Utilizing Emerging Technology Trends and Artificial Intelligence in Higher Education

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Today's higher education is characterized by accelerated technological advances and a growing need for adaptation. This research focuses on the utilization of emerging technological trends and artificial intelligence (AI) as innovative solutions to enhance the quality and effectiveness of teaching and learning. The problem lies in the necessity of strategically harnessing the potential of emerging technologies and AI in higher education. The objective is to thoroughly examine the implementation of emerging technologies and artificial intelligence within the realm of higher education. A comprehensive systematic review was conducted, involving the analysis of 240 articles selected from searches within the Scopus, SpringerLink, and Web of Science databases the selection process employed rigorous inclusion and exclusion criteria, to achieve this, we utilized the PRISMA methodology with a systematic approach. Consequently, our findings indicate that the integration of emerging technologies and artificial intelligence in higher education offers valuable guidance for decision-making and enhances the effectiveness of educational strategies in the digital era.

Keywords: artificial intelligence, emerging technologies, higher education, learning

INTRODUCTION

In recent decades, higher education has been undergoing a deep transformation driven by emerging technology trends and artificial intelligence (AI) (Hwang et al., 2023). This outstanding progress underscores the importance of thoroughly investigating the emerging trends that are giving relevance to both the learning experience and the very foundations of education in higher education institutions (Sabbah et al., 2023). The main focus of this research is to explore how Artificial Intelligence and technological

trends are integrated into higher education, with the central purpose of understanding the implications and possibilities of integrating AI with higher education (Almufarreh & Arshad, 2023).

Within the context of emerging technological trends and the increasing advancement of information, higher education is faced with the role of fostering skills that enable it to thrive in an era of constant transformation (Criollo-C et al., 2023). In other words, these skills must be related to emerging technologies such as virtual and augmented reality, machine learning and data analytics, presenting a focus on academic ability and skills (Franco et al., 2023). Therefore, as mentioned (Adzifome & Agyei, 2023), artificial intelligence emerges as a strategic tool to personalize teaching and adapt the educational process to the characteristics and needs of each student.

Highlighting the importance of research are decisions made by educational institutions, curriculum designers and political leaders interested in the future of higher education (Rangel-de Lázaro & Duart, 2023). By incorporating these technologies effectively, higher education institutions can raise the quality of learning, strengthen student retention and ensure the relevance of academic programs in an increasingly digitized education (Jiang et al., 2023). Therefore, this study is positioning itself as an inspirational guide towards an educational landscape that becomes more dynamic and efficient (Schön et al., 2023).

This research arises from a need, which is to provide information in the academic literature, namely the lack of a complete and updated analysis on technological trends and artificial intelligence in the field of higher education (Pinto et al., 2023). Despite progress in incorporating emerging technologies, there remains a demand for a holistic perspective that considers the benefits, challenges and opportunities they present for student education and institutional effectiveness (Saluja et al., 2023). Consequently, this research aims to create an overview and establish a scientific foundation to generate future academic initiatives (Chugh et al., 2023).

The relevance of this study is strongly supported by data, according to the latest figures from UNESCO, 60% of higher education students say that incorporating technology in the classroom increases their motivation and level of engagement (Irwanto et al., 2023). In addition, according to the Association of American Universities (AAU) Report, the online learning modality has experienced an increase in recent years, mentioning that 30% of college students in the United States participated in at least one online course during the year 2020 (Cerratto Pargman et al., 2023). According to the NMC (New Media Consortium) Horizon Report emphasizes that artificial intelligence and other technologies will have a profound impact on higher education within 5 to 10 years (Janahi et al., 2023). Consequently, these data highlight the need to understand and prepare for this ever-evolving educational transformation (Hajirasouli & Banihashemi, 2022).

Within this context, the research is focused on a central question: How do emerging technological trends and artificial intelligence influence higher education? In order to find an answer, it is necessary to analyze examples of implementation, identify the obstacles to overcome and assess the ethical and pedagogical issues that these technologies entail in the field of higher education (Guillén-Gámez et al., 2022). The global dialogue regarding the future of higher education in the digital era should also be enriched (Hemachandran et al., 2022). To this end, we propose not only to contribute to the debate, but also to offer concrete guidelines for maximizing the potential of these technological trends for the benefit of both students and educational institutions (Ayite et al., 2022).

