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Preferences towards artificial intelligence in Ecuadorian university professors

Preferências por inteligência artificial em professores universitários equatorianos

Preferencias hacia la inteligencia artificial en profesores universitarios ecuatorianos

Viviana Vanessa Aparicio-Izurieta
https://orcid.org/0000-0002-1417-2036
University Professor at Luis Vargas Torres Technical University of Esmeraldas (UTLVT-E), Ecuador. Graduate research Andrés Bello Catholic University (UCAB), Venezuela.
vvaparicio23@est.ucab.edu.ve (correspondence)

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The article offers direct information from actors linked to the daily reality of higher education in Ecuador. In a practical way, its results allow us to identify the weak points to improve to implement AI in higher education.
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The article presents original empirical evidence and can support future research and/or well-informed public education policies regarding the implementation of AI in Ecuador educational context.

ABSTRACT

The general objective of this research was to analyze the preferences towards Artificial Intelligence (AI) in university professors in Ecuador, particularly those who teach the subject of Microeconomics. The methodology used was quantitative, descriptive, field-typed, and non-experimental, based on documentary research. The population consisted of 25 teachers from three state universities in the city of Guayaquil, Ecuador. The data collection technique was the survey and the instrument was a questionnaire of closed questions, which was applied through the Google Forms platform. The results found indicate that a large majority know about the use of AI in higher education; they also consider that the benefits that AI brings to education are to improve teaching, a large percentage indicated not to use AIs to teach Microeconomics, a small number of teachers who use AI, do it for data analysis through Machine Learning, the fact of the little use of this technology among teachers is mainly due to the absence of university policies on the use of artificial intelligence. Among the conclusions, the formulation of educational policies oriented to the implementation of artificial intelligence in Ecuadorian universities, the adaptation of infrastructure, and the investment of resources for this purpose are considered essential, as well as the training of teaching staff to take full advantage of this technology that is already a reality in many national and international contexts.

Keywords: Artificial intelligence, microeconomics, university teachers.

RESUMO

O objetivo geral desta pesquisa foi analisar as preferências pela Inteligência Artificial (IA) em professores universitários no Equador, particularmente aqueles que ensinam a disciplina de Microeconomia. A metodologia utilizada foi quantitativa, de nível descritivo, tipo campo e de natureza não experimental, apoiada em pesquisa documental. A população foi composta por 25 professores de três universidades estaduais da cidade de Guayaquil, Equador. A técnica de coleta de dados foi a survey e o instrumento foi um questionário de perguntas fechadas, que foi aplicado por meio da plataforma Google Forms. Os resultados encontrados indicam que uma grande maioria tem conhecimento da utilização da IA no ensino superior; Consideram também que os benefícios que a IA traz para a educação é a melhoria do ensino, uma grande percentagem indicou não utilizar a IA para ministrar a aula de Microeconomia, o pequeno número de professores que utilizam a IA o fazem para análise de dados através de Machine Learning, o facto da O pouco uso dessa tecnologia entre os professores se deve principalmente ao absenteísmo das políticas universitárias quanto ao uso da inteligência artificial. Entre as conclusões, considera-se predominante a formulação de políticas educacionais voltadas à implementação da inteligência artificial nas universidades equatorianas, adaptando a infraestrutura e investindo recursos para esse fim, assim como a formação do corpo docente é essencial para que possam aproveitá-la ao máximo. . esta tecnologia que já é uma realidade em vários contextos nacionais e internacionais.

Palavras-chave: Inteligência artificial, microeconomia, professores universitários.

RESUMEN

El objetivo general de esta investigación fue analizar las preferencias hacia la Inteligencia Artificial (IA) en profesores universitarios del Ecuador, particularmente aquellos que imparten la asignatura de Microeconomía. La metodología empleada fue cuantitativa, de nivel descriptivo, tipificada de campo y de carácter no experimental, sustentado en una indagación documental. La población quedó conformada por 25 docentes de tres universidades estatales de la ciudad de Guayaquil, Ecuador. La técnica de recolección de datos fue la encuesta y el instrumento un cuestionario de preguntas cerradas, el cual fue aplicado a través de la plataforma Google Forms. Los resultados encontrados indican que una gran mayoría conoce del uso de la IA en la educación superior; asimismo consideran que los beneficios de que la IA aporta a la educación es mejorar la enseñanza, un gran porcentaje indicó no emplear las IAs para impartir la cátedra de Microeconomía, el exiguo número de docentes que usa la IA, lo hace para el análisis de datos mediante el Machine Learning, el hecho del poco uso de esta tecnología entre los docente se debe principalmente al ausentismo de políticas universitarias en materia de uso de la inteligencia artificial. Dentro de las conclusiones se considera preponderante la formulación de políticas educativas orientadas a la implementación de la inteligencia artificial en las universidades ecuatorianas, adecuar la infraestructura e invertir los recursos para tal fin, así mismo es fundamental la capacitación del personal docente para que pueda aprovechar cabalmente esta tecnología que ya es una realidad en muchos contextos nacionales e internacionales.

