A Qualitative Research on The Relationship Between Artificial Intelligence and Higher Education Performance in Tunisia

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ABSTRACT

The recent rise of artificial intelligence represents an unprecedented revolution for our societies. AI has brought about a significant transformation in higher education, which has affected the majority of pedagogical aspects and all stakeholders in the Ministry of Higher Education and Scientific Research. This article aims to explore the perception of artificial intelligence among teachers and students. Thus, this work attempts to understand the role of AI in improving the performance of higher education in Tunisia. To this end, we carried out a state-of-the-art review on this subject. Semi-directive interviews were conducted with 12 teachers and 12 students at two Higher Institutes of Management (ISG Tunis and ISG Bizerte). Using two qualitative analysis techniques, we were able to gain insight into the perception of AI in the university world. In addition, this research enabled us to identify potential intelligent applications to be used to improve pedagogy, with the aim of minimising the potential negative effects of this new technology. This qualitative research has led us to put forward a set of evaluation factors relating to the performance of higher education in Tunisia.

Key words: Artificial intelligence, Performance, Higher education

INTRODUCTION

The use of intelligent technologies in education is booming. The power of artificial intelligence (AI) algorithms is giving rise to a new panorama in educational pedagogy. Personalised treatment of learning techniques is an innovative solution fuelled by the art of AI. As in all fields, Artificial Intelligence (AI) today offers unlimited benefits for human beings (Palombi, 2022). Beyond stimulating the collective imagination, the main question is how intelligent techniques can change the way knowledge in management sciences and economics is taught. The use of digital technology is not intended to replace the teacher. Nevertheless, the traditional process of imparting knowledge is destined to disappear.

Artificial intelligence also makes it possible to automate and facilitate the administrative procedures of higher education establishments. It analyses massive student data. It is an effective solution for managing and exploiting data. For this reason, AI has attracted particular attention (Mantouzi & Said, 2023).

The information technology situation is leading to an increase in the use of digital technology. The data used in higher education comes from a variety of sources, including databases, educational platforms, scientific literature, professional reports and social media.... To keep pace with this unprecedented detonation of data, universities need to adapt intelligent techniques. Artificial intelligence plays a crucial role in optimising learning processes and ensuring that universities are well managed (Jmoula & Belouali, 2022).

Under this heading, we will clarify, through a literature review, the importance of artificial intelligence in Tunisian higher education and its effect on the performance of educational pedagogy. In addition, using qualitative research with teachers and students from two higher management institutes in Tunisia, we want to build a model that brings together all the variables needed to strengthen the performance of higher education

through artificial intelligence. Our objective is therefore to explore the perception of artificial intelligence among teachers and students. Thus, this work attempts to understand the role of AI in improving the performance of Tunisian higher education. Firstly, we will present a state of the art on the concept of artificial intelligence. We will focus on the relationship between artificial intelligence and higher education, particularly in Tunisia. Secondly, we will present the methodological approach followed and the output of the qualitative study carried out with 12 teachers and 12 students. We will conclude with a discussion of the results obtained in comparison with the literature.

LITERATURE REVIEW

History and Definitions of Artificial Intelligence (AI)

The concept of artificial intelligence was first proposed in 1950 by Alan Turing, one of the pioneers of this revolutionary technology. Turing's seminal work on the subject involved the question of whether such a machine could be said to "think" in a manner analogous to that of a human being. In 1960, John McCarthy, Marvin Minsky and Claude Shannon made pioneering contributions to the development of machine learning tools and neural networks. Their research yielded insights into the origins of today's artificial intelligence. AI aims to integrate the study of the brain with that of the machine (Senihji, 2023). The innovations underlying artificial intelligence are now pervasive in our daily lives. Soudoplatoff (2018) identifies three approaches to AI: human, analytical and algorithmic.

The concept of AI has been defined in numerous ways, contributing to the expansion of the academic literature. The advent of AI in various fields has prompted researchers to examine the performance of this technology and its capacity to create machines that stimulate human intelligence. Artificial intelligence is presented as a field of science and engineering. The objective of AI is to comprehend intelligent behaviour through the use of a machine, particularly a computer (Shapiro, 1992). However, it is not possible for AI to achieve true reasoning if it does not understand emotions (Minsky, 2006).

