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Integration of Artificial Intelligence Technology in Distance Learning in Higher Education

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ABSTRACT

Background. Higher education in this digital era is faced with significant changes, especially with the development of artificial intelligence (AI) technology.

Purpose. This research aims to explore the potential and limitations of integrating AI technology in improving the quality of distance learning and present findings that can guide the development of AI-based pedagogy.

Method. This research method adopts a quantitative survey approach to detail the integration of artificial intelligence (AI) technology in the context of distance learning in higher education. A total of 20 students were randomly selected as respondents, with sample selection using the purposive sampling method. This process ensures maximum representation of students who have significant experience with the integration of AI technology in their learning. Data was collected through questionnaires focused on effectiveness, adaptability of material, and level of interactivity during learning. Next, descriptive and inferential statistical analysis will analyze patterns and relationships between variables to explore the effectiveness of AI technology, the factors that influence it, and its impact on student learning experiences.

Results. Survey results show that the majority of students actively use AI technology, especially several times a week, and express a high level of satisfaction with the use of AI technology in distance learning. Virtual Reality or Augmented Reality learning experiences were considered to benefit the most, even though all respondents experienced challenges or obstacles in using AI technology.

Conclusion. The conclusions of this research emphasize the need to address these challenges to maximize the benefits of integrating AI technology in increasing the effectiveness and efficiency of distance learning in higher education.

KEYWORDS

Artificial Intelligence, Distance Learning, Higher Education

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INTRODUCTION

Rapid technological developments, especially in the realm of artificial intelligence (AI), have brought about paradigmatic changes in the higher education landscape around the world (Baldao dkk., 2020). This transformation not only creates a new era, but also challenges educational institutions to adapt and utilize innovation to meet the growing needs of modern students . In the face of ever-changing global dynamics and to meet the demands of

technological progress, universities around the world are increasingly actively exploring the potential of distance learning. It is important to note that in an era where digital connectivity is expanding, access to global resources is becoming increasingly accessible (Dolgui & Ivanov, 2022). This provides encouragement for higher education institutions to explore and optimize distance learning methods in response to changing student demands and needs. With the integration of AI technology, significant new opportunities open up to improve the quality of learning and progressively overcome obstacles that may arise in a distance learning environment (Toreini dkk., 2020).

The use of AI technology in a distance learning context is not only a practical solution, but also a mistake one key to addressing the complex challenges faced by higher education institutions (Zhang & Aslan, 2021). AI integration is able to provide a more adaptive, personalized and effective learning experience, helping to strengthen interactions between students and the learning process (How & Hung, 2019). Therefore, this background shows how important it is to explore and understand the impact of integrating AI technology in distance learning in higher education, along with the continuous evolution of students' needs and expectations in this digital era (Seng dkk., 2023).

Nowadays, the distance learning paradigm is faced with a number of problems that result in critical challenges in the student learning experience (Epps dkk., 2021). In this context, students often find themselves having difficulty adapting to a curriculum that feels less flexible. These limitations create a gap between students' individual needs and a curriculum structure that may not always be responsive to dynamic developments in their understanding.

In addition, minimal personal interaction is a major obstacle in distance learning. Limited communication and lack of face-to-face contact with lecturers or fellow students can be detrimental to students' academic and emotional well-being. This sense of disconnection often results in significant levels of dissatisfaction, as students miss the personal bonds and social experiences that typically occur in conventional learning.

Furthermore, the low effectiveness of distance learning is an additional problem that needs to be addressed. Students can experience difficulty in gaining a deep understanding of the material due to the lack of support and guidance they can receive directly. This can create a knowledge gap between students taking part in distance learning and those in conventional learning environments, hindering the development of skills and understanding needed in the world of work or their academic careers.

By identifying and understanding the problems that arise in distance learning away, we can better understand the need to seek innovative solutions (Mangiaracina dkk., 2019). Such innovation may involve utilizing AI technology as a solution that can provide the adaptability, interactivity, and personalization needed to enhance the distance learning experience, overcome dissatisfaction, motivate students, and increase overall learning effectiveness (Vollmer dkk., 2020).

Limited human interaction, lack of material adaptation, and limited personalization in distance learning create an unsatisfactory learning environment (Trevisan dkk., 2023). Students feel disconnected from the learning process and experience obstacles in achieving their maximum potential. It is important to address these issues because the future of higher education depends on our ability to meet emerging challenges in innovative and effective ways (Gulyamov dkk., 2023). The integration of AI technology offers a potential solution to improve the quality and accessibility of distance learning (Alahi dkk., 2023; Karakose dkk., 2023).