Palabras clave: Inteligencia artificial, microeconomía, docentes universitarios.

INTRODUCTION

There is no doubt that the use of technology in education has brought great changes and challenges for the teaching profession in the university context, its application requires accepting the increasingly pronounced presence of digital tools in the educational scenario and the recognition by the educator of the constant training that is required in this area of knowledge for the development of technological competencies and skills essential to address the task that involves the teaching and learning process of students and future professionals of today.

This panorama forces universities to look for alternatives to adapt the teaching and learning process of the different areas and knowledge developed in the different professional careers taught there, to the current global era and highly permeated by technological advances, specifically, Microeconomics as a discipline that has a direct impact on the professional performance of future university graduates, should enhance its practice towards the achievement of a training in line with the demanding and changing social environment of today.

The globalization of the economy and the rapid growth of companies require a solid formation of the future professional in the administrative, financial and economic area. In this sense, it is essential to provide students with knowledge about the value of microeconomics as a basis for understanding the economic problems that occur in society and thus be able to contribute to the contribution of solutions aimed at achieving development in this direction. In this regard, (Urday, 2019) emphasizes, technological advances, the progress of the international market and the rapid evolution of companies lead to seek alternatives and skills on how to use quantitative and qualitative methods inherent to the discipline Microeconomics as part of Economics as a science, in charge of preparing the student to face the problems of professional and social practice (p.10).

According to Colomé, Elías, & Navajas (2021) the effects of Artificial Intelligence (AI) on the economy and economic analysis are evaluated in terms of the decision process, macroeconomic dynamics, labor market, economic growth, industrial organization and education competition. Advances in the measurement of innovation are also shown.

Related to the above, the document prepared by the Ministry of Telecommunications and the Information Society (Mintel) of Ecuador states that the use of AI-driven tools in numerous additional data-centric applications is likely to increase in the coming years. These may include, among others, the public administration sector, across a wide range of programs (e.g., governments in Organization for Economic Cooperation and Development (OECD) countries are experimenting with AI to better meet the needs of public service users and improve the management of their resources) and to improve the efficiency of their public services (Mintel, 2021). (Mintel, 2021). Data Science is the area of study that explains where information comes from, what it represents, and how it can be turned into a valuable resource in business and strategy building (Mintel, 2021).

In attention to the above, Ocaña, Valenzuela, & Garro (2019) points out, formats based on Artificial Intelligence (AI) promise a very substantial improvement in education for all the various levels, with an unprecedented qualitative improvement: to provide the student with an accurate personalization of their learning tailored to their requirements, managing to integrate the various forms of human interaction and information and communication technologies.

Technological advances have led to the creation of Artificial Intelligence (AI) languages, whose applications in the daily environment are more frequent due to the multiple facilities and advantages offered to people and organizations of various kinds to perform many activities in an automated way. In higher education, the use of AI provides invaluable support to carry out teaching work in line with the times.

In this framework, the United Nations Educational, Scientific and Cultural Organization (UNESCO) argues, the use of AI in education should be focused on developing innovative teaching and learning practices, accelerating progress in achieving the fourth Sustainable Development Goal (SDG 4) on inclusive, equitable and quality education, as well as aiming to improve human capabilities and the protection of human rights. (UNESCO, 2019).

Educational transformation is a fact in many parts of the world, and artificial intelligence is an important part of this change, as it has a lot of potential, as expressed by (Fu Lee, 2023) if artificial intelligence is integrated into today's classrooms, the teacher could save up to forty or fifty percent of his or her time. According to the aforementioned specialist, this time should be invested by the teacher in optimizing his praxis in the subject he teaches, better observing the aptitudes, aspirations and other aspects of the students that can serve as a basis for a more personalized attention to the learner in order to improve the learning results. (Fu Lee, 2023).

The aforementioned author also points out that artificial intelligence can be integrated to personalize students' homework, hence, it is necessary to train this technology to assign each student the educational material best suited to their interests and characteristics. (Fu Lee, 2023). In line with these points (Ayuso & Gutiérrez, 2022) indicates that Artificial Intelligence (AI) is presented as an emerging technology that facilitates the personalization of learning and prepares young

people for a changing labor market marked by new social requirements. Having made the above considerations, the general objective of this research is focused on analyzing the preferences towards Artificial Intelligence (AI) in university professors in Ecuador, particularly those who teach the course of Microeconomics.