It is evident that AI represents an intelligent form of information technology that is designed to create machines that are capable of performing tasks associated with human intelligence, such as perception and decision-making (Russell & Norvig, 2010). Similarly, Accenture Technology Vision (2017) posits that artificial intelligence (AI) is a set of processes and techniques that enables machines to become conscious and intelligent, and to reproduce human behaviour. This intelligent technology is defined as the reproduction of human reasoning through the use of a computer system. It encompasses the acquisition of knowledge via algorithms, neuronics and expert systems (Zouhri, 2019). AI is often described as *"a program designed to perform tasks requiring a certain level of intelligence at least as well as humans"* (Braunschweig, 2019, p. 34). Artificial intelligence (AI) is based on sophisticated, high-performance technologies that ensure the well-being of users. This novel formula is prompting a novel vision of teaching pedagogy (Dagnogo & Samasse, 2022).

Artificial intelligence is a revolutionary technology that has reached a mature phase. It provides individuals with a wide range of techniques. *Machine learning* is a subset of AI that is defined as an automatic learning system. It is described as powerful because of its ability to anticipate behaviour (Bhatnagar, 2018). The field of *learning analytics* is dedicated to measuring, collecting, and analysing new habits through the use of data filtering techniques. Customer journey mapping is an AI tool that pre-designates the consumer's pattern by referring to their usual behaviours. *Text mining* is the process of analysing and extracting information from text-based sources on the Internet. The advent of artificial intelligence has enabled the use of facial recognition as a means of identifying individuals based on their appearance, whether that be a photograph, fingerprint or other biometric data. This has led to the development of AI systems that can leverage the expertise of experts in their respective fields, combining their knowledge to make optimal decisions at the right time. AI has become a global phenomenon. This is encouraging the successive development of intelligent applications in all areas of activity (Senihji, 2023).

It is crucial to acknowledge that while Big Data and artificial intelligence are distinct concepts, they are

complementary. Big Data is concerned with the data itself, whereas artificial intelligence employs specific algorithms to interpret this data. In this sense, Big Data is a raw material that can be exploited by AI.

The Performance of Higher Education

The term 'performance' is frequently employed in the field of management research. Despite the

existence of several theoretical frameworks, the precise definition of this concept remains elusive (Bourguignon, 1995: Bessir, 1999). Performance is the result of comparing an action's outcome with its objective. It is multidimensional and can be measured by several indicators. This may be the main cause of its ambiguity (Amine et al., 2017).

In the context of higher education, performance is defined as the establishment of a balance between expectations and interests (Elms et al., 2002). This is regarded as evidence of efficiency, effectiveness and economy. It reflects the level of learning and the effectiveness of programmes. Additionally, performance refers to the quality of management in the higher education sector.

Performance can be defined as the achievement of an objective in an optimal manner, which is realised through the successful completion of a well-defined task. In essence, an educational establishment performs well when it is capable of maximising positive results with minimal resources. (Mantouzi & Said, 2023). In a similar vein, the effectiveness of performance is contingent upon the professionalism of the evaluation and control procedure. The higher education sector is characterised by a multiplicity of stakeholders, which renders the assessment of their performance a challenging endeavour (Hanafi & Said, 2021). Artificial intelligence (AI) is a technology that facilitates the enrichment of educational content. It also encourages interaction between teachers, administrative staff and students. AI is being used to personalise the courses on offer even more and to facilitate the sound management of universities. However, in order to improve the performance of higher education, it is necessary to implement high-performance AI solutions.

The Application of Artificial Intelligence in Higher Education in Tunisia

The advent of intelligent technology has generated considerable interest in the fields of teaching and scientific research. The application of artificial intelligence techniques offers professors and students new perspectives that will help to enhance the performance of Tunisian universities. The Tunisian Ministry of Higher Education and Scientific Research has announced the successful completion of initial tests of the ELM platform. From the beginning of the 2024-2025 academic year, teaching staff, researchers and students will benefit from a 100% national artificial intelligence platform. This platform will provide academics with training programmes, courses/tutorials and scientific research in various specialities, gratis. Theoretically, a variety of applications of artificial intelligence are emerging at the heart of higher education. These intelligent applications include intelligent tutoring systems, adaptive and personalised systems, autonomous driving, correlation-based learning, and so forth (Zawacki-Richter et al., 2019). Investment in AI is a means of improving the quality of higher education. The use of AI is facilitating the modernisation of assessment procedures, the development of students' abilities and skills (Biggs et al., 2022).