Accelerated technological advances have driven a link between the digital and educational spheres, putting traditional teaching methodologies to the test (Vasiliev, 2021). According to it, Leoste et al. (2021) educators and institutions are faced with the need to adjust to technological trends, where the ability to incorporate the latest technological innovations in education becomes an imperative to safeguard relevance and effectiveness (Chugh et al., 2021). Therefore, an essential demand for adaptation arises to ensure effective education in the current scenario (Bsharat & Ibrahim, 2020).

Investment in educational technology has been steadily increasing, evidencing growing confidence in its ability to radically transform methods of accessing and acquiring knowledge (Ngoc et al., 2020). For which and according to Mckie & Narayan (2019), the adoption of technology in the classroom, along with the spread of online courses and digital resources, underscores the need for further research to understand how these trends are shaping higher education with a positive impact (Suhasini & Santhosh Kumar, 2019).

Finally, the research has the central purpose of exploring how emerging technology trends and AI can address current educational challenges and anticipate future needs in higher education (Hinojo-Lucena et al., 2019). According to Vasiliev (2021), by understanding the synergy between technology and education, this research proposes to establish a scientific information base for the creation of pedagogical strategies and informed decisions in higher education institutions, within the framework of a world in constant change and digitization (Khoo, 2019). But at the same time, there are also questions about equity in access to education and technology, data privacy and certain skills in an automated world (Leoste et al., 2021). Ultimately, it must adapt towards a more adaptable and effective education, in accordance with the changing demands of the global environment (Schön et al., 2023).

METHODOLOGY

This research is based on a systematic approach methodology that involves the search and review of documentation and scientific articles related to the research topic. The objective is to understand the relevance of the subject and the most current trends in recent years. In order to carry out this process, it is essential to perform a search in documents and articles indexed in journals of high academic prestige, which allows access to direct and updated information on the subject under study. In this regard, specialized databases in the field of higher education and emerging technologies were used, specifically selecting Scopus, SpringerLink and Web of Science. The following are the subsequent steps necessary to develop this methodology: a) search questions, b) literature search, c) literature selection, and d) data extraction.

Search Strategies

To initiate our research, we used key descriptors related to the topic of interest: “emerging technologies” OR “technology trends” AND “higher education” AND “learning”. Then, in a more specific search, a Boolean algorithm was implemented to ensure the quality and validity of each study. The terms (“emerging technology trends” OR “emerging technologies”) AND (“higher education” OR “university education”) AND (“application” OR “implementation”) AND (“teaching processes” OR “learning processes”) AND (“artificial intelligence” OR “AI”) AND (“impact” OR “effects”) were used. These terms and Boolean operators were combined for the purpose of establishing logical relationships between them and detecting search patterns. The primary focus was to find references that address emerging technologies and higher education, with a focus on Artificial Intelligence.

Eligibility Criteria

The review included scientific articles that specifically addressed the issue of emerging technological trends, as well as their application in higher education and related challenges. As exclusion criteria, we removed duplicate studies and those that did not align with our research objectives. We also excluded documents published more than 5 years ago in order to ensure that the information we analyzed is up to date.

TABLE 1
SEARCH QUESTION

Number	Search Question (PB)	Objective
PB1	What are the most relevant emerging technology trends in higher education and how are they being applied?	Identifying emerging technology trends in higher education to understand how they are being applied.

It is critical to identify the appropriate terms to carry out the information search in order to apply the relevant filters, in this sense, different points of view should be used for the information search question in order to obtain relevant results.

