenges encountered in online learning environments. However, the seamless integration of these cutting-edge technologies into the current educational paradigm is not without its share of risks and challenges, necessitating careful consideration and strategic planning.

This comprehensive study delves deeply into the multifaceted impact of AI technologies on the landscape of higher education. It meticulously examines the array of benefits and challenges posed by the integration of AI within educational frameworks. A focal point of this inquiry revolves around the strategic incorporation of Natural Language Processing (NLP) into existing educational platforms.

Specifically, this research highlights the pivotal role that NLP plays in revolutionizing content creation processes for educators. By harnessing NLP capabilities, educators can craft dynamic and tailored learning materials that cater to the diverse needs and preferences of students. Moreover, this study meticulously explores how NLP facilitates the seamless navigation of educational platforms, thereby enhancing the overall learning experience for students.

Through a nuanced exploration of these advancements, the overarching goal is to set the stage for the development of a more agile and efficient digital learning environment within the realm of higher education. By shedding light on the transformative potential of AI technologies, this research seeks to empower educational stakeholders with the knowledge and insights necessary to navigate the evolving landscape of digital education effectively.

The remainder of this paper is structured into three main sections. The initial section presents a comprehensive literature review covering Artificial Intelligence (AI) and Natural Language Processing (NLP), delving into their various applications within the education sector. Following this, the second section emphasizes the significance of incorporating NLP technologies into teaching methodologies. Lastly, the third section examines both the contributions and challenges associated with the integration of AI devices in higher education.

II. EXAMINATION OF AI'S APPLICATION IN THE FIELD OF EDUCATION

A. AI Application in the Field of Education

According to Nabiyev (2010) [4], AI (Artificial Intelligence) is delineated as the capacity of a computer-controlled device to execute tasks with a level of proficiency comparable to that of a human being. John McCarthy describes AI tools as devices capable of simulating human thought, revealing the possibility that computers will be able to reproduce human cognitive functions.

This definition evolves with the continuous advancement and progress in AI research. Contemporary researchers now characterize AI as models grounded in human reasoning, without the primary aim of reproducing intricate human thought processes [5]. AI is a field of computer science dedicated to the development of intelligent machines capable of performing tasks traditionally associated with human intelligence, such as learning, problem-solving, and decision-making.

Although the term "AI" was introduced as early as 1955, its integration into the field of education, often referred to as Artificial Intelligence in Education (AIED), began to manifest itself in various ways around the 1970s [6]. The evolution of AI in education has proved polymorphous, with the results of advanced research significantly influencing teaching and learning methodologies. A striking illustration of this impact lies in the substantial growth in the number of scientific articles related to AI and education listed in PUBMED, a major medical and scientific research database, from the 1965s onwards. This exponential increase testifies to the growing interest in the field of AIED. Figure 1, which depicts the dynamic evolution of the number of articles indexed in PUBMED from 1964 to 2024, as well as the corresponding search query employed in this study, highlights the progressive trajectory of exploration and research in this field.
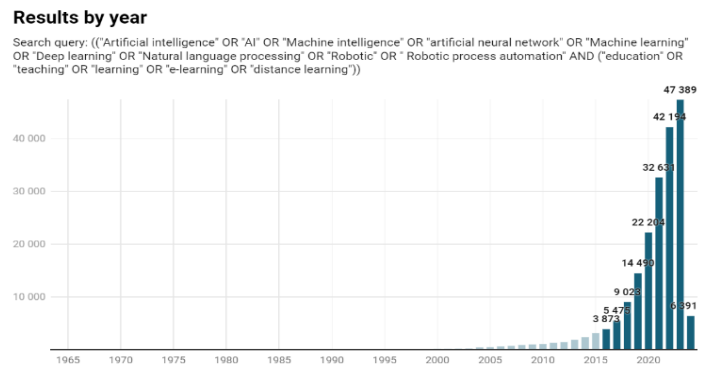

Fig. 1. Evolution of AIED Research Publications Indexed in PubMed (1965-2024)

