Impact of Artificial Intelligence as an Educational Resource in Teaching-Learning Processes in the Area of Biology: Significant Experiences with Eighth Grade Students of the CEA Cámbulos Adventist School

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Abstract

Artificial intelligence is a current tool that is used in different areas of the human life with the purpose of facilitating and directing the processes in distinct sceneries of society. This research aimed to use AI as an educational resource in teaching and learning process in the area of biology for students at the Adventist School CEA Cambulos in the city of Cali. A qualitative research methodology was used, with data collection techniques such as observation and interviews, presenting an action research approach. The main results were the potential of AI to enhance learning, the disposition of students to learn through it, and the need for training in the educational sector for its inclusive use and achieving responsible and effective results. That is how it is considered the challenge of reflecting the imminent arrival of AI in the student context and being prepared to be part of the transformation that can be generated in pedagogical processes.

Keywords: Artificial intelligence; teaching; learning; secondary teaching; biology.

1. Introduction

We are in a historical moment where technology has made great progress for the development of humanity, advances in communication and the revolution in the way we carry out daily tasks, shows that it has become an essential tool for our lives. Framed in this continuous technological development we find the rise of Artificial Intelligence (AI), one of the branches of computer science that has aroused the most interest today, due to its enormous field of application, and which is defined as a technology with the ability to make a machine think on its own through a series of algorithms that provide it with the ability to interpret. decision and problem solving autonomously in response to the signals it receives.

From the educational field, this resource has begun to generate great expectations as it facilitates the development of educational content based on different learning rhythms and styles, allowing students to access educational resources that adapt to the way they assimilate information (Colombia aprende, 2022). In this way, it becomes a promising tool to combat learning problems due to the personalization of educational processes, while at the same time it is emerging as an important aid in educational didactics due to the plasticity it has when it comes to stimulating interest and learning in students.

Within the range of areas of knowledge are the natural sciences, which are subcategorized in turn into branches or disciplines that encompass the study of matter and living beings, one of them being ecology, which aims to study the relationships of different living beings with each other and their environment; It is one of the most analyzed and studied currently, since according to (Lopez & Rodriguez, 2006) efforts must be joined to stop the accelerated process of ecological destruction of contemporary man, which is why joint efforts must be made in environmental education in order to raise awareness among the new generations of the correct balance that must exist between nature and society, since it is not only the salvation of the environment. nature, but that of man as a species.

Currently the environmental condition is a social problem that has been denounced through the voice of thousands of men throughout the world, in academic, scientific, political, social and economic circles both on a global, national and local scale given the magnitude of the global problems denounced at the United Nations conference held in Rio de Janeiro in 1992. a space in which the decline of the quality of the air, seas, lakes, coasts, rivers and the very living conditions of man was highlighted as a consequence of the action generated by polluting waste generated by human activities (Lopez & Rodriguez, 2005). These

Taking into account the above, the research explores AI as a strategy in teaching-learning processes, comparing educational content through information research with this technological resource to dynamize the acquisition of knowledge in the area of biology, which is very important in training processes since it allows us to know the world in which we live. It helps us to understand our environment, as well as to develop responsible attitudes and reflection on aspects related to living beings, resources and the environment.

2. Methodology:

The research was carried out at the CEA Cámbulos Adventist school in the city of Cali with eighth-grade students between the ages of 12 and 14. There was a total population of 24 students, of which only 20 were part of the research by voluntarily presenting the informed consent previously filled out by the parents, with only 17 finally carrying out all the stages of the research process.

The work was carried out using a qualitative approach through the action research methodology that allows interaction between researchers and those under investigation in an active way, generating reflective spaces with the intention of proposing changes to the problems addressed.