Conceptual framework

Artificial Intelligence (AI)

There is no single or fixed definition of Artificial Intelligence (AI), but there is common agreement that AI-based machines "are potentially capable of mimicking or even surpassing human cognitive abilities, including sensing, linguistic interaction, reasoning and analysis, problem solving, and even creativity" (UNESCO, 2019a). According to the Royal Spanish Academy (RAE), Artificial Intelligence (AI) is a scientific discipline that deals with creating computer programs that execute operations comparable to those performed by the human mind, such as learning or logical reasoning (RAE, 2014). Artificial Intelligence is defined as a discipline of computer science that seeks to create systems that mimic the human ability to perceive problems, identify their components and, consequently, solve them and make decisions (Lobo, 2019).

In the last five years, education is facing a major shift in teaching techniques in the face of Artificial Intelligence (AI) with tools such as Thinkster, Knewton, Chat GPT or DreamBox Learning. (Rios, 2023). Artificial Intelligence applied to education has experienced significant progress in the last ten years thanks to the promotion of techniques such as machine learning, including data mining and learning analytics. (González González, 2023).

Knewton is an adaptive learning platform that uses AI techniques to tailor the learning experience to the individual needs of each learner and provide detailed feedback in real time (Gonzalez Gonzalez, 2023). Gradescope is a task assessment platform that uses AI techniques, such as computer vision and natural language processing, to automate the correction of tasks and provide detailed feedback to learners (Gonzalez Gonzalez, 2023). Smart Sparrow is an adaptive learning platform that allows educators to create personalized courses using AI techniques to tailor the learning experience to the individual needs of each student (González González, 2023).

Thinkster Math uses artificial intelligence and machine learning to track the steps students take when solving math problems. Students solve problems in the app and produce detailed progress reports that specify their understanding of the different skills assessed (Varela, 2021). Thinkster Math matches students with online math tutors who customize their learning programs based on students' strengths and weaknesses (Varela, 2021).

ChatGPT is based on machine learning, which is currently the most popular technique in Artificial Intelligence (AI). (UNESCO, 2023). ChatGPT is a language model that allows people to interact with a computer in a more natural and conversational way. GPT stands for Generative Pre-trained Transformer and is the name given to a family of natural language models developed by open Artificial Intelligence (AI). It is also known as a form of generative AI because of its ability to produce original results. (UNESCO, 2023). Together with other forms of AI, ChatGPT could improve the learning process and experience of students in Higher Education Institutions (HEIs). To this end, ChatGPT can be used as a stand-alone tool or integrated into other systems and platforms used by HEIs. ChatGPT can perform many tasks, whether simple or more technical (e.g. basic research, calculations, tests). ChatGPT has also been tested in other research-related processes. (UNESCO, 2023).

Artificial Intelligence in Education

Artificial intelligence (AI) has demonstrated its potential to transform numerous fields, and education is no exception. In today's digital age, AI has emerged as a powerful tool that is revolutionizing the way teaching and learning take place. (González González, 2023). Artificial intelligence in education offers numerous possibilities to add more value to students, facilitate the teaching-learning process and improve the positioning of educational institutions. Far from being an innovation alien to educational institutions, AI has the power to profoundly transform education, as stated by UNESCO (Varela, 2021).

Artificial intelligence (AI) has the capacity to address some of the greatest challenges facing, today, the field of education, to develop innovative teaching and learning practices, and ultimately to accelerate progress in achieving equitable, inclusive, and quality education (UNESCO, 2019). The link between AI and education consists of three domains: learning with AI (using AI tools in classrooms), learning about AI (its technologies and techniques), and preparing for AI (enabling all citizens to understand the potential impact of AI on human life) (UNESCO, 2019).

The great challenge of the university of the new millennium lies in the urgent need to plan, design, develop and implement digital competencies in order to train better professionals capable of understanding and developing the technological environment according to their needs, as well as implementing the universalization of a digital language supported by programs developed under artificial intelligence formats (Ocaña, Valenzuela, & Garro, 2019)..

Artificial Intelligence in education as a technological tool, brings with it the possibility of implementing innovative educational models, advantages of improvement in different educational and research areas, the opportunity to overcome

the barriers of access to knowledge, inequality and discrimination in order to achieve the integral development of people. (Rios, 2023).

Teachers and AI

The role of the teacher after the arrival of artificial intelligence (AI) in the educational environment is to learn how AI works, its potential and limitations, in order to be in a position to use it in the development of their teaching functions, as well as to guide their students on the academically correct ways of use (Moscardini, Strachan, & Vlasova, 2022).. The current global landscape requires academics to adopt and adapt to new technology quickly, in order to be able to offer current training to students (Moscardini, Strachan, & Vlasova, 2022)..

