Students' knowledge and expectations regarding the impact of Artificial Intelligence in school

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ABSTRACT. The study was carried out in the Mariscal Sucre Educational Institution of Sampués with 113 students of tenth and eleventh grade with the purpose of inquiring about the knowledge and expectations of the students on the use of artificial intelligence in the school context. The profile of the sample of students in this subject has been given by having studied physical processes in each of the grades, emphasizing the principles of electricity and electromagnetism. To do so, a questionnaire was designed with 24 items, which was validated with a pilot test, giving a Cronbach's alpha of 0.89 showing high internal consistency. It was then applied to the 113 students with results that were analyzed with SPSS software version 26, obtaining statistics for each dimension and indicator that were used to interpret the results. They showed good knowledge of electricity, electromagnetism, automation and robotics. Conceptual weaknesses were identified in the topic artificial intelligence. Regarding the expectations they have about the application of intelligence in the school context, it was found that, in areas such as school management and teacher management, expectations are high, but they are pessimistic about its use in teaching.

INTRODUCTION

The study was conducted at the Mariscal Sucre Educational Institution in Sampués with the aim of investigating students' knowledge and expectations regarding the use of artificial intelligence in the educational context. Many of them have studied topics such as electricity, electromagnetism, and some principles of automation and robotics in their natural science courses, which they have used to build some representations and prototypes that they have presented at the science and technology fair. In this educational process, they have seen how the use of technology has simplified human work and improved performance and productivity, effectively contributing to the resolution of problems in food production, public health, and the business and industrial sectors. However, despite the noticeable impact on these sectors, in many places it is unclear how one of the emerging issues could impact school dynamics and undermine the school model established more than 200 years ago, based on repetition and memorization of information. One example of resistance to the use of software technology at different levels of education can be seen in most Latin American educational institutions, where problems such as poor connectivity and a lack of computer tools in schools still persist. Software programming has been used to design many applications used in teaching and learning mathematics, science, humanities, and the arts, facilitating the automation of data analysis functions, text creation, and process modeling, and facilitating the movement of prototypes. Although work has become faster and more illustrative with the help of technology, in countries such as Colombia, where there is a public policy on the use of ICTs, their use has not become widespread among all teachers, students, and educational institutions. It has remained within a very small circle, highlighting the sector's high resistance to the proposed change.

For this reason, many academics are concerned that the use of emerging technologies such as artificial intelligence are having a positive impact on many aspects of human life, even though they are not achieving the desired transformation in school dynamics, as expressed by Rivero and Beltrán (2024) when referring to education. This concern is based on the impact that emerging technologies are having in contexts where there are no substantive changes in the pedagogical model they implement. An example of this can be seen when information and communication technologies (TIC) are used in scenarios involving memorization or the consumption of content without any added value.

Therefore, the group outlines its research work with the following question: What are students' knowledge and expectations regarding the use of AI in the school context?

To answer the above question, the following objective was formulated: To characterize the knowledge and expectations of students at the Mariscal Sucre educational institution in Sampués regarding the use of artificial intelligence in the educational context.

Before delving into the two categories that support this study, we reviewed the technologies that preceded AI and found that: Currently, research on machine learning applied to education stands out in areas such as teacher perception (Salas Rueda et al., 2022), student perception (Demir and Güraksın, 2022), academic performance (Ahajjam et al., 2022), school dropout (Alvarado Uribe et al., 2022), computational thinking (Almeida Pereira Abar et al., 2021), among others, which show in their results the implications of using intelligent techniques in solving complex problems in the education sector, based on information management and the prediction of results by analyzing frequencies or trends to make recommendations or adjustments to institutional operational plans or suggestions to teachers, administrators, parents, or students on issues such as absenteeism, dropout rates, family support, etc. This type of technology created great expectations, especially in the university sector, but it remained confined to certain sectors without achieving the expected widespread adoption.