Conversely, the utilisation of artificial intelligence is associated with some concerning risks. The sourcing of algorithms can influence the results of AI, which may compromise the objectivity of this technology (Maclure & Saint-Pierre, 2018). Furthermore, the use of AI in higher education raises concerns about the potential for the private data of teaching staff and students to be accessed and exploited without their knowledge. The ambiguity surrounding the privacy of higher education stakeholders, including their private lives, makes this a particularly pertinent issue.

(Collin & Marceau, 2021). At this juncture, Ministry of Higher Education and Scientific Research must ensure the protection of the private data of artificial intelligence users throughout their academic careers. From a critical perspective, the ascendancy of algorithms in the education system is paving the way for a artial or total

replacement of traditional classroom teaching (Brusilovsky & Peylo, 2003). Consequently, artificial intelligence may offer the potential for a direct and powerful substitution of the role of a teacher. Nevertheless, some scientific research supports this digital transformation and its positive impact on teaching performance. Artificial intelligence is undoubtedly playing an increasingly prominent role in the management of educational activities at the highest level. It is also enhancing the status quo of the student Students have the opportunity to become co-creators of courses or training (Porayska-Pomsta, 2016: du Boulay, 2021). Artificial intelligence (AI) can be a source of expertise for students, who can address their questions and even assume the role of the teacher for some basic course materials. However, in the majority of instances, AI will merely transform the role of the teacher into that of a facilitator (Yuskovych-Zhukovska et al., 2022).

Despite the lack of a unified definition of 'intelligence', the concept of artificial intelligence encompasses a range of intelligent applications that assist individuals or organisms in achieving challenging tasks. The value of these applications is largely dependent on the human skills that enable the algorithms to perform at a super-intelligent level.

METHODOLOGY

The aim of this qualitative research is to explore the perception of artificial intelligence among teachers and students. Thus, this work attempts to understand the role of AI in improving the performance of higher education in Tunisia. An interview guide was drafted based on the existing literature. Twenty-four semi-directive interviews were conducted with 12 teachers and 12 students. Data collection was terminated once theoretical saturation had been achieved. Two analytical techniques were employed: a thematic content analysis (manual) and a complementary analysis utilising NVivo software. The specifics of our qualitative sample are outlined in the following table;

Table 1: Qualitative sample			
Interviewees	**Genre**	**Occupation**	**Higher Education Institutions**
1	Men	University Professor	ISG Tunis
2	Men	University Professor	ISG Tunis
3	Female	University Professor	ISG Tunis
4	Female	University Professor	ISG Tunis
5	Female	University Professor	ISG Tunis
6	Men	University Professor	ISG Tunis
7	Men	University Professor	ISG Bizerte
8	Men	University Professor	ISG Bizerte
9	Men	University Professor	ISG Bizerte
10	Female	University Professor	ISG Bizerte
11	Men	University Professor	ISG Bizerte
12	Female	University Professor	ISG Bizerte

13	Men	Student	ISG Tunis
14	Men	Student	ISG Tunis
15	Female	Student	ISG Tunis
16	Female	Student	ISG Tunis
17	Female	Student	ISG Tunis
18	Female	Student	ISG Tunis
19	Female	Student	ISG Bizerte
20	Men	Student	ISG Bizerte
21	Men	Student	ISG Bizerte
22	Men	Student	ISG Bizerte
23	Men	Student	ISG Bizerte
24	Female	Student	ISG Bizerte

Results of the Qualitative Study

I.   Results of Thematic Content Analysis

Analysis of the interviewees' verbatim revealed five fundamental themes. These themes will be explained as follows;

Theme 1: What is Artificial Intelligence?

A qualitative analysis of the data revealed that artificial intelligence manifests itself in the form of applications used by the students participating in our exploratory study. "AI is ChatGPT, this ChatGPT can answer any question! It's also facial reconnaissance and virtual assistants. When I navigate on the web, I see these virtual assistants appearing".

According to other students, the concept of artificial intelligence is; "A rapid benchmark for scientific research, AI enables researchers to complete a master's or doctoral thesis in a significantly reduced timeframe". The university professors interviewed provided a few definitions of this concept. Based on the verbatim, AI was explained as follows: "A hyperactive virtual universe in which we can interact through intelligent technologies, it's a sort of metaverse". Another description of the concept is as "A complex algorithm leads to the invasion of machines".