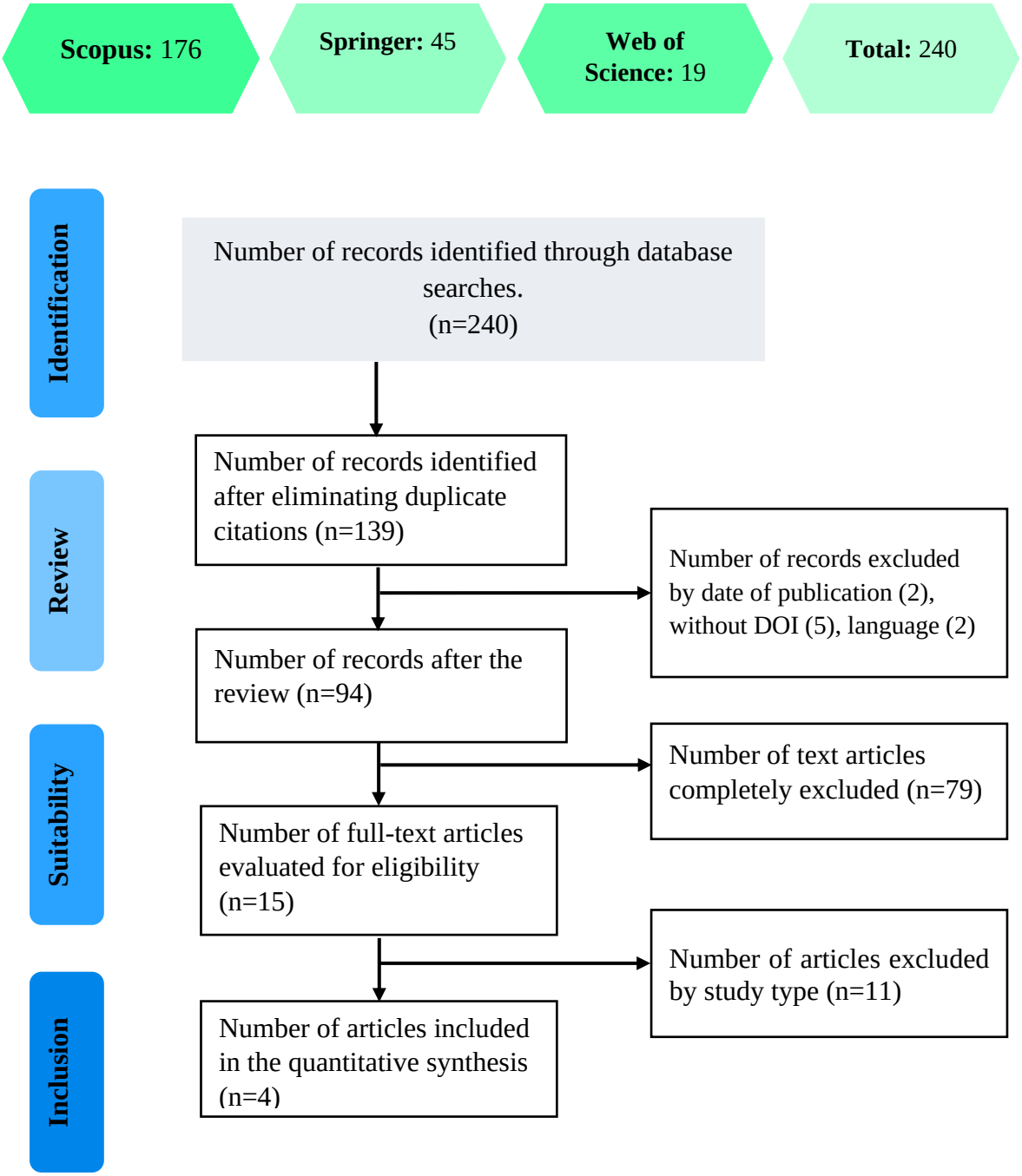
TABLE 2
SEARCH ALGORITHMS

Databases	Search algorithm
Scopus	(“emerging technology” OR “emerging technologies”) AND (“higher education” OR “university education”) AND (“application” OR “implementation”) AND (“teaching processes” OR “learning processes”) AND (“artificial intelligence” OR “AI”) AND (“impact” OR “effects”)
SpringerLink	(“emerging technology trends” OR “emerging technologies”) AND (“higher education” OR “university education”) AND (“application” OR “implementation”) AND (“teaching processes” OR “learning processes”) AND (“artificial intelligence” OR “AI”) AND (“impact” OR “effects”)
Web of Science	“emerging technology” AND “higher education” AND “application” AND “learning”) AND “artificial intelligence”