To find reasons that justify the relationship between users' expectations about the impact of a technology in a given context, we relied on a systematic review of the literature on emerging technologies such as Machine Learning (ML) and Artificial Intelligence (AI) on achievements in the educational context conducted by Forero, W. and Negre, F. (2022). It analyzed 55 references on the use of ML and AI in education in 38 countries, led by the United States, from primary school to university levels. The results show that the 33 smart techniques extracted from the studies can be applied in the education sector to detect student academic performance early on, improve teachers' educational skills, facilitate learning for students with autism spectrum disorders (ASD), predict school dropout and make decisions about it, improve and generate educational content, close educational gaps, implement IA teaching at all educational levels, strengthen information security in the educational community, and motivate learning through mobile devices. Strengthen the field of robotics, improve academic and professional guidance for students, prevent the spread of fake news on social media, understand and reflect on the relationship between humans and machines, and develop critical thinking based on computational thinking. The distribution of studies on the application of intelligent techniques in education is analyzed, focusing mainly on their use. The results showed that the application of intelligent techniques in education is gaining ground at all educational levels, with the university sector standing out due to the technological package it uses. Despite this favorable outlook, there is a

noticeable gap between developed countries and the rest, between urban and rural areas, and between public and private institutions. These types of gaps mean that technologies that support and enable e-learning and b-learning, which were seen as concepts that would transform face-to-face educational models, have not become widespread, and the transmissionist models that predominated in the previous century still persist in the 21st century.

For this reason, research in the education sector seeks to close the educational gaps mentioned above and is now focused on promoting the articulation of ML and AI as an alternative means of achieving optimal results in reaching high-impact educational goals in comprehensive human development. Among the examples shown of this type of initiative is a study of robotics with intelligent techniques that aims to close the gap between educational and professional robotics by introducing ML techniques where differences in access, trajectory, progress, and educational outcomes are better for students (Dietz et al., 2022).

This time, it is the turn of IA, which has aroused great interest among academics, especially due to the impact it is having on different sectors and the number of applications that are appearing and being used to generate content. Educational processes, together with these intelligent techniques and tools applied inside and outside the classroom, have led to their implementation being treated with caution due to the ethical considerations involved (Bogina et al., 2022). So much so that teachers must be trained and kept up to date to cope with teaching processes, improving their communication, research, pedagogical, technological, and information management skills, among others. As UNESCO (2019) states in the Beijing Council on IA and Education, the education sectors must address the integration of AI into TIC competency frameworks to support the training of teaching, management, and administrative staff in the processes of modernizing school management.

In line with the structuring of theoretical foundations consistent with the objectives, two categories are presented below that illustrate the moment humanity is experiencing with the emergence of artificial intelligence:

THE EVOLUTION OF ARTIFICIAL INTELLIGENCE IN DIFFERENT CONTEXTS

The content of this section is outlined by the following question:

Artificial intelligence is a technology that is still in its infancy and has generated high expectations regarding its scope and the transformations it will bring about in different contexts in the near future. How is artificial intelligence impacting the contexts in which it is being applied?

In recent years, advances in artificial intelligence (IA) have been spectacular, giving rise to inventions that we would never have believed possible, such as applications and robots that are capable of learning to improve their work and even make decisions, which is obviously done through an algorithm and without individual consciousness. In this sense, rather than a fourth industrial revolution, IA is causing a cultural and social revolution. This technology is undoubtedly destined to transform our future, but we still do not know how and where it will take us. That is why it is both fascinating and frightening, especially when it has begun to transform business life and has become an important tool in the field of research, but generative IA applications have only just begun to be used in school processes, creating expectations about what would happen to the existing school model if all these developments were to be established.

However, some of the applications of IA are already questionable: data collection that invades privacy, facial recognition algorithms that are supposed to identify hostile behavior but are imbued with racial bias, military drones and lethal autonomous weapons, etc. This shows that the issue is not the technology itself but the use that humans make of it according to their interests. Many issues arise from this trend.

This trend gives rise to many ethical problems that IA poses and will continue to pose in the future, requiring regulation that addresses both the generality and the uniqueness of different contexts, as expressed by Azoulay, A. (2018), in one of UNESCO's publications:

"It is our responsibility to engage in a universal and informed debate so that we can enter this new era with our eyes wide open, without sacrificing our own values and, if member states so desire, achieving a common set of ethical principles" (pp. 36-39).

The aim is for countries to regulate their use in contexts where it is required, seeking to regulate their application in terms of security, respect for privacy, recognition of authorship, improving physical well-being, and without causing problems that affect business life as a result of the hacking of their secrets or causing monopolies of certain brands of products over others and, in the worst-case scenario, destabilizing the democracies of countries.