According to the authors (López & Rodríguez, 2023)According to the authors (López & Rodríguez, 2023), teachers can use various IAs in the planning and development of their subjects, to perform tasks such as: (a) describe specific learning objectives of a subject; (b) develop concrete activities to be carried out in the classroom on a specific topic; (c) improve the evaluation and monitoring of students' progress, through data analysis systems and automatic feedback; (d) customize the teaching-learning process according to the needs, interests and rhythms of each student; e) facilitate access to quality educational resources anywhere and at any time, through interactive and adaptive digital platforms and; f) enhance the development of 21st century skills, such as critical thinking, problem solving or collaboration, through the use of AI tools that stimulate creativity and innovation.

Artificial Intelligence (AI) in Ecuadorian Universities

Data on the application of artificial intelligence in Ecuador within the higher education sector show that the largest publications are related to electronics, mechatronics and software technologies, the field of application of artificial intelligence is very varied without showing any specific trend, the most used techniques are machine learning and neural networks, finally the use of free and paid software is balanced without any of them predominating. (Albuja & Almeida, 2022).. In the study of the referred authors, it is highlighted that 1.78% is the percentage of published works in the field of knowledge Administration, business and legislation in the highest ranked universities in Ecuador (EPN, ESPE and ESPOL). (Albuja & Almeida, 2022)..

The document issued by the Ministry of Telecommunications and the Information Society (Mintel) highlights that, after the compilation process of AI initiatives in Ecuador, it has been determined that the projects implemented are scarce and very basic; however, it also reveals that there is a great interest in exploiting the possibilities of this and other emerging technologies on a larger scale. (Mintel, 2021). The areas where AI application initiatives are observed in the country are healthcare, transportation, finance, retail and marketing, cybersecurity (Mintel, 2021).

At the higher education level (Mintel, 2021) indicates that there are 14 researchers in Ecuador working on this technology. Half of them (50%) belong to UTN (Universidad Técnica del Norte), followed by 14.30% belonging to researchers from UTA (Universidad Técnica de Ambato); the rest are distributed in equal percentage among 7.10% EPN; 7.10% FLACSO; 7.10% SYNESCYT; 7.10% UCE and 7.10% UTMACH.

In this sense, among the conclusions issued in the document (Mintel, 2021) emphasizes that there is an urgent need to work on the training of professionals trained in areas related to emerging and new technologies, considering that Ecuador has proven to have professionals of the highest level in areas that are not promoted locally, but which are becoming increasingly necessary according to the demands of the evolution of technology worldwide.

METHODS

The methodology of this study can be characterized as quantitative (Hernández-Sampieri et al, 2018), descriptive, field design, non-experimental and based on a documentary type of research, in order to achieve the objective of analyzing the preferences towards Artificial Intelligence (AI) in university professors in Ecuador, particularly those who teach the subject of Microeconomics.

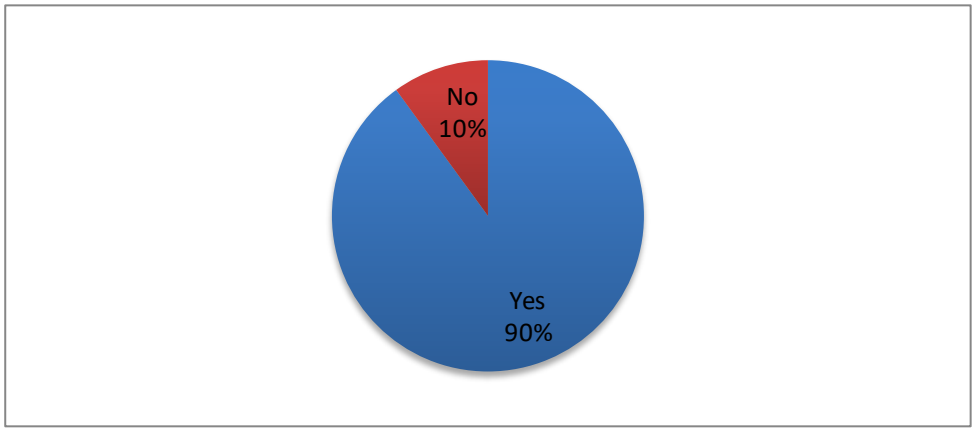
The population consulted included a sample of 25 university professors from three state universities in the city of Guayaquil in the field of Economics, Administrative and Financial Sciences who teach Microeconomics, who were consulted about the use of AI in their training activities.