Addressing this problem requires a revolutionary approach. AI technology can be used to adapt material, provide automatic feedback, and create a more personalized and effective learning

experience for each student (Olaye & Seixas, 2023). In the realm of higher education, the integration of modern technology, exemplified by the use of artificial intelligence (AI) as a personalized learning platform, holds significant promise for enhancing the learning experience across various subjects. This research is driven by the exploration of experimental data concerning the integration of modern technology in higher education, specifically focusing on the use of AI (Cheng, 2020; Stefancik & Stradiotova, 2021).

The primary objective is to optimize and improve teaching approaches based on the insights derived from the obtained data. Conducted within higher educational institutions in the People's Republic of China, the study employs an experimental design to assess the impact of AI technologies on the education system (Wu & Liu, 2019). The implementation of the Raptivity personalized learning platform is evaluated through statistical data analysis and paired t-tests involving 356 students. This research holds practical significance by affirming the positive impact of the Raptivity personalized learning platform on students' academic achievements. The findings underscore the importance of modern technology integration, particularly the introduction of AI, in the educational systems of the People's Republic of China and beyond (Zhao, 2021).

This systematic review addresses the growing prevalence of online learning in higher education and the transformative role played by artificial intelligence (AI) in enhancing instructional methods and learning outcomes (Macea-Anaya dkk., 2023). Despite the increasing reliance on AI in online higher education, a noticeable gap exists in the literature regarding comprehensive reviews focusing on the functions, effects, and implications of AI applications in this context. This study aims to fill these gaps by offering a meticulous overview of empirical research on the applications of AI in online higher education conducted between 2011 and 2020. Analyzing 434 initially identified articles, the final synthesis includes 32 articles that meet the screening criteria. The findings reveal that AI applications in online higher education encompass diverse functions such as predicting learning status, performance, or satisfaction, recommending resources, facilitating automatic assessment, and enhancing the overall learning experience (Avsec dkk., 2022; Ufarte Ruiz dkk., 2020). Traditional AI technologies are commonly employed, with more advanced techniques like genetic algorithms and deep learning being less prevalent. The effects generated by AI applications encompass high-quality predictions, personalized recommendations, improved academic performance, and enhanced online engagement (Longoni & Cian, 2022). The systematic review proposes theoretical, technological, and practical implications, emphasizing the integration of educational theories into AI-enabled online learning, the adoption of advanced AI technologies for real-time data analysis, and the imperative need for further empirical research to validate the actual effects of AI applications in online higher education (Chen dkk., 2020).

This research contributes to filling the knowledge gap on how AI technology can be effectively integrated in distance learning. By understanding its potential and limitations, we can develop better pedagogy and optimize the student learning experience (Co dkk., 2022). This research will apply a quantitative survey methodology to collect data about student perceptions of AI technology integration (Shi dkk., 2021). Analysis of this data will provide deep insight into the effectiveness and impact of using AI technology in distance learning contexts.

At a global level, current literature provides insight into various approaches and implementations of AI technology in distance learning contexts (Q. Liu dkk., 2019). By understanding the framework and current research results, we can set the foundation for further innovation. The research question is How does the integration of AI technology affect the adaptability of learning materials in a distance learning context? What are students' perceptions of

the use of AI technology in distance teaching? To what extent can AI technology increase the interactivity and personalization of distance learning? So the main aim of this research is to explore the potential and limitations of integrating AI technology in improving the quality of distance learning in higher education, as well as presenting findings that can guide the development of AI-based pedagogy.

RESEARCH METHODOLOGY

This research takes a quantitative survey approach (Davies dkk., 2021). a survey quantitative approach to investigate the impact of the integration of artificial intelligence (AI) technology in distance learning in higher education (Jiang dkk., 2021). The survey method was chosen because it can provide a comprehensive picture of students' perceptions and experiences regarding the use of AI technology in the context of online learning. To detail the integration of artificial intelligence (AI) technology in the context of distance learning in higher education (Kor dkk., 2023). Respondents consisted of 20 students who were randomly selected as research samples. The sample selection process was carried out using a purposive sampling method, where students who were actively involved in distance learning were identified as the main target.