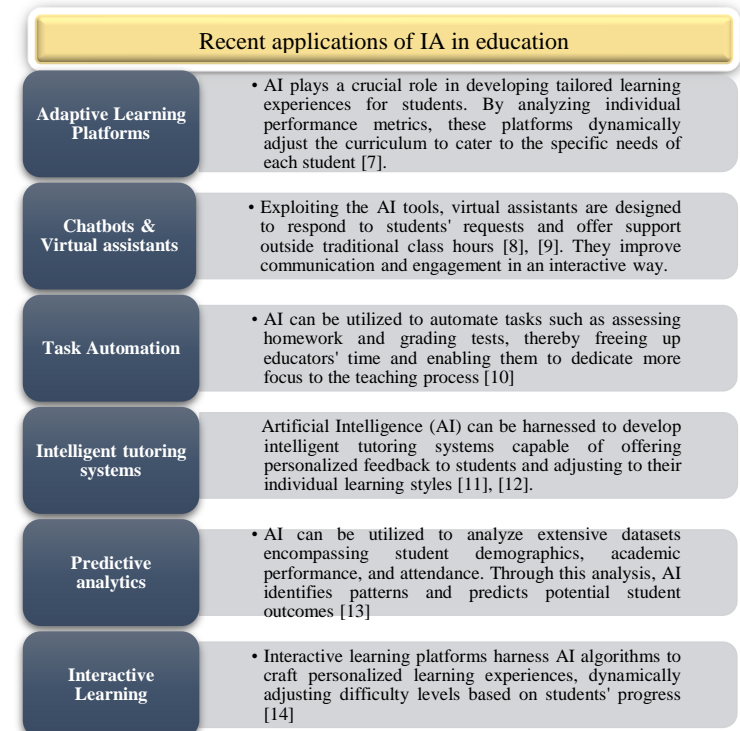Some of the recent applications of IA in education include:

Fig. 2. Applications of Artificial Intelligence in Education

The COVID-19 pandemic has accelerated the integration of information and communication technologies (ICT) into education. This special circumstance has fostered the development of e-learning solutions, making it imperative to evaluate their effectiveness and influence on students' academic results.

advanced facial recognition mechanisms. Additionally, it excels in the proficiency of scanning and identifying objects within the physical environment.

This multifaceted functionality proves to be of immeasurable value, especially for students with visual impairments. By aiding in the automatic identification and navigation of their surroundings, AI empowers blind learners to interact with their environment more effectively and independently.
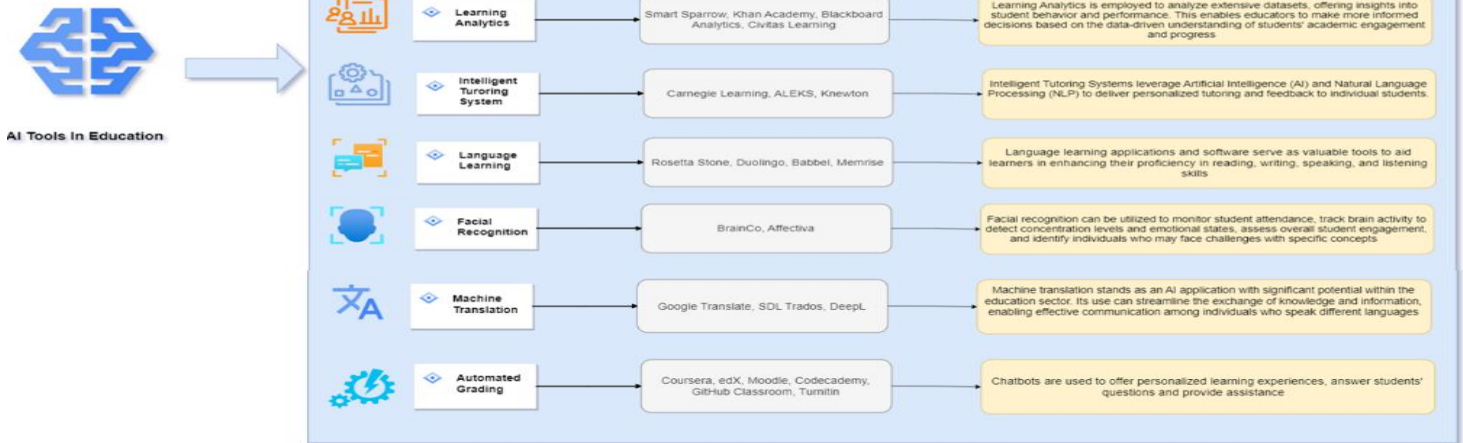