According to Lomax (1990), this method generates an intervention in professional practice with the intention of causing improvement. For the purposes of our research, qualitative research techniques were used, such as the interview, which allows us to obtain broad, deep, and complete information by specifying the criteria, disposition, and sensitivity of each interviewee (Mendicoa, 2003), participant observation, which provided us with descriptions of the events, people, and interactions observed, along with the experience and sensation of the observers (San Juan, 2011) and the field diary to record the events that occurred in each of the classes in order to carry out a detailed description of the significant behaviors observed in our research context (Albertin, 2007). The categorization of our research information is structured by categories, subcategories, techniques and related instruments in the following table:

Analysis category	Subcategory	Technique	Information collection instrument
Experience of using Artificial Intelligence.	Students' perceptions of how they feel about using technology in their chemistry classes.	-Observation	-Field diaries.
	Opinions on the novelty and usefulness of Artificial Intelligence in the learning process.	-Interview	Semi-structured scripts
Motivation and commitment	Observation of changes in students' intrinsic and extrinsic motivation due to the implementation of Artificial Intelligence.	-Observation	-Field diary.
	Self-determination in the levels of interest and enthusiasm for the subject of the chemistry subject.	-Interviews	-Structured scripts.
Meaningful learning:	Identification of learning moments or activities that students consider most significant with the use of Artificial Intelligence.	-Observation. -Interviews	-Field diary. -Structured scripts.
	Comparison of understanding and retention of concepts before and after implementation.		
Perceptions about teaching and learning.	Students' opinions on how Artificial Intelligence changes the dynamics of classes and the relationship with teachers.	-Interviews	-Structured scripts

Finally, the data analysis was carried out using the Altas.ti Software that allows the analysis of large corpus of text, audio, image or video data; with a wide variety of sophisticated possibilities to organize and manage the data in a creative and systematic way (Atlas.ti Software 2024)

3. Results

The findings analyzed in the research are detailed below through categories that delve into the main concepts involved in the impact of artificial intelligence on educational processes. The examples are intended to give evidence of each consideration in data collection.

Perceptions of AI Students

Students show mixed opinions about the usefulness of AI in education, highlighting its help with homework and the search for information, although some consider that it can take away from their academic commitment; This is due to the speed and agility with which information can be obtained that responds to the needs of academic homework, to which those who do not use it, feel frustration for the time measured in effort dedicated with other tools to obtain the same result.

In this way, they show a variety of opinions and experiences with AI in education, highlighting its usefulness but also raising concerns about its impact on the learning process. There are both positive and negative experiences, highlighting their usefulness in carrying out tasks, but also mentioning problems such as incorrect answers or slowness sometimes that vary in the quality of equipment and internet that are available, demonstrating that they need more exploration of these platforms and from their criteria choose the most appropriate one for their benefit.

In the same way, it was found that not all students have generalized perceptions regarding the advantages of AI, depending on the programmed activity and the results yielded by these applications, they issued value judgments regarding their use, stating that not all applications were efficient with respect to what was requested. for example, when it comes to making stories, most students prefer to create them personally and renounce the use of AI since they do not feel identified with what they want to capture and express.

It was also observed that some see in AI a potential to improve learning and facilitate the acquisition of knowledge, they feel that it can speed up processes to be able to dedicate time to situations of their greatest interest. An example of the above can be making posters by hand for an exhibition (which affects those who have not strengthened their artistic skills) to replace them with an AI (Gamma) that makes such a presentation, which includes the information and design, in less time to be able to dedicate it to the study and exhibition of the content. On the other hand, concerns are expressed about the over-reliance on AI for answers.

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Impact on the Teaching-Learning Process of AI

Artificial Intelligence has had a positive impact on students' academic performance, helping them to raise their grades, better understand content and complete homework; generating changes in teaching strategies, making students more efficient in their jobs. It is mainly used to search for complex information in biology topics such as the characterization and identification of biomes for presentation through exhibitions with the Gamma AI tool; as well as discussion and reflection on environmental issues.