The advances in science to date are remarkable. The accumulation of big data and increased processing capacity facilitate the development of new AI products, which will be even more profitable tomorrow than they are today. An example of these processes was the manufacture of a COVID-19 vaccine in less than a year using all the information stored on the genetics of viruses. Currently, when we search the Internet, we are constantly bombarded with targeted ads—and it is this advertising that sustains companies such as Facebook, Amazon, YouTube, etc. At the moment, IA products represent only

a very small part of the market, but economists predict that within ten years they will account for up to 15% of total goods production. ¡That is enormous!

ARTIFICIAL INTELLIGENCE IN THE SCHOOL CONTEXT

A review of the literature highlights the following studies from the last five years:

Quirumbay, R., et al., (2024), conducted a study to examine the use of artificial intelligence in education, focusing on the experience at the Trece de Abril Educational Institution in Ecuador, whose objective is to evaluate the impact of integrating artificial intelligence into education. The methodology combines a qualitative and quantitative analysis, in the form of a literature review. The sample comprises 35 teachers and 30 students. The results provide valuable information on the influence of IA in education. The results indicate that 57% of teachers are unfamiliar with artificial intelligence, while 60% of students say they do not use IA in their tasks. This means that they have limited knowledge on this subject. Many teachers need training on artificial intelligence to better understand its role and how they can integrate it into their educational practice.

Sanhueza and Valdivia (2024) in Chile proposed a teaching sequence that incorporates the use of artificial intelligence with the aim of highlighting digital literacy skills in secondary school students. A teaching sequence was presented that integrated two AI applications to demonstrate the development of digital literacy skills associated with searching for information on the internet and creating digital infographics. As a result, there was an increase in the achievement of students' skills.

Da Silva and Silva (2024) in Brazil used artificial intelligence to improve ecology essays: a study they conducted in a Brazilian high school. When evaluating the potential of AI resources as an auxiliary tool in improving argumentative essays written by second-year secondary school students on ecology, they found that chatbots can be used as complementary resources in the classroom, facilitating the application of content and making assessments more engaging and productive.

Castillo (2023), in Ecuador, evaluates the impact of artificial intelligence on the teaching and learning process in secondary education. Both the teachers and students who participated in the study use AI, the former for planning and creating academic content, and the latter for doing schoolwork. The study reflects on the ethical and responsible use of this type of technological tool, so that it enhances, but does not replace, the intellectual effort of students.

To reinforce the benefits of using IA in education, Loor et al. (2024) argue that this technology will make education more inclusive. They base this argument on the fact that students with special needs or those who do not speak the same language as the teacher will be able to attend school on an equal footing

with their peers. These authors also believe that IA will facilitate and automate many of the tasks performed by teachers, allowing them to devote more time to preparing for their classes and setting their sights on higher goals.

Along the same lines, Yu (2023) conducted a study on the impact of ChatGPT on secondary education, in which he considers that this tool can make a significant contribution at this educational level in processes such as information management.

In the field of education, Bernate and Fonseca (2023) believe that it faces constant changes, challenges, and opportunities in order to improve the quality of the educational process and facilitate access to education, for which it is currently intentionally limited to the use of technology. In this context, from Aparicio's perspective (2023), AI emerges as a technology that can offer innovative and effective solutions to support teachers in their educational work.

IA has advanced significantly thanks to three key factors: the development of specialized graphics processors, the massive availability of data, and open-source programming environments for machine learning. These advances have enabled the creation of deep neural network models that can process and learn from large volumes of data, facilitating tasks such as image recognition, machine translation, and behavior prediction.

With all the information that has been reported over the last three years, it can be said that we are living in a pivotal moment where two trends are converging to transform education: on the one hand, new pedagogies, such as Adaptive Learning and Immersive Learning, and, on the other hand, new applications and technological tools that Artificial Intelligence (IA) is making possible, "engineering," in both the literal and metaphorical senses, more solutions to the most relevant problems in student learning, such as information management and knowledge construction.

On the other hand, it is necessary to review the way in which AI training is being carried out. In this regard, Angeletti (2024) raises the need to educate in IA knowledge and skills, given that it has become one of the fundamental technological skills of this century. Because of this, digital literacy alone is not enough at the present time; IA literacy is also necessary. The latter concept encompasses acquiring knowledge, understanding techniques, and being users of products and services, among other things. In her study, this author also addresses the content and skills related to IA in the basic cycle of secondary schools, where she argues that priority content should be established in this regard so that there is adequate and coherent development of IA in the curricula.

Using machine learning and data analysis systems, IA can assess students' progress and learning patterns and provide personalized recommendations

to help educators create teaching plans tailored to each student's needs (Magallanes, 2023). The intelligent tutoring system (ITS) is an IA system that has been used in education to provide personalized feedback and support to students.