Fig. 3. Artificial intelligence applications in education

B. The potential benefits of AI in promoting teaching and learning for teachers and learners

Artificial intelligence (AI) technologies are enabling the era of adaptive learning environments, transforming learning platforms into dynamic entities tailored to learners' unique profiles, encompassing their learning styles, preferences, and needs [15]. This transformation process relies on a wide range of AI techniques, models, and algorithms, including machine learning algorithms, deep learning algorithms, and rule-based systems. Beyond adaptability, this discipline catalyzes seamless communication and interaction between learners and educators, fostering an enriched educational experience. In addition, it is giving rise to the development of intelligent chatbots and teaching assistant robots bases [16], equipped to respond effectively to learner requests by analyzing and skillfully consolidating knowledge.

Artificial Intelligence (AI) assumes a pivotal role in providing substantial support to students confronting disabilities, learning challenges, or language disorders, employing an array of advanced techniques [17]-[19]. Harnessing the power of machine-learning algorithms, this transformative technology meticulously scrutinizes diverse sets of student data, encompassing academic performance, behavioral trends, and medical records. The overarching objective is to discern potential disabilities such as Attention Deficit Hyperactivity Disorder (ADHD), dyslexia, autism spectrum disorders, and Attention Deficit Disorder (ADD).

Notably, AI exhibits a remarkable capability in automatically recognizing facial expressions through

The table below presents various applications of artificial intelligence (AI) designed to offer personalized support according to students' specific needs.

TABLE I.
APPLICATIONS OF ARTIFICIAL INTELLIGENCE FOR TAILORED LEARNERS SUPPORT

Application	Publication	Description
Seeing AI	[20]	Developed by Microsoft, uses advanced object recognition to help blind and partially sighted learners identify and navigate more effectively in their physical environment.
ALEXZA	[21]	A mobile application for dyslexics based on the principles of artificial intelligence and machine learning
BESPECIAL	[22]	BESPECIAL, an AI-based solution, is a software platform capable of providing dyslexic university students with personalized digital support tools and personal learning strategies.
Helpicto	[23]	This application uses AI technologies to transform text into images, helping students with autism to visualize and understand information more effectively.
Proloquo2go	[24]	Proloquo2Go is an augmentative and alternative communication (AAC) application specially designed to help learners, particularly those with difficulties in verbal communication, including autistic learners.

From educators, Artificial Intelligence (AI) plays a multifaceted role in supporting various aspects of the teaching and assessment process. Firstly, AI contributes to plagiarism detection through user-friendly platforms that exploit the capabilities of machine learning and deep learning

algorithms. This ensures a streamlined process for educators to maintain academic integrity.

In addition, facial recognition and sentiment analysis technologies can be used by teachers to automatically identify cases of potential fraud during exams. These advanced tools enhance the security of assessment processes, promoting fair and transparent evaluation.

Moreover, AI facilitates the automation of student grading, particularly for multiple-choice questions (MCQs), streamlining the assessment process. This not only saves educators valuable time but also improves grading efficiency and consistency.

The integration of Neural Networks enables the automatic translation of courses, quizzes, and educational content using machine translation based on natural language processing.

Furthermore, sentiment analysis, derived from feedback on course quality provided by learners, offers a comprehensive assessment of student satisfaction. This valuable insight empowers teachers to make informed decisions, enabling them to implement targeted enhancements in both instructional materials and teaching methods for an improved educational experience.

Finally, the use of recommendation systems based on AI categorizes and classifies educational content, paving the way for personalized learning experiences. By tailoring content recommendations to individual learning preferences, educators can create a more engaging, personalized learning path for each student.