The data collection technique was the survey and the instrument used consisted of a questionnaire of closed questions, administered through the google form platform, the results of which are presented in the following section. This research adheres to the principles of academic integrity, ensuring participant confidentiality, voluntary participation, and transparency in data collection and analysis processes. Informed consent was obtained from all participants, and their privacy and rights were respected throughout the study.

RESULTS AND DISCUSSION

The following section presents the key findings obtained from the survey conducted among university professors in Ecuador regarding their utilization of artificial intelligence (AI) tools, specifically in teaching Microeconomics.

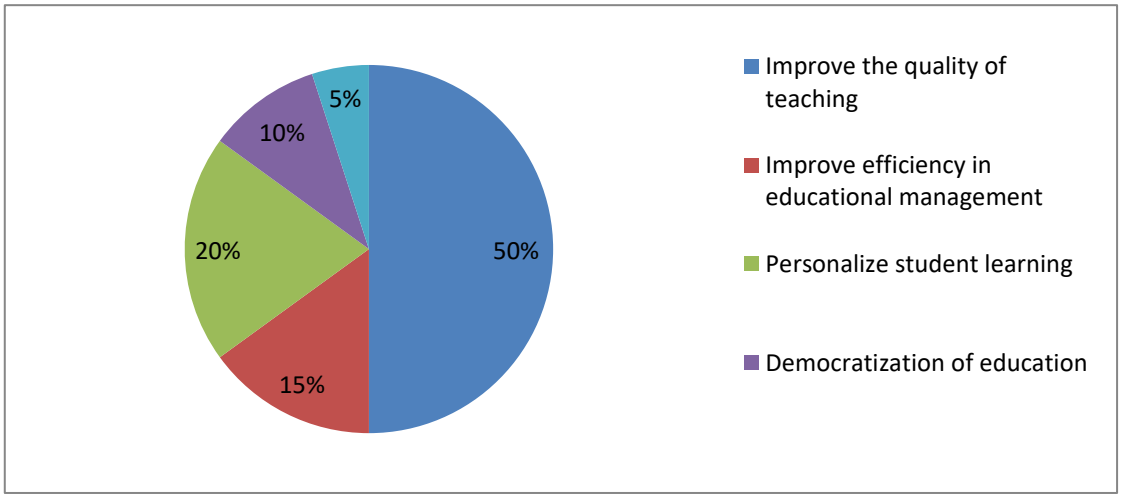
Figure 1. Do you know about AI applications in Ecuadorian higher education?



Note: Own elaboration (2023)
Source: Data collection instrument

The results obtained show that a large percentage (90%) respond on the question of knowing the applications of AI in Ecuadorian higher education, while 10% indicate the opposite.

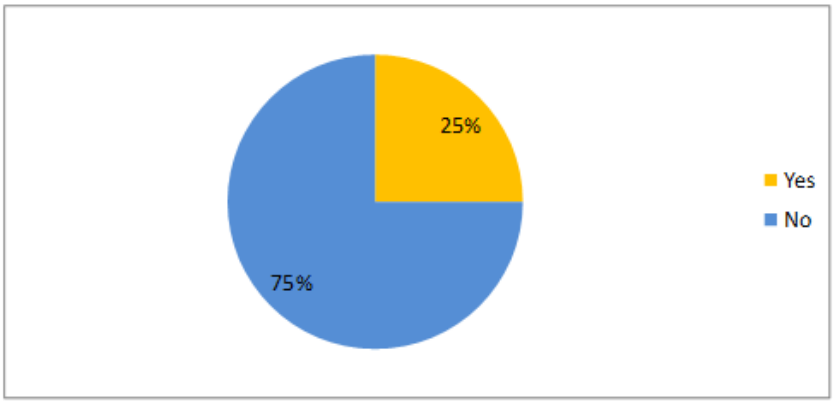
Figure 2. What benefits do you think artificial intelligence could bring to higher education?



Note: Own elaboration (2023)
Source: Data collection instrument

The data obtained indicate that half (50%) of the teachers surveyed consider that among the benefits that artificial intelligence could bring to higher education is the improvement of the quality of teaching; 20% emphasize that it personalizes student learning; 15% say that it improves efficiency in educational management; 10% say that it democratizes education and 5% say they are unaware of the contributions of AI to higher education.