METHODOLOGY

A quantitative study was conducted, with a descriptive scope and non-experimental design (Hernández, Fernández, & Baptista, 2014, pp. 33-57), which included fieldwork with students in order to gather information about their knowledge and expectations regarding the impact of artificial intelligence in the educational context. The work was carried out in three phases, beginning with the design and validation of the questionnaire aimed at characterizing the students' knowledge and expectations. It contains 24 items that contribute to the following variables, dimensions, and indicators:

Table 1. Questionnaire Structure

Variable	Dimension	Indicator	Items
Perception	Knowledge and representations	Identify how an electrical circuit works.	1
		Identify the principles of electromagnetism.	2, 3, 4
		Identify the principles of automation in an automatic system.	5, 6, 7
		Identify the principles of robotics	8, 9, 10
		Identify the applications of artificial intelligence	11, 12, 13, 14,
	Expectations	Information management and text production	15, 16, 17, 18
		Role of teachers and school administration	19, 20, 21, 22, 23 y 24

Source: own

After validating the questionnaire through expert evaluation using criteria such as semantics, coherence, and significance, a pilot test was conducted with 20 participants, yielding the following information:

Table 2

Questionnaire validation— Reliability statistic

Reliability statistics			Summary		N	%
Cronbach's Alpha	Cronbach's alpha based on standardized items	Number of items		Valid	20	100,0
			Cases	Excludeda	0	,0
				Total	20	100,0
,890	,889	24	a. Deletion by list is based on all variables in the procedure.			

Source: own

The Cronbach's alpha value of 0.890 indicates that the questionnaire has high internal consistency among its items.

RESULTS

In the second phase, the questionnaire was administered to 114 students in grades 10 and 11 at the Mariscal Sucre educational institution in the municipality of Sampués, and the analysis showed the following, in line with the research objectives:

Table 3.Descriptive statistics of knowledge and expectations

		Knowledge	Expectations	Item rating	knowledge frequency	Expectations frequency
N	Valid	114	114	1	3,5	7,9
	Lost	0	0	2	7,0	3,5
Mean		3,20	3,04	3	55,3	65,8
Mode		3	3	4	34,2	22,8
Standard deviation		,719	,763	Total	100,0	100,0
Variance		,516	,583			

Source: own (Rating: strongly disagree (1); disagree (2); agree (3); strongly agree (4)

The analysis showed that 89.5% of students have good knowledge of electricity, electromagnetism, automation, robotics, and artificial intelligence, as shown by the measures of central tendency. The same is true of their expectations regarding the field under investigation, with 88.6% having high expectations for the use of AI in the educational context.

The breakdown of knowledge in fields such as electricity, electromagnetism, automation, robotics, and artificial intelligence yielded the following statistics:

Table 4. Descriptive statistics for knowledge indicators

		Electricity	Electromagnetism	Automation	Robotics	Artificial Intelligence
N	Valid	114	114	114	114	114
	Lost	0	0	0	0	0
Mean		3,04	2,99	3,11	3,11	3,03
Mode		3	3	3	3	3
Standard deviation		,896	,723	,824	,835	,734
Variance		,803	,522	,679	,697	,539

Source: own

The average score for the indicators of knowledge in electricity, automation, robotics, and artificial intelligence is above three. The indicator corresponding to electromagnetism has the lowest average score, but its dispersion is the lowest.

To identify the contribution of each item in the indicator, its frequency percentage was determined, highlighting the accuracy of each item. The table with the frequencies is shown below:

Table 6. Frequency of categories knowledge about electricity

		Frequency Electricity	Frequency Electromagnetism	Frequency Automation	Frequency Robotics	Frequency Artificial Intelligence
Valid	1	10,5	6,1	8,8	8,8	7,0
	2	6,1	7,9	2,6	3,5	4,4
	3	51,8	66,7	57,9	56,1	67,5
	4	31,6	19,3	30,7	31,6	21,1
	Total	100,0	100,0	100,0	100,0	100,0

Source: own

The table above highlights the average ratings for AI knowledge. It shows that 52.6% of students express a high degree of acceptance of item 13, but only 11.4% are correct.