III. THE IMPACT OF AI AND NLP ON EDUCATION

In education, various applications of AI have significantly revolutionized the educational environment [25]-[33]. Chatbots, such as ChatGPT, Quizlet, and Duolingo, have become integral components, offering personalized learning experiences, answering students' questions, and providing crucial support. These chatbots are used in many areas, from facilitating the enrolment process to teaching practices and student learning experiences. They provide immediate answers to questions, guide students and parents through the sales funnel, and prompt them to take further action.

Speech recognition software, leveraging artificial intelligence (AI) and natural language processing (NLP), is another innovative tool used to improve students' pronunciation and oral expression. SpeechAce and Duolingo are notable examples of speech recognition software in education.

Learning analytics, an essential facet of modern education, harnesses the power of data analysis to gain insights into student behavior and performance, enabling educators to make more informed decisions. Blackboard Analytics and Civitas Learning are examples of learning analytics software used in education.

Intelligent tutoring systems, which integrate AI and NLP, enhance the educational experience by providing tailored tutoring and feedback to individual students. Estimated systems in this category include Knewton and Carnegie Learning.

Language learning apps and software, such as Babbel and Rosetta Stone, are indispensable tools for improving reading, writing, speaking, and listening skills.

AI extends its scope to grading work and providing constructive feedback, Turnitin being a notable example of software facilitating automated grading. The application of machine translation further enhances the exchange of knowledge between languages in the field of education. Google Translate, SDL Trados, and DeepL are notable examples.

Facial recognition technology has a variety of applications in AI for education, from monitoring student attendance to tracking engagement levels and identifying students struggling with specific concepts. Affectiva and BrainCo are notable examples of facial recognition software used in educational contexts, illustrating the multiple contributions of AI to the educational landscape.

A. THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HIGHER EDUCATION IN MOROCCO (CASE OF MOROCCO)

Artificial intelligence is significantly transforming research and higher education in Morocco. A recent study shows that AI is revolutionising research and teaching methods in Moroccan universities by improving methodologies, automating complex tasks and personalising learning. More than 67% of Moroccan lecturers use AI-based tools for a variety of tasks, including translation, language checking, plagiarism detection and the creation of teaching materials [34]. A study conducted by [35] demonstrates that AI-driven adaptive learning notably enhances student motivation and engagement. Approximately 60.8% of students reported increased motivation, while 84.3% advocated for extending this method to other subjects. The majority of students found the adaptive learning solution highly beneficial and showed interest in applying it across various disciplines.

The study carried out by [36] highlights the significant impact of AI and intelligent systems on higher education and networking in Morocco. It found that 60% of participants are using AI tools, such as machine learning algorithms, chatbots and virtual assistants, to improve user experience and streamline tasks. AI's ability to analyse data in real time supports personalised learning and decision-making, although 20% of respondents expressed concerns about data privacy.

IV. EXPLORING THE INTEGRATION OF AI CHATBOTS IN EDUCATION

Chatbots are recognized as a technological application model that significantly enhances interpersonal communication and learning experiences. They facilitate the dissemination of diverse information and knowledge through interactive methodologies and user-friendly interfaces [37].

The integration of artificial intelligence (AI) and chatbots in education and research has witnessed substantial growth in recent years, particularly since 2023. Figure 2 visually illustrates the increase in the number of articles indexed in PUBMED that examine the integration of artificial intelligence (AI) and chatbots in education. These automated conversational agents, known as chatbots, leverage natural language processing and machine learning algorithms to engage with users in a way that closely mimics human interaction [38].
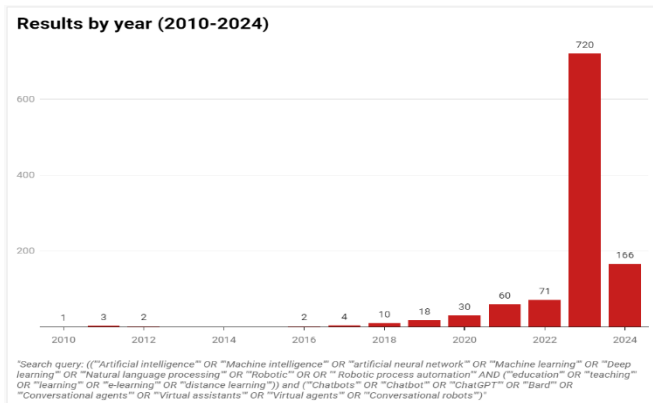
Fig. 3. The integration of artificial intelligence (AI) and chatbots in education and research