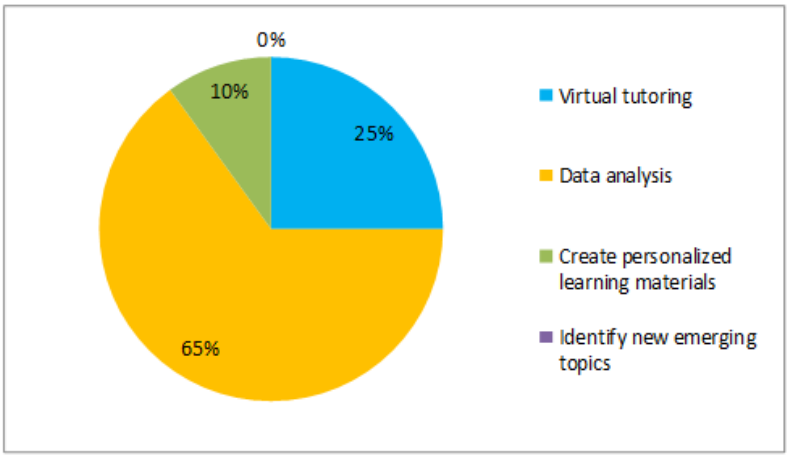
Figure 3. Do you apply some of the IAs to teach Microeconomics?



Note: Own elaboration (2023)
Source: Data collection instrument

It is observed that 75% of the respondents indicate that they do not make use of AIs to teach Microeconomics, in contrast to 25% of the teachers who answered affirmatively.

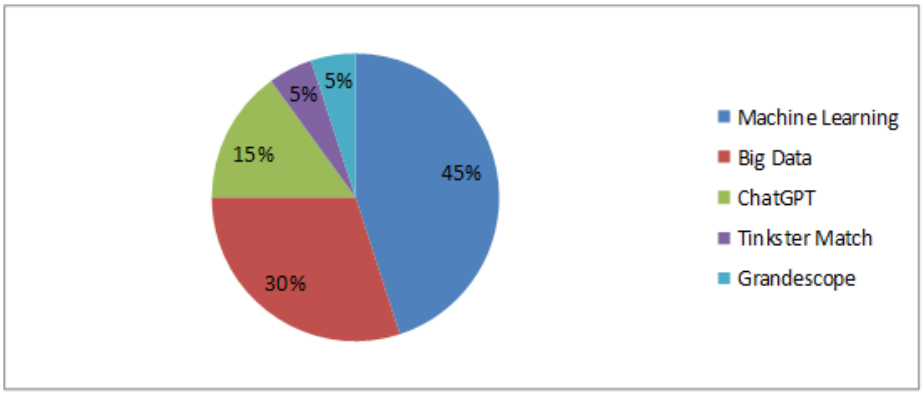
Figure 4. How do you use artificial intelligence to teach Microeconomics?



Note: Own elaboration (2023).
Source: Data collection instrument

According to the answers provided by the teachers surveyed, it is observed that 65% of the teachers stated that they use the tools provided by artificial intelligence to teach Microeconomics to analyze economic data; 25% indicated its use for virtual tutorials; 10% said they use AI to develop personalized learning materials and with 0% of responses, the option of identifying new topics on the rise was not taken as an alternative by the participants.

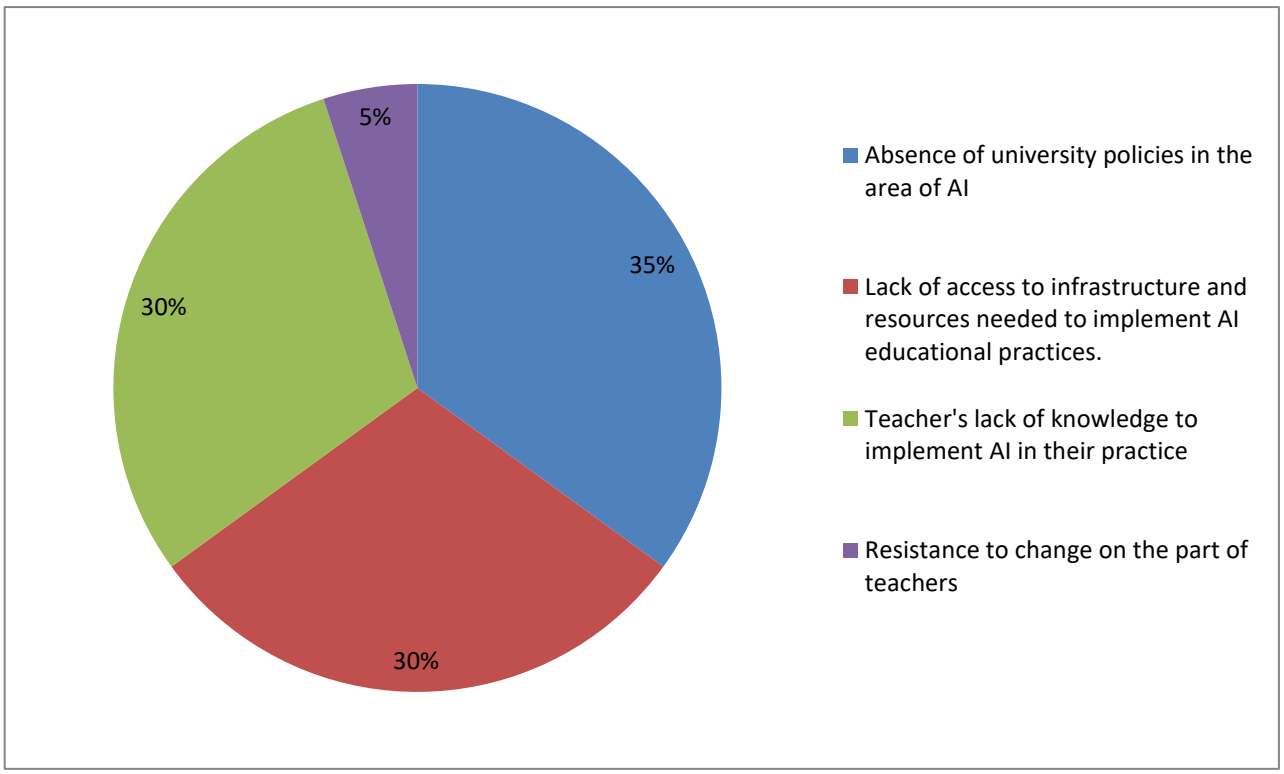
Figure 5. Which of the following IAs do you use to teach Microeconomics?