Theme 2: Participants' experience with AI

The majority of recommendations following such an experience with artificial intelligence are positive. According to the students; "the use of AI is intellectually enriching, as it saves time, thereby making work more efficient. Furthermore, it provides physical and mental comfort". Moreover, AI can be a source of pleasure; "I can talk with ChatGPT for fun, especially when I ask typically Tunisian questions that reflect our culture". However, the teachers' verbatim comments exhibit a concerning nuance, particularly with regard to their experience with ChatGPT; "So I had an experience with this famous ChatGPT, yes it's quick, it gives a

convincing answer to any question, it corrects and revises the text but in my opinion ChatGPT is simply cheating, it's legal plagiarism which can totally destroy students skills". It is also worth noting the role of artificial intelligence in creating a personalised and satisfying experience. AI is a key factor in engaging students. Some of the verbatim comments made it clear that ; "AI is a trend that is attracting the attention of our students, so we need to exploit this artificial magic to get them more committed to our educational programmes, for example... I think that AI provides a personalised experience, it's an experience that responds to the morphology of our student… so this intelligent technology

will be very welcome".

Theme 3: What are the potential applications of AI in the context of higher education in Tunisia?

In light of the manual thematic analysis, it was concluded that the use of artificial intelligence was perceived as a potential lever for enhancing and revitalising higher education pedagogy. The interviewees highlighted the advantages of AI for Tunisian universities. This innovative approach to education has the potential to revolutionize the field of teaching, benefiting all stakeholders, including students, professors, and administrative staff. The utilisation of artificial intelligence in educational pedagogy represents a high-level co-design approach to learning.

Based on the verbatim, the primary criticism of AI is the protection of private data;"I think that effective artificial intelligence in education requires good training for teachers and students, with a strict procedure to guarantee the confidentiality of our private data". Despite the inherent risks associated with AI, intelligent techniques can be employed to enhance the performance of the academic world. The functionalities that can be expected and offered by artificial intelligence are outlined in the table below;

Table 2: The use of AI in higher education		
Categories	**Teachers' verbatim**	**Students' verbatim**
Chatbots	« Chatbots support students, providing a text or voice dialogue that reinforces their commitment to the course material on offer"	
ChatGPT	« ChatGPT can automate the assessment of students' levels, and also makes it easy to mark exams, especially MCQs"	"ChatGPT has become my teacher, explaining concepts, theories and phenomena to me"
Learning platforms	"A learning platform creates personalised learning experiences that adapt to the preferences of each student, and I see that this type of platform facilitates learning based on feedback and interaction...so the exchange is very rich and remembered more than an ordinary course"	"It develops meaningful interaction between us, the students and our teachers, and therefore a better learning result', it's access to adaptive learning"
Virtual assistants	"The virtual assistant is more of an organiser of administrative tasks to avoid the cumbersome procedures of the Tunisian administration"	'Virtual assistance is individual assistance 24/24, we are always accompanied by AI perfection... I can make my own education and revision planning'

Voice synthesis	"I see that AI is offering rhythmic voice synthesis to students who are living with health or social obstacles; that's certainly a contribution"	
Virtual advisers		"Virtual advisers help us to choose the right research methodology and measurement scales for our dissertations"
Predictive analysis	"I prefer AI predictive analysis because this analysis can identify students' behaviour towards my course in advance and this helps me to better guide the content of the subjects"	
Augmented reality		"We've used augmented reality in our marketing tutorials because it's more attractive and the information is easier to understand"

Theme 4: The artificial intelligence (AI) revolution may soon replace the role of the university professor?

A quantitative analysis of the students' responses revealed two distinct perspectives. The first perspective viewed artificial intelligence as a technology capable of replacing the professor; "AI does everything, all the time and without discrimination... I am happy to be AI's student".

The second perspective posits that AI and the professor are mutually complementary; "We are the digital generation, AI is the intermediary between professors and students... intelligent applications make courses more attractive, richer and extraordinary... I am a student and I see that the ordinary presentation of the course is very boring".