Nowadays, advanced AI Chatbots such as OpenAI's ChatGPT, Google's Bard, Microsoft's Bing, Replika, and ADA, among others, perform a significant role in literature searching, resolving research questions, and academic writing. These tools collectively empower researchers by supporting them at different stages of the research process, from organizing articles and relevant literature to synthesizing and analyzing complex research documents [39].

Chatbots provide personalized support, tailored specifically to learners' needs. These virtual assistants provide personalized feedback on writing assignments, simplify navigation within courses, and solve technological problems. Complementarily, they can translate a teacher's instructions, improving comprehension for learners whose main language is not English. This adaptability of chatbots helps to create a more inclusive and effective learning experience for a diverse range of students [40].

Chatbots have the potential to become invaluable tools in education, capable of significantly amplifying student learning outcomes in multiple areas such as knowledge acquisition, problem-solving skills, self-regulation, and motivation. In the educational landscape, chatbots have found a variety of applications, from efficiently disseminating information, responsively handling requests, providing constructive feedback, and offering academic support, to gamifying the learning experience and facilitating social interaction [41],[42].

Chatbots offer a wide range of functionalities, including study plans and time management support. In addition, AI-driven chatbots act as virtual tutors, tailoring personalized learning paths and helping students answer academic questions. Their usefulness extends to providing immediate feedback on specific tasks, such as multiple-choice quizzes or language exercises, speeding up the learning process by enabling students to quickly identify and rectify mistakes.

The distinctive, interactive features inherent in chatbots make a significant contribution to increasing student motivation and engagement. By injecting an element of novelty into the learning experience, these chatbots can make educational activities more enjoyable and captivating, thus encouraging increased participation and active engagement on the part of students.

What's more, chatbots are reliable partners for language practice, available around the clock. Learners can engage in conversations with the AI, honing their speaking and comprehension skills in a pressure-free environment. This round-the-clock accessibility not only accommodates varied schedules but also encourages regular language practice, helping to improve language skills practically and effectively.

Nevertheless, the seamless integration of chatbots into educational environments is an undertaking that is not without its complexities and requires careful thought. These challenges encompass the indispensable need to develop high-quality chatbot systems, ensuring that they meet rigorous standards of reliability and functionality. In addition, it is essential to put in place effective evaluation methods to comprehensively measure the impact of chatbots on educational outcomes. In this respect, it is essential to strike a balance between innovation and practicality.

In addition, the ethical dimension of integrating chatbots into education needs particular attention. Questions relating to data confidentiality, the transparency of algorithmic decisions, and the possibility of unintended bias within these systems call for robust ethical frameworks. It is therefore imperative to take a conscientious approach to ensuring the responsible and ethical use of chatbots in education. Addressing these challenges proactively will enable chatbots to realize their full potential as constructive and ethical contributors to the educational landscape.

V. THE BENEFITS AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION

The field of artificial intelligence (AI) is driving innovative solutions in the education sector, promising advances in e-learning platforms. Despite the potential for improving the quality of education, the integration of AI in education faces multiple challenges. The first of these concerns the ethical implications of using learner data in AI tracking. The process of collecting, analyzing, and disseminating learner data raises concerns bordering on surveillance, necessitating the implementation of robust charters protecting learners' personal information. Certification of added software by data protection authorities becomes imperative to guarantee compliance. Another major challenge lies in adequately preparing and training teachers to integrate AI into educational settings. Effective use of AI technologies requires teachers to acquire new knowledge and skills through continuous learning initiatives. Beyond ethical concerns and teacher preparation, challenges are further compounded by insufficient digital infrastructure, particularly evident in some countries, and disparities in access between rural and urban areas. Successful AI integration requires a solid technological and networking infrastructure, as well as full access to technological resources facilitated by secure, high-speed internet connectivity. The financial aspect introduces another level of complexity, as the cost of implementing and maintaining AI systems can be exorbitant for some institutions, potentially limiting accessibility for students and educators. To remedy this, strategic investments and financial considerations are needed to ensure equitable access. Furthermore, the diversity