Note The table shows the search algorithm used in the research of information in each Indexed Base. **Source** Prepared by the author

Regarding what the flow chart represents, the criteria for the categorization and selection of the data were analyzed to relate to the topic, with which for the first filter according to the selected databases, a total of 176 were obtained in Scopus, 45 in SpringerLink and 19 documents in Web of Science, giving a total of 240 articles of which 139 were eliminated by criteria of excluded by the same database and also duplicate documents, giving a result of 94 selected documents. Finally, 8 articles were chosen from Scopus and SpringerLink because of their relevance to this review. These articles were subjected to a strict evaluation process in order to determine whether they met the necessary relevance. As a result, a total of 4 articles were identified that met these criteria.

FIGURE 1
PRISMA METHODOLOGY FOR INFORMATION FILTERING

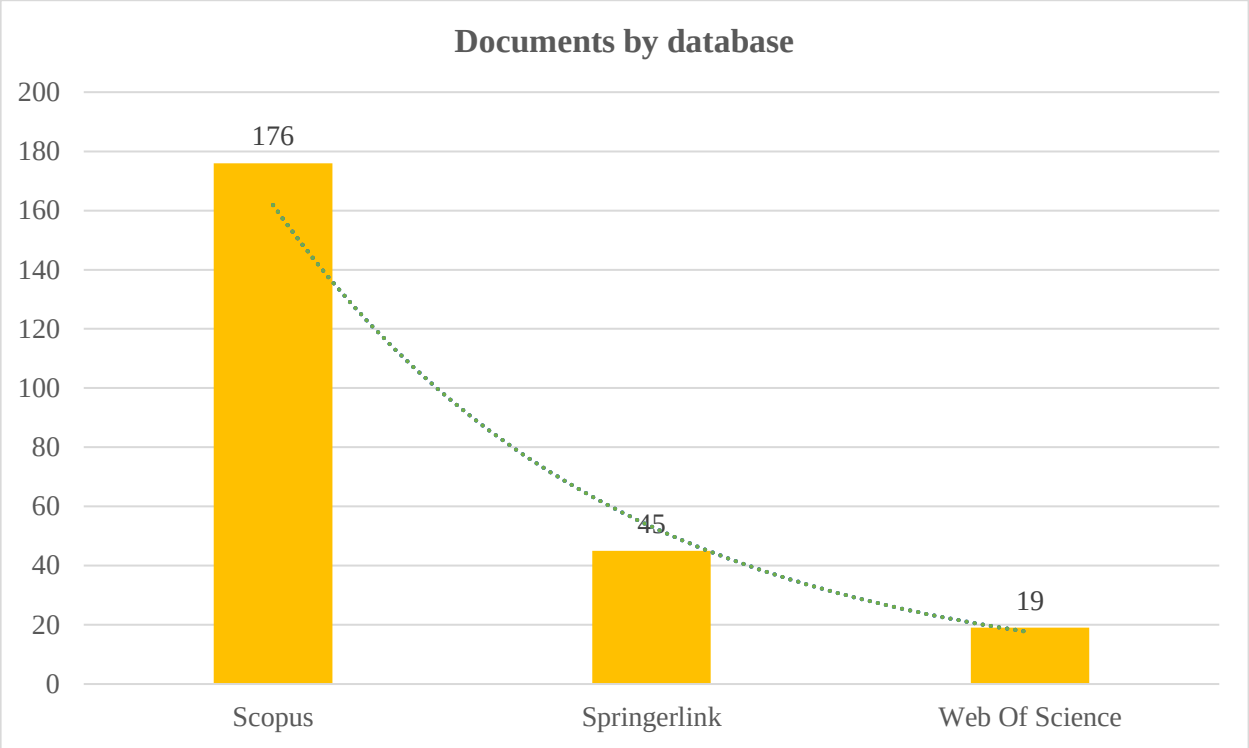


Note. PRISMA methodology in each Indexed Database. **Source.** Prepared by the author