Since the process of implementing AI in classes began, the interaction between students and these technological systems such as Chat GPT and You.com has made it easier for them to understand concepts and carry out tasks more quickly, so they are interested in making them part of their learning tools; However, it also poses challenges for teachers when evaluating student work, since the tasks are focused on the fulfillment of assignments and not on the strengthening of knowledge.

The results of the teachers' field diary using artificial intelligence to teach the topic of earth biomes showed that many students cared about grades, some had little previous contact with AI, and liked the accurate information it provided. It was also seen that it was difficult for them to delve into topics, ask argumentative questions and differentiate between biotic and abiotic factors. In general, they prefer the digital environment, have difficulty writing by hand and have vocabulary gaps in ecology. AI can be useful for accessing information, but it does not guarantee better understanding. Also, working in pairs on the same computer resulted in distraction.

Challenges and Limitations of AI

In the use of artificial intelligence, there are challenges that include technical and accessibility difficulty. On the one hand, the school, although it has spaces such as a computer room, does not have technical support in its equipment, it has internet but it is not allowed to share its use, students are not allowed to carry their mobiles to avoid distractions, so the teacher saw the need to be skillful and strategic so that AI will not reach a few but all, placing their students in groups or allowing them to explore AI at home and get to share the experience in class.

Another limitation mentioned is the ethical and privacy concern, as AI is a tool that is presented as if it thought for itself, students do not know if it can go beyond personal spaces. When delving into the fact, it is evident that they are students who have not interacted with AI and are unaware of them, although some find them useful despite these challenges.

4. Discussions

Student perceptions of AI

The fear of evolution in different aspects of society is a common response to technological, cultural and social changes and advances in students. Artificial Intelligence is no exception to skepticism, distrust, uncertainty, suspicion, as well as curiosity, search, analysis and consideration. However, the different perspectives must be addressed in an informed way, reality cannot be omitted, it is necessary to consider how adapting to these changes can lead to improvements in the quality of educational processes. Cabrera, M. (2022) mentions that it is time to start living with innovation and new technology. We cannot continue to resist, since this implies stagnating society. AI is here to stay and what better way than to be able to use it to our advantage, starting from the basis of the human being, education.

On the other hand, students say they make use of AI even though their teachers are not doing it, some even do not know about this technology, which makes the student have an advantage in

the use of innovative tools, so they ask themselves: What are teachers and school administrators doing to update their teaching strategies? Given these concerns, a study carried out by Ayanwale, Sanusi, Adelana, Aruleba, and Oyelere (2022) comments in the UNESCO report that eleven countries have currently been supported by the government in their Artificial Intelligence curricula with few other developing countries, which implies that a greater effort is needed in the development of resources for this emerging field. These initiatives support the feeling of CEA students to increase AI educational spaces, expressing the need for institutions and teachers to include AI knowledge in education in their daily practice.

This is how technological advances lead to rethinking curricular adjustments, education is constantly transforming, innovation through Artificial Intelligence is an area of mutation in educational strategies. In this way, we agree with Ocaña, Fernández (2019); Sanabria-Navarro et al. (2023), emphasizing that teachers need training that allows them to carry out strategies supported by AI. In the face of all this, there are positive, motivating attitudes towards change; the student population sees AI as a promising tool that can improve efficiency, they find potential through it to improve their research processes.

It is noteworthy that the current generation of students is open to new technological knowledge, they show a greater interest in feeling part of the youth that surrounds them, these are called "digital natives"; Ocaña-Fernández, Valenzuela-Fernández, and Garro-Aburto (2019) argue that these students, due to their continuity in the face of technologies, process and are more related to a digital language; since, on the other hand, those who do not circumscribe themselves within such parameters can be classified as "digital immigrants". All this attracts the student's interest in experiencing the era of artificial intelligence.

It is not surprising in the Colombian context that students show skepticism or denial of Artificial Intelligence, when analyzing the situation of their positions, it is analyzed that the context influences their knowledge; In order not to feel rejection or labels of ignorance, they are indifferent to the relevance of the dynamics of AI presented, all because of the lack of digital tools in homes or in the institution that allow them to be informed and promote their learning.