of learner needs and challenges, even within the same country, requires meticulous study and analysis before AI integration. Understanding these subtleties is essential to improving the effectiveness and efficiency of the AI technologies under consideration. In addition, to unlock the full potential of AI in education, countries need to invest heavily in AI training and research. This investment must focus on improving data collection processes and enhancing the quality, quantity, and relevance of the data collected. In addition, the results of AI research need to be seamlessly integrated into educational practice and policy-making, to foster harmonious alignment between theoretical advances and practical implementation. In essence, addressing the multifaceted challenges surrounding AI in education requires a holistic approach that takes into account ethical considerations, teacher readiness, infrastructure gaps, financial constraints, and the diverse needs of learners.

The table N°2 below provides an overview of the contributions and challenges associated with the implementation of artificial intelligence devices in higher education.

VI. ETHICAL AI DEVELOPMENT IN EDUCATION

Nowadays, the rapidly increasing use of artificial intelligence (AI) tools in education presents both opportunities and challenges, particularly for educators and learners. The main objective of this integration is the creation of interactive and customizable educational content, tailored to learners' needs and preferences, thus aiming to improve the learning process and learner outcomes. However, this integration raises crucial ethical issues, such as data confidentiality, algorithm transparency, equity in access to technologies, and the need to train stakeholders in the ethical use of AI.The ethical development of artificial intelligence (AI) in education has become a major concern to ensure responsible use that respects ethical values. Initiatives to promote the ethical development of AI in education seek to balance the potential benefits of these technologies with the protection of the rights, privacy, and dignity of learners, educators, and the educational community as a whole. The table N°3 provides an overview of recommendations on the ethical use of artificial intelligence in education.

TABLE II.
THE CONTRIBUTION AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN EDUCATION

The contribution of artificial intelligence in education	
Personalized learning	Adaptation to learners' specific needs, preferences, learning styles and abilities.
Instant interaction with Chatbots	Use of Chatbots and question-and-answer systems for instant interaction.
Improving the learning process for Learners with Special Needs	Benefits for learners with health problems, disabilities or language barriers.Automatic content transformation for enhanced accessibility.
Media and Preferred Language Conversion	Automatic conversion of text into images, images into text, or even video into textual content. Automatic translation of content into the learner's preferred language, improving accessibility
The challenges of artificial intelligence systems in education	
Ethical Challenges and Data Privacy	One of the main challenges posed by artificial intelligence systems in education concerns the thorough control of learner data collection and its subsequent use. As educational establishments increasingly exploit AI for personalized learning and performance assessment, the ethical implications of data use come to the fore. Addressing this challenge requires a strategic approach involving the implementation of privacy charters and software certification standards.
Cost and Accessibility of AI Systems	The expense of deploying and maintaining AI systems can be an obstacle for some institutions, limiting access to these tools for students and educators. In addition, the different requirements and difficulties faced by learners in each country, and even within the same country, should be thoroughly examined and assessed prior to AI integration. This is essential to improve the effectiveness and efficiency of future AI technologies to be implemented. In addition, individual countries need to make substantial investments in AI training and research in education over the coming years.
Teacher training and Research investment	To fully exploit the potential of AI technologies in an effective and pedagogical way, it is imperative that teachers participate in ongoing training and acquire new knowledge and skills. This adaptive approach is essential to keep abreast of technological developments in education. Furthermore, existing challenges are exacerbated by the lack of a solid digital infrastructure in some countries, creating a significant digital divide between rural and urban areas.
Digital Infrastructure and Unequal Access	In order to successfully integrate AI into educational methods, it is necessary to build a solid foundation based on a robust technological and network infrastructure. This means guaranteeing the widespread availability of technological resources and ensuring secure, high-speed Internet access. Without this essential support, the full realization of the benefits of AI in education remains limited, hindering the possibility of equitable access and enriching learning experiences for every student. Solving these infrastructure challenges is imperative to promoting inclusive and effective AI-enhanced education on a global scale. Successfully integrating AI into educational practices requires a foundation built on a robust technological and network infrastructure. This includes ensuring the ubiquity of technological resources, as well as guaranteeing secure, high-speed internet access. Without this fundamental support, realizing the benefits of AI in education remains limited, hindering the potential for equitable access and learning experiences for all students. Addressing these infrastructure challenges is essential to fostering inclusive and effective AI-enhanced education on a global scale.
Lack of data	One of the major challenges stems from data scarcity and the need for extensive datasets to effectively train AI systems. AI and NLP-based systems can encounter difficulties in capturing the subtleties of specific learning environments and the nuances of human language, which can lead to an inability to provide feedback as nuanced as that of human teachers.
Data Security and Cyberthreat Prevention	The challenges of securing learners data and preventing cyberthreats are of crucial importance. They arise mainly from the collection and storage of sensitive data by AI systems. The need to protect this data against potential threats is imperative. One of the major challenges lies in securing the data collected by AI systems, particularly when this data includes sensitive information about users, such as personal, academic or medical data. Potential threats range from privacy breaches and data breaches to ransomware attacks targeting stored information. To meet this challenge, it is essential to implement robust cybersecurity protocols that guarantee data confidentiality, integrity and availability. This includes implementing advanced encryption practices, robust firewalls and strict access control mechanisms.