With regard to student expectations, the indicators showed that:

Table 7. Information Management Statistics

Information Management			Item rating	Frequency Information management
N	Valid	114	1	9,6
	Lost	0	2	58,8
Mean		2,22	3	31,6
Mode		2	4	
Standard deviation		,606	Total	100%
Variance		,367		

Source: own

Based on the measures of central tendency, mean, and median, it can be observed that students have low expectations regarding the use of artificial intelligence in information management and text production by teachers. This difficulty arises from teachers' low digital literacy and their lack of commitment to using artificial intelligence tools in the classroom. Finally, the statistics corresponding to the teacher-administration role indicator were determined, with the following results:

Table 8. Teacher-administration role statistics

Role teacher-administration			Item rating	Frequency
N	Valid	114	1	7,9
	Lost	0	2	5,3
Mean		2,98	3	67,5
Mode		3	4	19,3
Standard deviation		,752	Total	100%
Variance		,566		

Source: own

It can be observed that the measures of central tendency are close to accepting the statements of the corresponding items as true. This observation is complemented by the frequency of the indicator, especially rating 3, which has a 67% acceptance rate, although they express reservations about the time frame in which the AI tools will be implemented.

Based on the characteristics of the findings, students demonstrate knowledge of the basic principles of electricity and electromagnetism learned during classroom work. There, they combine theoretical and practical work when building prototypes demonstrating how bodies are electrically charged, energy transformation and flow in an electrical circuit, movement in motorized circuits, and automatic and robotic systems. They also have superficial knowledge of technological applications that use artificial intelligence, as a result of not emphasizing their training in this field of knowledge. This knowledge underpins and lends credibility to the respondents' opinions because many of them use mobile applications that incorporate artificial intelligence to generate text and images and manage information, and they are part of the group of people who are regular users of social media. They view with great concern how their teachers only use information technology to present their slides or videos. Some use programs such as Word or Excel.

DISCUSSION AND CONCLUSIONS

Based on the characteristics of the findings, students demonstrate knowledge of the basic principles of electricity and electromagnetism learned during classroom work. There, following Díaz-Barriga (2003), students and teachers use strategies that combine theoretical and practical work when building prototypes, demonstrating, as expressed by Duarte, Gutiérrez, and Morales (2007), creativity, motivation, curiosity, and the application of knowledge acquired through everyday experience. the way bodies are electrically charged, energy transformation and flow in an electrical circuit, movement in motorized circuits, automatic and robotic systems. They also have superficial knowledge of technological applications that use artificial intelligence, as a result of not emphasizing their training in this field of knowledge. It should be noted that the educational institution does not emphasize this type of knowledge in its curriculum and that what students demonstrate is the result of their classes in the areas of natural sciences and environmental education, in technology and computer science work sessions, or what they have learned independently. For this reason, the knowledge and gaps demonstrated by the students support and lend credibility to the opinion of the respondents, because many of them use mobile applications that incorporate artificial intelligence to generate text and images and manage information, and they are part of the group of people who are regular users of social media. These

skills that some of these students demonstrate in the use of artificial intelligence applications are not the result of the cross-cutting use of these tools by teachers, despite the fact that there are many suggestions in the current literature in this field, such as those of Sanhueza and Valdivia (2024), who proposed a teaching sequence that incorporates the use of artificial intelligence in classroom work, without neglecting the assessment made by Aparicio (2023), who recognizes the power of AI in innovative and effective solutions to support teachers in their educational work. And the work of Magallanes (2023) shows how an intelligent tutoring system (ITS) can be used in processes such as feedback and personalized support for students.

Despite the fact that guidance such as this can be found in various media outlets andspecialized literature, students view withgreat concern (Tables 7 and 8) how their teachers only use information technologiesto present their slides or videos. Some use programssuch as Word or Excel to produce text or perform very simple calculationson calculators or mobile applications. They do not use applicationsto design online assessments, let alone create audiovisual contentfor social media, and they are resistant to thetraining offered to them. For this reason, they are very pessimistic aboutteachers immediately incorporating emerging technologies into their teaching practices.

Students demonstrate good knowledge of electricity, electromagnetism, automation, and robotics, which are basic skills for understanding the field of emerging technologies. However, they show weaknesses in conceptualizing the basic principles of artificial intelligence and its use in the educational context. This reveals that the subject is only just entering students' personal lives and is not being applied in academic tasks.

Expectations regarding the use of artificial intelligence in the school context in areas such as school management and teaching are high, but students are pessimistic about its widespread use and express reservations about the time it will take to implement AI tools in teachers' routine work.

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