The teachers interviewed refused to make comparisons between AI and the essential presence of professors in students' careers; "I am against AI in my speciality, AI reduces the ability of students to analyse, it is an intellectual impasse... I am a teacher; I need a fresh and active human brain... Artificial intelligence in higher education is equal to human stupidity". In another vein, the verbatim commented that "Teaching is essentially a human activity and artificial intelligence is just an added value".

Theme 5: The relationship between artificial intelligence and human intelligence

The perception of the relationship between artificial intelligence and human intelligence varies considerably between students and professors. Our qualitative research indicates that these two types of intelligence are often seen as a source of fruitful debate. The perceptions of our qualitative sample will be

presented in the following table;

Table 3: The perception of the relationship between artificial intelligence and human intelligence.		
Categories	**Teachers' verbatim**	**Students' verbatim**
	" Artificial Intelligence is an	"Artificial intelligence helps us as

Two complementary types of intelligence	additional gift to human intelligence"	students, so AI supports human intelligence"
	"Artificial Intelligence is a technology at the service of human intelligence"	
The superiority of artificial intelligence		"I think it's clear that AI surpasses human intelligence in some areas, the rapidity of AI incomparable with the performance of human beings''
The superiority of human intelligence	"Artificial Intelligence is the result of human intelligence"	"AI is based on algorithms and computer programs, which is why I believe that human intelligence is superior to AI"
	"Artificial intelligence under the control of human skills, intelligent applications and algorithms are created by human intelligence"	"Applications are not a substitute for human skills. Human knowledge is the basis of artificial intelligence"
	« You shouldn't compare the human brain with a machine, there is only absolute human intelligence"	"Yes, AI is a form of imitated human intelligence, that's normal, applications created by engineers"
	"AI is an imitation of human intelligence"	
Artificial intelligence is a danger to human intelligence	« AI is turning us into real machines and I'm sure that the machine is suppressing human intelligence"	"I don't know, but in my opinion, if artificial intelligence goes beyond the limits, it poses a problem"
	"AI techniques like ChatGPT lose the charm of human intelligence"	

II.   Results of the N Vivo Analysis

The results of the NVivo analysis are consistent with those of the manual thematic analysis. The students interviewed were from ISG Tunis and ISG Bizerte. The NVivo graphical representation highlighted the importance of artificial intelligence in the daily lives of students, particularly ChatGPT. The N Vivo output also highlighted the advantages of intelligent applications, including time savings, mental and physical comfort. This new technology can ensure a high quality of learning and, consequently, the performance of higher education in Tunisia. The digital generation is frequently drawn to the allure of artificial intelligence, its visual appeal, and the rapid responses expected of students. The underlying richness of AI represents a source of motivation that must be considered in the teaching system.

The majority of students consider AI to be a complementary technology to human intelligence. It is therefore essential that all Tunisian universities adopt a common culture regarding the duality between artificial intelligence and human intelligence.
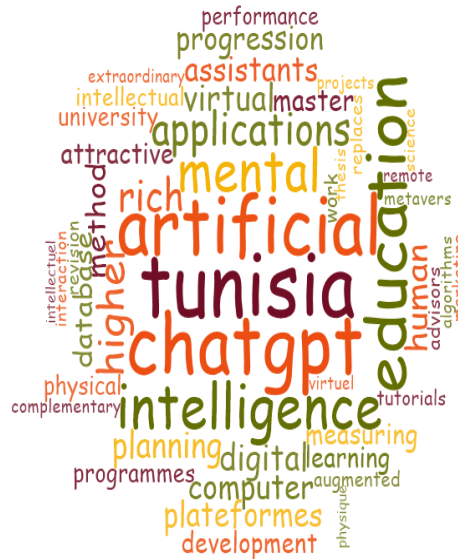
Figure 1: NVivo graphical representation of students' verbatim

The second NVivo graph is focused on superiority of human intelligence. In this sense, AI is unable to replace a professor. This technology is an imitation of human intelligence. It can facilitate the work of all those involved in higher education. But, it is essential to maintain continuous control in order to safeguard students from any potential harm.The NVivo analysis identified a number of intelligent applications that could enhance the performance of Tunisian universities, including chatbots, learning platforms, database analysis and predictive analysis. The professors were adamant that originality and human intellect should be protected, as they considered the utilisation of intelligent applications to be a hindrance to students' intellectual development.