Note: Own elaboration (2023).
Source: Data collection instrument

According to the data recorded from the answers given by the participants, 45% of the teachers use Machine Learning tools, followed by 30% who claim to use Big Data, 15% ChatGPT and with identical percentages 5% Thinkster Math and 5% Gradescope.

Figure 6. Which of the following options do you think influences the low use of AIs by the Microeconomics teacher?



Note: Own elaboration (2023)
Source: Data collection instrument

Based on the answers given, 35% of the teachers surveyed consider the lack of university policies on the use of artificial intelligence (AI) as the main cause that influences the low use of AIs by Microeconomics teachers; 30% of the respondents considered the lack of access to the infrastructure and resources necessary to implement AI, 30% responded that it is due to the lack of knowledge on the part of the teacher to implement AI in their educational practice and 5% highlighted as a reason the resistance to change on the part of university teachers.

The use of artificial intelligence in the educational field is a fact increasingly evident in various latitudes and the Ecuadorian university cannot turn its back or isolate itself from this reality, for years, it has been used in a multitude of research in various disciplines; in addition, it is called to play a relevant role in the training of professionals according to the demands and challenges of the present times and for the future.

Thus, based on the findings found, it can be described that within the higher education institutions of Ecuador addressed, there is the strength of a large number of teachers who claim to know about the application of artificial intelligence tools. U.S. and European universities continue to lead relevant creations in the use of AI in teaching. (Peñaherrera, Cunuhay, Nata, & Moreira, 2022).

In Ecuador, the areas where AI application initiatives are observed in the country are grouped in the sectors of health care, transportation, finance, retail and marketing, cybersecurity (Mintel, 2021). With its use in the university sector being relatively scarce with only three universities highlighting a use of it (Albuja & Almeida, 2022)..

In other interesting data collected, half of the university teachers surveyed are aware of the advantages offered by AI in the higher education environment, however, on the other hand, a significant number say that they do not use it to teach, specifically, Microeconomics, as the interest in this research, as indicated above, the reasons given for this fact is mainly due to the lack of university policies on the use of AI. In this sense, (Barragan, 2023) highlights within the findings of his study that there is a significant gap when comparing the AI ecosystem in Ecuador with the ecosystems of Argentina, Brazil, Chile, Colombia, and Uruguay; showing an incipient use, adoption of this technology and the lack of public policies that promote the use of AI as a means of social, economic and environmental development.

In this regard, (Tobar, Rodríguez, Martinez, & Pozo, 2023) points out within the conclusions that the challenges for

the implementation of artificial intelligence in higher education in Ecuador identified include: the lack of investment in educational technology and teacher training, the lack of public policies that promote innovation in education and equitable access to technologies, and the need to develop teacher training programs to integrate artificial intelligence into pedagogical practice.

On the one hand, teachers who claim to use IAs tools to teach Microeconomics emphasize their use for data analysis, the most used being Machine Learning, in this regard, (Ahumada, 2021)describes Machine Learning (ML) as an area of AI that builds algorithms that can learn from data. Its relevance cannot be isolated from the advent and development of Big Data in different disciplines. For these large sets of information such as those coming from cell phones, online transactions or social networks ML appears as a powerful tool.