From the above, it is argued that attitudes towards the use of AI in education and research are varied and often depend on contextual and personal factors. Magallanes Ronquillo, K. K., Plúas Pérez, L. del R., Aguas Veloz, J. F., & Freire Solís, R. L. (2023), in their article present that another important challenge is the need to ensure that educators and students understand how AI works and how they can interact with it effectively. The discussion and debate about the benefits and challenges of AI in these fields must be strengthened so that interest in its applicability evolves as the technology advances and is implemented in educational and research settings.

Ensure inclusive and equitable use of AI in education – including through actions to address inequalities linked to socio-economic status, gender, ethnicity and geographical location and through successful projects or AI-related solutions that have been proven to be effective in removing barriers that prevent the most vulnerable groups from accessing quality education. (Ochoa Valle et al., 2019, 46) These difficulties were evidenced in attitudes of discontent with

innovative strategies, starting with teachers, those responsible for directing educational processes.

Likewise, it is essential to ensure that this type of technology does not widen the already existing gaps in society such as rural areas that for years have carried the badge of backwardness in technological innovation due to different factors. Without going to such large places, these gaps are visible from the classroom due to the inaccessibility of students to devices, whether mobile or portable, that allow them to get advice and learn from the scope of AI. This raises the importance of providing access to technology and learning resources to people of all socioeconomic levels, regardless of their location, origin, ethnicity or geographical location.

We could say that an educator is a "natural intelligence" that mobilizes its cognitive resources to teach as well as possible. In view of this, Ochoa Valle et al., 2019 wonders, like many teachers and students: How far has science come today in this ambitious goal of copying the human mind? Can the natural mind of an expert and competent teacher be simulated and placed in a program that educates through the computer? From these questions, teachers create the fear of being replaced by AI, worry about the loss of authority, employment or the decrease in the importance of human interaction in education. They choose to doubt AI's ability to significantly improve education and research, believing that technology cannot replace human experience and traditional pedagogy.

Teachers can benefit from AI by receiving insights into their students' progress, suggestions for curriculum improvement, and tools for classroom management. This can make your work more effective and rewarding. On the other hand, the way students are assessed can be transformed, allowing for more interactive, formative, and project-based assessments instead of traditional tests. On the other hand, the study by According to Chiu, Xia, Zhou, Chai, and Cheng (2023) supports this scoop, saying that thirty percent of the studies indicated that Artificial Intelligence technologies improved the efficiency of teaching work. AI technologies have been used to automate and simplify trivial and routine tasks, which reduces the workload of teachers.

Education is to advance, to grow in knowledge; Human beings have been responsible for producing significant changes throughout history in methods, approaches and technologies. As the 20th century progressed, technology began to play an increasingly important role in education. Distance learning systems were developed, and later, online education. The computer and Internet access revolutionized access to information and learning. AI began to make its way into the lines of study that revolutionized educational practices by wanting to assimilate human capabilities.

One of the fathers of computing, (Turing, 1950), in one of his famous phrases says "A computer can be called intelligent if it manages to deceive a person into believing that he is a human." AI is not only about the ability to solve complex problems, but also about the ability to interact in a human way. In other words, AI is not limited to logical tasks, but also involves the understanding of language, human reasoning. This is relevant in fields such as virtual customer service, virtual assistants and chatbots, reaching the educational field. One of the first evidences of AI in the educational field was evidenced from virtual education.