Figure 2: NVivo graphical representation of teachers' verbatim

DISCUSSION OF RESULTS

The results of our qualitative research offer a more comprehensive understanding of existing literature. Artificial intelligence presents a new opportunity to enhance the effective and efficient management of

organisations (Jmoula & Belouali, 2022). This exploratory study has demonstrated that the use of AI applications in higher education in Tunisia can improve pedagogical approaches, better engage students with university programmes and partially facilitate the work of professors and administrative staff. Similarly, EL Haoud & Hali (2023) emphasised that the utilisation of AI in higher education has become a necessity for all stakeholders. The results also confirmed the risks associated with this technology. Intelligent applications collect a significant amount of data on students and teachers, which has led to concerns about breaches of privacy and data security risks. As Stephen Hawking notes; "succeeding in creating artificial intelligence would be a great event in human history. But it might also be the las… ». According to the results obtained, artificial intelligence is essentially based on applications that enable machines to imitate or support human intelligence. It is perceived as an innovative technology that reduces errors and improves the user experience. In this context, AI can be an effective aid to teachers, without replacing them. Lamb (2016) also noted that teaching is one of the professions least likely to be affected by automation. A teacher's soft skills represent the distinctive attributes that differentiate them from AI. At this stage, the traditional pedagogical triangle proposed by Houssaye in 1988 will be influenced by AI to align with the evolving needs of the new generation of students.

The students surveyed were significantly influenced by ChatGPT. They perceived this version of Chatbot as the most accessible source of learning and understanding. ChatGPT can be conceptualised as an open classroom, under the direction of the students. The MOOC (Massive Open Online Course) programme has been a success in the West, but this pedagogy has the potential to devalue the level of education. A student lacks the experience of a teacher to structure and direct the learning process (Djelti & Kouninef, 2022). The efficacy of some intelligent applications in higher education is open to debate. Higher education has become a crucial area for economic development. It represents national competitiveness on an international scale. Current trends are characterised by the digitalisation of higher education (Grace & Jared, 2020). Artificial intelligence (AI) has the potential to transform education in a number of ways. Firstly, it has the capacity to offer more flexible courses, which could be beneficial for students who require a more flexible approach to their studies. Secondly, AI has the potential to enable closer collaboration between students and teachers, which could facilitate a more interactive learning environment. Thirdly, AI has the capacity to improve the quality of university learning through data analysis, which could enhance the effectiveness of the learning process.

Our qualitative research has identified the key components needed to strengthen the performance of higher education through artificial intelligence. It is clear that the interpersonal and personal skills required are increasing significantly. In order to ensure a successful transformation of higher education, it is essential to invest in human skills and continuous training in AI. The ethical implications of AI are a matter of concern for all university stakeholders. According to the OECD, AI is ethical if it is reliable, equitable, transparent, comprehensible and secure. It must respect human privacy. It is important to be aware that AI applications can cause unintended detriment (Gehn, 2019). The advancement of AI research and development represents a fundamental pillar of higher education performance. This enables the most appropriate applications to be created for the behaviour of Tunisian students. Additionally, it facilitates the progression of skills in the AI era. The degree of student engagement with learning programmes is a key indicator of the performance AI in higher education.

CONCLUSION

Artificial intelligence (AI) represents a transformative technology with the potential to revolutionize higher education. However, for this technology to be beneficial, it must be ethical, sustainable, and aligned with the fundamental values of pedagogy. The objective of this article is to examine the perceptions of teachers and students regarding the role of artificial intelligence in enhancing the performance of higher education in Tunisia.

In this article, we commenced by conducting a review of the current state of the art on artificial intelligence and its role in higher education. Subsequently, we conducted qualitative research with 12 teachers

and 12 students (ISG Tunis & ISG Bizerte). Finally, we presented the results of our work. We employed two analytical techniques: a manual thematic analysis and a complementary analysis utilising NVivo software. The results obtained are in accordance with the existing literature. With the power of AI, we are on the verge of a profound transformation in the way teachers and students approach higher education pedagogy. Teaching is essentially a human activity. AI is an additional tool that enables us to improve the performance of this sector, which is the pillar of development for all nations.

As with all research, it is essential to consider the limitations of the study. This research focuses on the opinions of teachers and students, while the university's administrative staff are the stakeholders involved in the learning process. It would be possible to study the impact of the key components needed to enhance the performance of higher education through artificial intelligence on a larger sample.

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