According to, (Colomé, Elías, & Navajas, 2021) the effects of Artificial Intelligence (AI) on the economy and economic analysis are evaluated in terms of the decision process, macroeconomic dynamics, labor market, economic growth, industrial organization and education competition. Advances in the measurement of innovation are also shown.

CONCLUSIONS AND FINAL REMARKS

Taking into account the general objective of this research focused on analyzing the preferences towards Artificial Intelligence (AI) in university professors in Ecuador, particularly those who teach the subject of Microeconomics, the following conclusions are offered:

a) The advantages offered by artificial intelligence in higher education are numerous, particularly for the teaching of Microeconomics, in this sense, it is considered essential to formulate educational policies aimed at the implementation of artificial intelligence in Ecuadorian universities, adapt the infrastructure and invest resources for this purpose, it is also essential to train teachers so that they can take full advantage of this technology that is already a reality in many national and international contexts.

b) Although the use of AI tools by teachers to teach Microeconomics, some of the teachers who use it prefer Machine Learning for the analysis of economic data. This is due to the fact that, as they point out, Machine Learning is the most widely used tool for the analysis of economic data. (Colomé, Elías, & Navajas, 2021)The Machine Learning (ML) component of AI is a branch of computational statistics used as a prediction tool.

c) Artificial intelligence has an impact on the training processes of university students, in areas such as research, innovation and the quality of teaching and learning. According to (Fu Lee, 2023) artificial intelligence can personalize the tasks of each student by studying their individual capabilities and can save time for teachers to break down their work into many tasks to make their educational work more effective and quality.

d) The study has several limitations. Firstly, the sample size is small, comprising only 25 university professors from three state universities in Guayaquil, Ecuador, which may limit the generalizability of the findings. Secondly, the research relies solely on self-reported data obtained through a survey, which may introduce response bias and affect the accuracy of the results. Additionally, the study focuses exclusively on the field of Microeconomics, potentially overlooking insights from other disciplines. Furthermore, the study does not delve deeply into the reasons behind certain responses, such as why some professors do not use AI in their teaching practices. Lastly, the study does not explore the potential challenges or ethical considerations associated with AI integration in higher education, which could be important areas for future research.

e) To advance understanding in this area, future studies could explore various aspects of AI integration in higher education.

Firstly, investigating the effectiveness of AI-driven personalized learning platforms in improving student outcomes across different disciplines and educational settings could provide valuable insights. Secondly, examining faculty perceptions and attitudes towards AI integration, particularly focusing on factors influencing their adoption and use of AI technologies, would help identify barriers and facilitators to implementation. Thirdly, longitudinal studies tracking the evolution of AI integration in higher education over time could offer insights into trends, challenges, and opportunities in this rapidly evolving field. Additionally, exploring the impact of contextual factors such as institutional policies, technological infrastructure, and resource availability on AI adoption and implementation would deepen understanding of the broader socio-technical dynamics at play. Finally, comparative studies across different countries or regions could elucidate variations in AI integration strategies and outcomes, contributing to the global discourse on AI in education. Table 1 presents a detailed suggestion of future research agenda.

Table 1. Proposed research agenda for futures studies of AI in Ecuadorian educational context

Study title	Dependent variable	Independent variable	Methodology	Suggested context
Adoption of AI in Higher Education	Adoption of AI in Higher Education	Policy support for AI integration	Qualitative case study	Compare universities with robust policy support for AI integration with those lacking such support to understand the impact on adoption of AI in higher education.
Utilization of AI tools by university lecturers	Utilization of AI tools by lecturers	Access to AI infrastructure and resources	Survey and statistical analysis	Investigate how access to AI infrastructure and resources influences the willingness and ability of university lecturers to integrate AI tools into their teaching practices.
Perceived benefits of AI in higher education	Perceived benefits of AI in education	Faculty training in AI pedagogy	Mixed-methods approach	Examine perceptions of faculty members who have undergone AI pedagogy training compared to those who have not, regarding benefits of AI in higher education.
Integration of AI tools in microeconomics instruction	Integration of AI tools in microeconomics	Familiarity and comfort level with AI technologies	Longitudinal study	Track integration of AI tools in microeconomics instruction among faculty members over time, correlating it with increasing familiarity and comfort level with AI technologies.
Institutional support for AI integration in education	Institutional support for AI integration	Perception of AI's role in enhancing educational quality	Comparative analysis of policies and practices	Compare universities that prioritize AI integration in education due to recognizing its role in enhancing educational quality with those that do not prioritize it.

Note: Own elaboration (2023)

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