This approach is designed to ensure maximum representation of students who have significant experience with the integration of AI technology in their learning. Sample selection through purposive sampling ensures that respondents have relevant insights and in-depth experience with AI technology in distance learning. Data collection was carried out through a specially developed questionnaire, focusing on the dimensions of effectiveness, adaptability of the material, and the level of interactivity experienced by students during the learning process (Xie dkk., 2020). The questionnaire also included questions related to their perceptions of the benefits and obstacles to using AI technology.

After data collection is complete, descriptive and inferential statistical analysis will be applied to explore patterns and relationships between variables. Through this technique, this research will analyze the level of effectiveness of AI technology, the factors that influence it, and its impact on student learning experiences. It is hoped that the results of this research will provide in-depth insight into the impact of integrating AI technology in distance learning in higher education (Al-Abdullatif, 2023). It is hoped that these findings will provide a basis for developing more effective strategies and policies in adopting AI technology in online learning environments. The practical implications of this research can also help universities to optimize the use of AI technology in improving the quality and efficiency of distance learning.

RESULT AND DISCUSSION

In the current digital era, the integration of artificial intelligence (AI) technology has become a crucial topic in discussing distance learning in higher education (Farrokhnia dkk., 2023). In this context, this research was carried out to explore students' perceptions and experiences regarding the integration of AI technology in distance learning. Higher education institutions around the world are increasingly adopting AI technology to enrich learning experiences, adapt learning materials, and provide automated assessments (J. Liu dkk., 2020). Along with these developments, it is important to understand the extent to which AI technology has permeated distance learning environments, the extent to which students feel engaged, and what impact it has had on the quality of learning.

Artificial Intelligence (AI) is a field of computer science that focuses on the development of systems or programs computers that can perform tasks that normally require human intelligence (Xu dkk., 2021). AI seeks to create machines that can think, learn, and adapt like humans (Awad

dkk., 2022). It involves the use of algorithms and mathematical models that allow computers to process data, learn from experience, and produce intelligent decisions or actions.

The integration of artificial intelligence technology in higher education learning involves the use of various AI-based applications and tools to improve student learning experiences and support lecturer teaching (Fuller dkk., 2020). Some forms of AI integration in higher education contexts include (Malik dkk., 2023):

Adaptation of Learning Materials

The AI system can identify students' individual learning needs and adapt learning materials according to their level of understanding, ensuring that each student can learn at their own pace and learning style.

Automated Grading

AI technology can be used to evaluate student work automatically, speeding up the grading process and providing instant feedback.

Individual Guidance and Support

AI-based virtual assistants can provide individual guidance to students, answer their questions, and provide support in the learning process.

Learning Data Analysis

AI systems can analyze learning data to identify patterns that can help universities improve teaching strategies, improve curricula, and provide support to students in need (Ahmad dkk., 2020).

Virtual Reality or Augmented Reality Learning Experiences

AI integration can create immersive learning experiences through the use of virtual reality or augmented reality technology to simulate certain situations or environments.

Based on survey results from 20 students with the question How often do you use AI technology in distance learning? With answer options ith answer options • Every day • Several times a week • Once a week • Rarely used • Never used. The results of the questionnaire were obtained as follows:

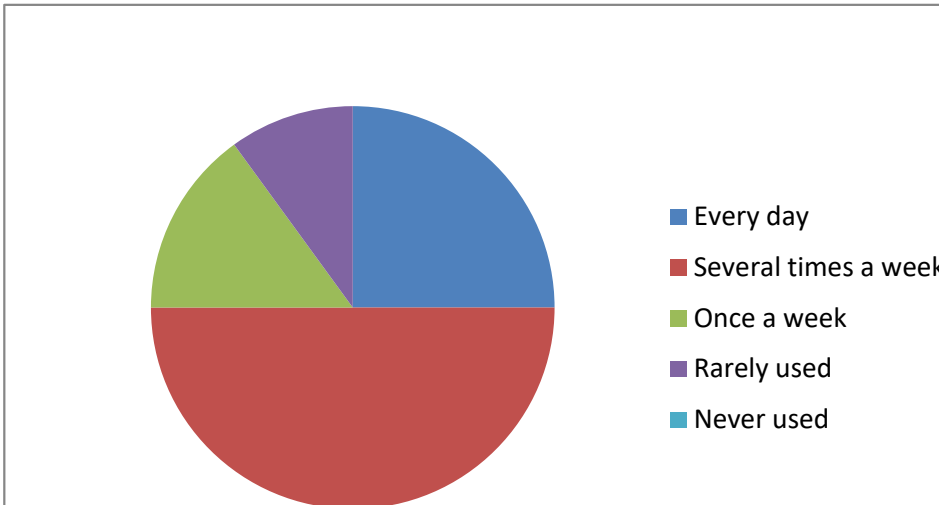

Figure 1. Frequently use AI technology in distance learning

Based on the results of a survey of 20 students regarding Every day 5 students (25%) several times a week 10 students (50%) once a week 3 students (15%) rarely used 2 students (10%) never use 0 students (0%) the use of AI technology in distance learning, it can be concluded that the majority of students (75%) actively use AI technology. The majority of them (50%) use AI technology several times a week, indicating a fairly high adoption rate. Meanwhile, a number of

students (25%) use AI technology every day. These results reflect that the integration of AI technology in distance learning has become an integral part of the student learning experience, which can provide a foundation for higher education institutions to continue to develop and improve the use of AI technology in the learning environment.

Next question What is your level of satisfaction with the use of AI technology in learning? With a choice of answer options from 20 students as follows:

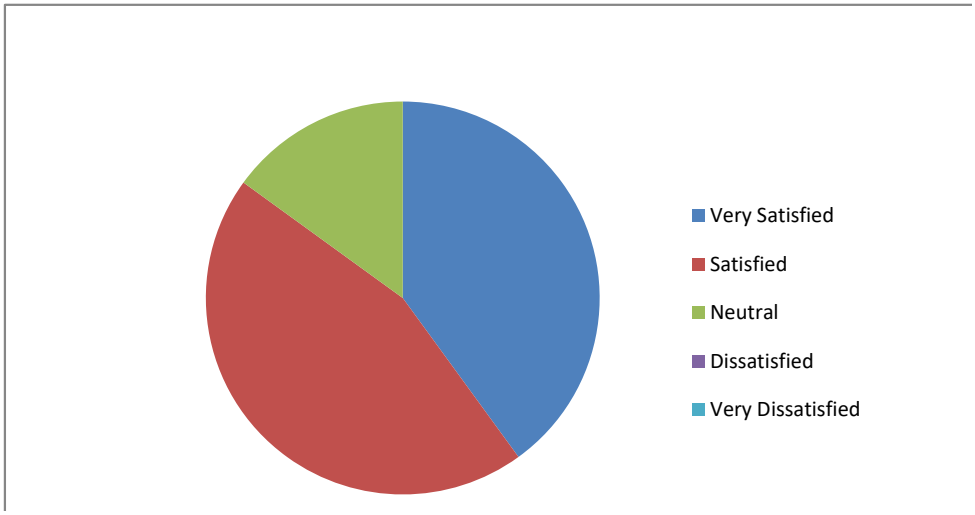

Figure 2. Level of satisfaction with the use of AI technology in learning

Of the 20 students who participated in the survey, the distribution of levels of satisfaction with the use of AI technology in distance learning is as follows: Very Satisfied: 8 students (40%), Satisfied: 9 students (45 %), Neutral: 3 students (15%), Dissatisfied: 0 students (0%), Very Dissatisfied: 0 students (0%). Thus, the survey results show that the majority of students (85%) expressed a high level of satisfaction with the use of AI technology in distance learning. As many as 40% of them felt very satisfied, while 45% felt satisfied. Only a small portion of students (15%) expressed neutral feelings regarding the use of AI technology. No one expressed dissatisfaction or very dissatisfaction. These results indicate that the adoption of AI technology in distance learning received a positive response from the majority of students.