TABLE III.

RECOMMENDATIONS ON THE ETHICAL USE OF ARTIFICIAL INTELLIGENCE IN EDUCATION

	Description	Recommendations	References
ENAI **(The European Network for Academic Integrity)**	ENAI, an international association dedicated to academic integrity, issues recommendations to promote the ethical use of AI tools in education.	ENAI's recommendations emphasize the importance of equipping stakeholders with the skills and knowledge required for the ethical use of AI tools, as well as the need to develop and implement suitable educational policies to address the challenges and opportunities associated with the integration of AI into education. When using AI tools, it is essential to correctly mention the contribution made to the AI tool, wherever possible. While services and tools that only influence form are generally acceptable, AI tools cannot be cited as co-authors in publications. Responsibility for content lies with the human author, taking into account potential biases, inaccuracies or errors in AI-generated results. The paragraph highlights the need to educate students and teachers in the ethical use of AI, insisting on the inclusion of AI information in teaching. Students should be made aware of the purpose of learning activities, ethical writing and content production skills. Teachers, for their part, should receive training in the ethical use of AI, and national and institutional policies should be developed or adapted to encompass AI, defining rules and guiding users on recognition practices.	[43]
UNESCO **(United Nations Educational, Scientific and Cultural Organization)**	UNESCO is the United Nations' specialized agency for education and the Education Sector	To effectively address the challenges of achieving the Sustainable Development Goal policies should go beyond the simple application of AI in education and embrace the broader intersections between AI and education. This means educating people about how AI works, how it can be created, and the wider societal implications it brings on a local and global scale. To achieve this, four strategic objectives should be pursued, tailored to the specific needs of the local context, particularly in low- and middle-income countries where it may be necessary to focus on identifying and addressing gaps in AI readiness, such as infrastructure and funding. These include ensuring the inclusive and equitable use of AI in education, harnessing AI to improve educational processes, promoting the development of skills relevant to the AI era (including understanding how it works and its implications), and ensuring the transparent and verifiable use of education data. However, it is essential to recognize that AI is not a one-size-fits-all solution, and that many challenges need to be addressed. The following fundamental principle and policy recommendations are inspired by the Beijing Consensus, established at the International Conference on AI and Education in Beijing. Therefore, after outlining the fundamental principle guiding AI and education policies, several recommendations are proposed: • Interdisciplinary planning and cross-sector governance. • Policies promoting equitable, inclusive and ethical use of AI. • Development of a blueprint for the use of AI in education management, teaching, learning and assessment. • Implementing pilot trials, monitoring and evaluation, and building an evidence base. • Encouraging local innovation in AI for education.	[44],[45]
The Institute for Ethical AI in Education	The Institute for Ethical AI in Education has been funded by: McGraw Hill, Microsoft Corporation,Nord Anglia Education, Pearson PLC; and by a discretionary grant from John Fairbairn at Esmee Fairbairn Foundation	The Institute has developed an ethical framework for AI in education following extensive stakeholder consultation. The framework aims to provide a shared vision of ethical AI in education, ensuring optimal benefits for learners while protecting them from potential risks. It is aimed at decision-makers involved in the acquisition and implementation of AI in education. Education leaders play a crucial role in ensuring that learners derive the maximum benefits from AI while mitigating the associated risks. The framework encourages responsible design, acquisition and application of AI, emphasizing