RESULTS

Based on the search questions, we proceeded to interpret the whole of the documents to identify trends in this type of publications. Figure 2 provides an annual analysis of the number of publications related to the approach of the points of view analyzed, with the following result:

FIGURE 2
NUMBER OF PUBLICATIONS PER SEARCH QUESTION



The databases contain a large number of documents related to emerging technologies and higher education, evidencing the significant growth of this topic and the need to focus on research to determine how it can influence the perception of higher education institutions. However, restricting the use of technologies is not a viable option, since they are an integral part of society's daily life. It is therefore critical to consider the different ways in which artificial intelligence can be harnessed to achieve improvements in learning.

TABLE 3
RESULTS

Author	Topic	Methodology	Results	Conclusions
Ahmad &Arshad (2023)	Promising Emerging Technologies for Teaching and Learning: Recent Developments and Future Challenges	A systematic methodology is applied for the analysis of emerging technologies in education, which have become a highly relevant topic, as reflected in the numerous articles and conference proceedings on the subject. In education, these technologies are being actively integrated into classrooms with the aim of enriching teaching methods and providing more innovative and engaging learning experiences.	This study is expected to provide a strong stimulus for other universities and colleges around the world to adopt innovative and revolutionary technologies to increase their academic performance.	The bibliographic review of state-of-the-art techniques incorporating Information and Communication Technologies (ICT) highlights the implementation of emerging technological strategies focused on improving the educational environment and the learning process. According to the study's conclusions, it is indisputable that emerging technologies significantly improve pedagogical practice, especially with regard to prompt feedback, the promotion of teamwork and the strengthening of the relationship between teachers and students.

Author	Topic	Methodology	Results	Conclusions
Criollo-C et al. (2023)	Towards the Integration of Emerging Technologies as Support for the Teaching and Learning Model in Higher Education	A literature review is performed with the purpose of determining how education has experienced a positive impact thanks to the appearance of emerging technologies such as virtual reality, augmented reality, games, web and mobile applications, among others.	The results obtained in this study are promising and establish the basis for the incorporation of network automation and the use of Python libraries in educational applications. These tools can play a critical role in teaching and learning models within higher education.	The web application can be used to teach networking in technical and university training programs. Its usefulness lies in the ability to display configurations in real time, which would help to improve students' understanding of the concepts.
Hemachandran et al. (2022)	Artificial Intelligence: A Universal Virtual Tool to Augment Tutoring in Higher Education	In this article a systematic review is applied with the intention that the authors explore the predictive capability of artificial intelligence in relation to the future of higher education. The research analyzes in depth the current educational system, the challenges faced by the institutions.	It is necessary to create artificial intelligence systems that are adaptable to the individual needs of students, allowing them to learn at their own pace, on their own schedule and in their own space.	Finally, this article looks to establish a connection between human teachers and machines. Therefore, we are deeply interested in understanding the psychological emotions of both teachers and students when artificial intelligence assumes a leading role.

Author	Topic	Methodology	Results	Conclusions
Pinto et al. (2023)	How Machine Learning (ML) is Transforming Higher Education: A Systematic Literature Review	An analysis (PRISMA) was used to carry out a systematic review of the literature in order to analyze, select and present the articles in a clearer way. PRISMA focuses on providing guidelines for authors to ensure transparent and complete disclosure of systematic reviews and meta-analyses.	After a thorough review of the full texts, 171 articles were found to meet the inclusion criteria. In order to provide more concise results, we have chosen to include only journals with at least 4 articles. We have also supplemented the information in the table with data provided by Resurchify, including impact score, h-index and quartiles for each journal.	This Systematic Literature Review (SLR) aimed to review the literature indexed in the SCOPUS database during the last 5 years (2019-2023) related to the implementation of Machine Learning (ML) solutions in History of Education (HIE). In general terms, the results suggest that the literature on this topic, although still limited, is experiencing rapid growth and receives funding mainly from public grants and universities.

DISCUSSION

This research has explored the use of emerging technological trends and artificial intelligence in higher education, focusing on their implications and opportunities. These results are contextualized in the studies mentioned in the introduction, which offer valuable insights into the linkage between technology and higher education.