Next question Do you feel that the integration of AI technology has improved the quality of your distance learning? Of the 20 students who participated in the survey, the distribution of responses regarding whether the integration of AI technology has improved the quality of distance learning is as follows:

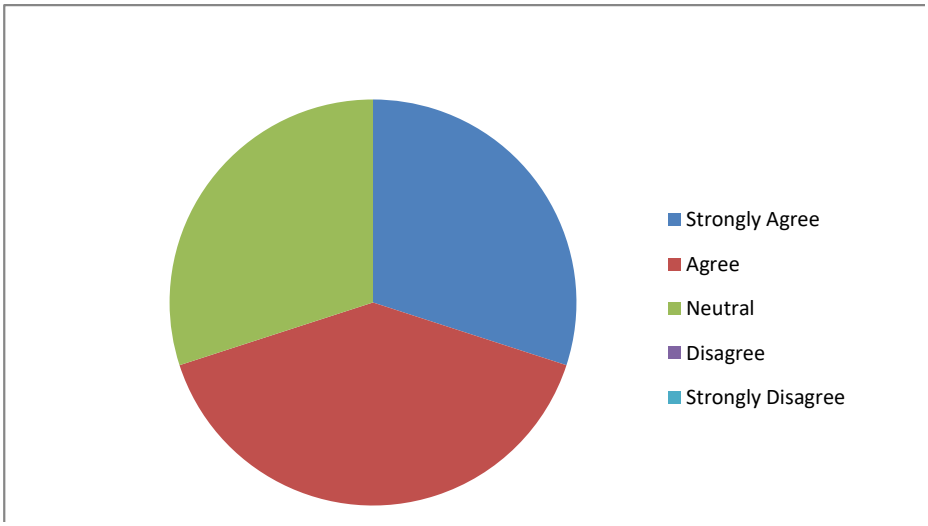

Figure 3. Integration of AI technology in improving the quality of distance learning

The results of the questionnaire from 20 respondents were Strongly Agree: 6 students (30%), Agree: 8 students (40%), Neutral: 6 students (30%), Disagree: 0 students (0%), Strongly Disagree: 0 students (0%) The survey results show that the majority of students (70%) have a positive view of the influence of AI technology integration in improve the quality of distance learning. As many as 30% of them felt neutral regarding this matter. No students expressed disagreement with this statement, indicating that the integration of AI technology made a positive contribution to their distance learning experience according to the majority of respondents.

Next question, : Of the 20 students who participated in the survey, the distribution of preferences for the areas most considered to benefit from the use of AI technology is as follows:

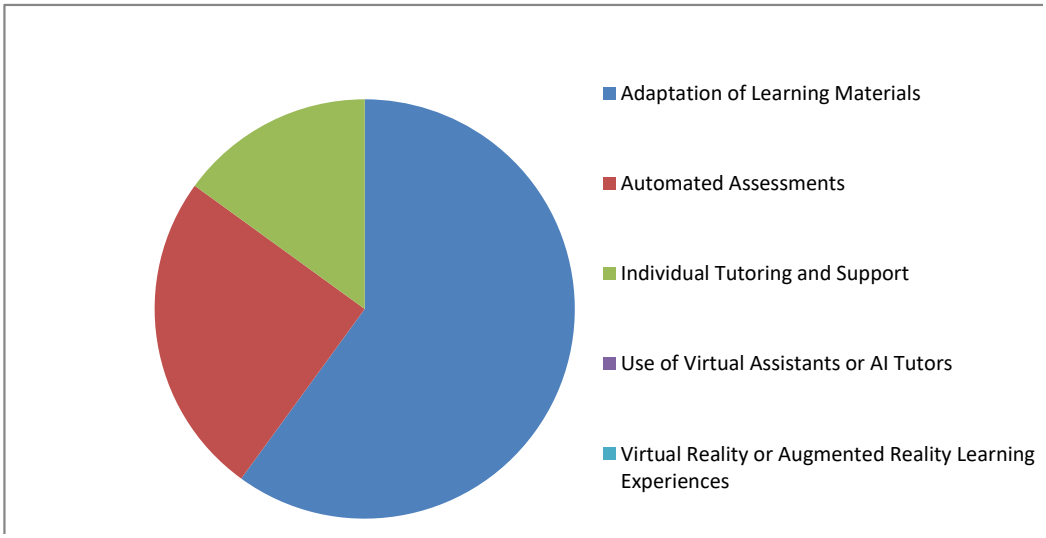

Figure 4. Areas that benefit most from the use of AI technology

The results of the 20 respondents were Virtual Reality or Augmented Reality Learning Experience: 12 students (60%) Automatic Assessment: 5 students (25%) Individual Guidance and Support: 3 students (15%) Adaptation of Learning Materials: 0 students (0%) Use of Virtual Assistants or AI Tutors: 0 students (0%) Survey results show that the majority of students (60%) sees Virtual Reality or Augmented Reality learning experiences as the area that will benefit most from the use of AI technology. Meanwhile, 25% of them chose automated assessments, and 15% chose individual guidance and support. No one singled out adapting learning materials or using virtual assistants or AI tutors as areas that would benefit most. This indicates a high level of interest in the application of AI technology to enhance learning experiences through simulation and reality augmentation.