ethical considerations throughout the process. It incorporates ethical expectations for designers and developers, and requires compliance with local data protection laws. The framework also calls for transparency, urging suppliers to comply with specified ethical requirements by September 2021, facilitating informed decision-making during the procurement process. The Ethical Framework for AI in Education objectives: • Educational Achievement: Utilize AI to attain well-defined educational objectives grounded in robust societal, educational, or scientific evidence for the benefit of learners. • Forms of Assessment: Employ AI to assess and acknowledge a wider array of learners' capabilities. • Administration and Workload: Enhance organizational capacity with AI while upholding human relationships. • Equity: Deploy AI systems to foster equity among diverse learner groups, avoiding any discriminatory practices. • Autonomy: Utilize AI systems to empower learners with greater control over their learning and development. • Privacy: Strike a balance between privacy and legitimate data use for achieving specific educational goals. • Transparency and Accountability: Maintain human responsibility for educational outcomes, ensuring adequate oversight of AI system operations. • Informed Participation: Equip learners, educators, and relevant practitioners with a reasonable understanding of artificial intelligence and its implications. Ethical Design: Ensure AI resources are designed by individuals comprehending the impacts of these resources.	[46]
European Digital Education HUB	The European Digital Education Hub (EDEH) is a project initiated by the European Commission and financially Executive Agency (EACEA)	Prudence should be a guiding principle at every educational level when integrating AI. Students must be educated about their rights and self-protection, teachers should be mindful of the information gathered by AI tools, developers must guard against undue influence and bias, and governmental bodies must enact robust legislation to safeguard citizens and maintain a rigorous approach to their own use of AI in data collection. In summary, our recommended learning goals for AI literacy and ethics encompass: • Recognizing and analyzing ethical and environmental opportunities and threats arising from everyday AI use. • Encouraging a safe, responsible, and conscientious use of digital tools and technologies related to AI. • Analyzing the human footprint and understanding the risks involved in automated decision-making processes. • Identifying and evaluating the ethical and policy implications of AI design and usage. Critically analyse the potential of AI to improve peoples' quality of life, assessing its operability in different social, economic and cultural contexts.	[47]

VII. CONCLUSION

The evolution of artificial intelligence (AI) has revolutionized the education sector, offering unprecedented opportunities to improve the quality of teaching and learning. These advances enable the creation of personalized and adaptive e-learning platforms, that respond to the diverse needs, preferences, learning styles, and abilities of individual learners. The integration of technologies such as chatbots and question-and-answer systems facilitates seamless interaction, offering learners immediate and rapid access to knowledge, and relevant responses to their requests. Furthermore, AI extends its transformative impact to learners facing health issues, disabilities, or language barriers.

The impact of AI on education goes beyond students and also extends to include educators. Teachers can rely on intelligent systems to streamline and automate various tasks, including assessments, data collection, planning management, and course administration.

While AI has undeniably improved the learning journey, it's essential to recognize that this technology is not without its challenges and limitations. Integrating AI into the education sector requires careful consideration of ethical, privacy, and security issues. In this paper, we explored the multifaceted contributions and challenges of natural language processing (NLP) technologies and we have focused on the importance of integrating NLP technologies in the education sector.

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