According to the results of Almufarreh & Arshad (2023), this research agrees that machine learning and data analytics can be used effectively in higher education, also the technological revolution of the last decades has profoundly transformed the way we live and work. The analysis disclosed that institutions that implement these technologies often experience significant improvements in student learning, supporting the idea that these tools have considerable potential to increase the efficiency and quality of higher education. But in an increasingly interconnected world, privacy and cybersecurity issues are critical challenges that must be addressed, i.e., higher education is evolving to prepare future generations for a changing and challenging world, where adaptability and the ability to continuously learn are essential.

As stated Criollo-C et al. (2023) in their study on virtual and augmented reality immersion in higher education, they point out that technologies can transform the learning experience by offering immersive environments and highly interactive learning experiences. This suggests a convergence in the literature on the potential of RV/RA to improve the teaching and understanding of complex concepts. Finally, the authors propose that the generation of web applications can play an important role in the teaching of networks in technical and university training programs. Its usefulness lies in its ability to visualize configurations in real time, which can contribute significantly to strengthening students' understanding of the concepts.

Emerging technologies can be tailored to the needs of students that can help ensure they have an equal chance of success, therefore artificial intelligence has great potential according to Hemachandran et al. (2022), therefore the authors raise the need for a strong ethical framework to guide the implementation of these technologies in the classroom, it is also essential to develop artificial intelligence systems that can

adapt to individual needs giving them the opportunity to learn at their own pace and place that is most convenient for them.

Based on the criteria of Pinto et al. (2023), global connectivity through the Internet has brought people from all over the world closer, but it has also raised challenges in terms of privacy and cyber security in higher education institutions, therefore, raises the application of Machine Learning (ML) solutions in the field of Higher Education. Thus, the results suggest that, despite its limited presence, the literature on this topic is experiencing accelerated growth and is primarily benefiting universities, and this research supports these arguments, demonstrating that these issues must be addressed proactively to ensure that all students have equal access and opportunities in an AI-driven educational environment.

Finally, the digital revolution has changed our society in every aspect, from the way we communicate to how we work and learn. Emerging technologies and learning are driving remarkable advances in all education areas. At the same time, online education has gained ground, providing access to training anywhere and anytime, therefore, adaptability to technological trends is increasing, and these skills are essential in this new digital era.

CONCLUSIONS

The application of emerging technological trends and artificial intelligence in higher education allowed highlighting the impacts and opportunities of these technologies in education. One of the highlights of this research is the adoption of the PRISMA methodology, which ensured a systematic and clear approach to the literature review, allowing the identification of trends for comparisons with relevant studies. Therefore, the use of content analysis tools and the collection of qualitative data enriched our understanding of the perceptions and experiences of those involved in the implementation of these technologies in higher education.

This research has the potential to provide information for future studies in the field of higher education and technology. The combination of quantitative and qualitative analyses allowed for a deeper understanding, and the inclusion of comparative studies provided valuable context to our findings. However, it is important to recognize the limitations of this study. The main limitation lies in the difficulty of keeping a systematic review up to date in a field as dynamic as educational technology. Given the constant emergence of new technologies and learning approaches, most of the data and studies analyzed focused on specific aspects, which allows generating knowledge between technological trends and higher education.

This study makes a significant contribution to knowledge in the field of higher education and technology. By highlighting the benefits and challenges associated with the adoption of emerging technologies and artificial intelligence, it provides valuable guidance for educators, administrators and decision makers in education interested in leveraging these tools effectively and equitably. Also, focusing on the current and future reality of higher education, this research becomes an essential tool to anticipate and adapt to the continuous technological transformations in the educational field.

In short, technological progress has left a deep mark on our society, artificial intelligence and learning are driving radical changes in a variety of ways, enabling task automation and more accurate decision making. Higher education has experienced a boom with the adaptation of artificial intelligence, providing flexible and accessible learning opportunities worldwide. Finally, the ongoing importance of adapting to emerging technological trends and AI to ensure quality higher education is emphasized.

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