The next question, Have you experienced any challenges or obstacles in using AI technology in distance learning? From 20 respondents the following answers were obtained:

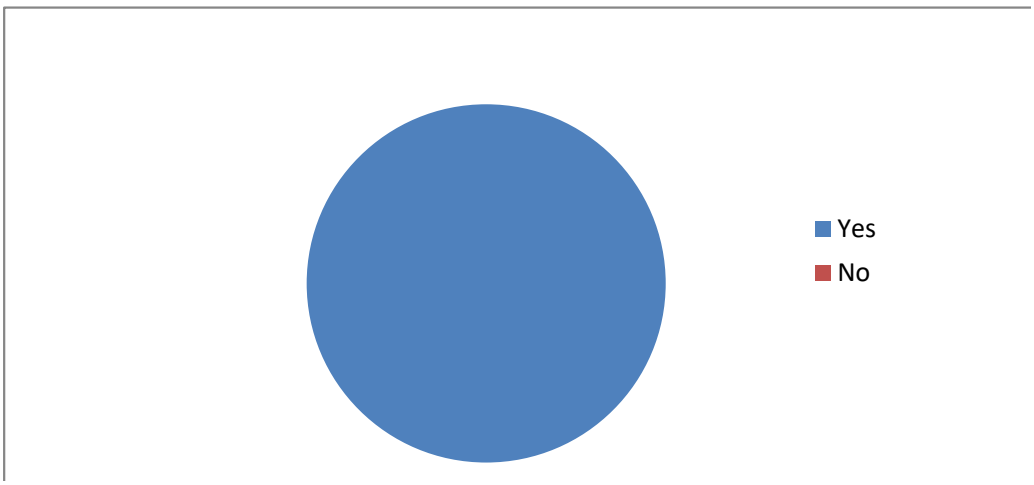

Figure 5. Challenges or barriers in using AI technology in distance learning

Of the 20 students who participated in the survey, all of them (100%) stated that they experienced challenges or obstacles in using AI technology in distance learning. These results show that although the adoption of AI technology in distance learning has become a reality, students face a number of challenges or obstacles in implementing it. Identifying and addressing these challenges can be a key focus for educational institutions to increase the use of AI technology and ensure a better learning experience for students.

Insights from the results of this survey show that students are generally actively using AI technology in distance learning, with the majority of them doing so several times a week. The level of satisfaction with the use of AI technology also tends to be high, with the majority of students feeling very satisfied or satisfied. Students also see that the integration of AI technology has made a positive contribution to improving the quality of their distance learning (Nikitas dkk., 2020).

The area most considered to benefit from the use of AI technology is the Virtual Reality or Augmented Reality learning experience. This reflects high interest in the application of AI technology to create more immersive and interactive learning experiences. Nonetheless, the survey also showed that all respondents experienced challenges or barriers in the use of AI technology, highlighting the importance of identifying and overcoming these barriers to increase the effectiveness of using AI technology in distance learning. Overall, this view paints a positive picture of adoption AI technologies in the context of distance learning in higher education, while also highlighting some aspects that can be improved to maximize the benefits of this integration.

CONCLUSION

Based on the results of a survey of 20 students regarding the use of AI technology in distance learning, it can be concluded that the majority of students actively use AI technology, especially several times a week. The level of satisfaction with the use of AI technology is also high, with the majority of students feeling very satisfied or satisfied. This positive view is also reflected in the perception that the integration of AI technology has made a positive contribution to improving the quality of distance learning.

The area most considered to benefit from the use of AI technology is the Virtual Reality or Augmented Reality learning experience, showing high interest in the application of the technology AI to create more immersive and interactive learning experiences. However, the survey results also highlight that all respondents experienced challenges or barriers in the use of AI technology, emphasizing the need to address these issues to maximize the benefits of integrating AI technology in distance learning. Thus, the overall survey shows that AI technology has has become an integral

part of students' distance learning experience in higher education, but certain challenges need to be overcome so that the implementation of this technology can run more effectively and efficiently in the future.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

Author 4: Formal analysis; Methodology; Writing - original draft.

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