Today, education continues to evolve with the use of artificial intelligence, virtual reality, and online learning. Education is becoming more personalized and student-centered, focusing on practical skills development and preparation for the world of work. Indeed, AI is a great contribution and it can be implemented in several ways based on student accommodation. Although, what is really important now and the work to be solved is the elimination of stereotypes and/or beliefs regarding AI and the implementation of AI in education. It is time to start living with innovation and new technology. We cannot continue to resist, since this implies stagnating society. AI is here to stay and what better way than to be able to use it to our advantage, starting from the basis of the human being, education. (Cabrera, 2022, 135)

Innovations in education, such as Artificial Intelligence in classrooms, can raise fears about the quality of teaching, human interaction, and the future of educational institutions. Even so, there must be continuous supervision to ensure that technology is used ethically and equitably, Cabrera, 2022, 4 tells us that in the specific case of education we should not look at the emergence of artificial intelligence as an enemy, but as a possible field of study, a tool for use, an enabler of new strategies for learning, Generator of new questions for educational research.

The future is uncertain, but it depends on the orientation given day by day to the use of AI to reach comprehensive results, which can be some negative, others positive, but to be able to reach the objective that is to learn from and through them. It is important to take into account within the educational field that it serves to analyze not only its scope, but also to use the tool as a means of inspiration in the teaching-learning process, to use it as an ally or complement to its use from education. (Mata, 2023, 100)

Impact of the AI teaching-learning process

Artificial intelligence plays an important impact on teaching and learning processes, as it is classified as a tool that provides multiple opportunities in the improvement of education worldwide (Guacan et al, 2023; Jara & Ochoa, 2020). The present research found that students feel that AI has positively impacted their academic performance in the area of biology because it has helped them to raise grades, thanks to the fact that it provides more flexible, personalized, and engaging learning that motivates them to expand their learning methodologies (Guacan et al, 2023; Obregón et al, 2023; Rodríguez et al, 2023). On the other hand, it facilitates the diversification of the educational act by including different ways of acquiring, processing and converting information into meaningful learning and that have been proposed in educational models such as the brain quadrant, the dimensions of knowledge, the cerebral hemispheres, multiple intelligences and the visual-auditory-kinesthetic model (Felder & Silverman, 1998; De la parra, 2004; Gardner, 1993; Nivela et al, 2020).

Other authors who consider the stimulation of academic habits and the use of reinforcers as school supports see in artificial intelligence an enormous possibility to improve the academic results of students at all school stages, since AI allows learning to be personalized by adapting to the individual needs of students through the use of machine learning algorithms that allow experiences to be adapted to needs and characteristics individual students, which can significantly improve the effectiveness of the educational process (Murtaza et al, 2022), thus

providing a personalized approach to the development of skills that allow students to progress at their own pace and focus on areas where they need more support; also favoring the possibility of carrying out virtual tutorials, providing immediate feedback and guiding students through exercises and activities that help them improve their understanding and performance in different subjects (Gonzalez, 2023).

Similarly, it was found that the greatest use that students make of AIs is to perform tasks and search for complex information in order to obtain quick information that allows them to fulfill their academic assignments, through interaction with generative AIs such as Luzia, You.com, Chat GPT and Bing. which allow students to write essays and other texts, helping to improve their grammar, spelling, writing style, and generate ideas for their essays (Gonzalez, 2023) in order to obtain accurate and summarized information on a particular topic. It was also evident that in most of the cases the students did not make a reflective reading of the texts that the artificial intelligences produced (Chat GPT and You.com), but simply limited themselves to making use of the information that they provided; which in some cases was incoherent so it was not reliable to use and that according to Gonzalez (2023) is one of the potential risks to education as it presents misinformation and bias due to its training data, which can be inaccurate, incomplete, and biased.

It is also raised the fact that this type of interaction in the search for answers or elaboration of academic texts generates a number of questions related to the issue of plagiarism due to the fact that there are AIs that allow paraphrasing and changing the text of a document, becoming a difficult problem to solve today (Gonzalez, 2023) and the creative elaboration of the students, since these texts are the sole and exclusive elaboration of AI without human intervention, which in an educational context implies that the student does not make any novel text but only the ability and means to use this tool (Fundación nuevas generacións, 2023); which is why some authors consider a possible trend towards a massive dependence on the use of AI and a decrease in the creative capacity of human beings by not being stimulated in the search for different sources of information, in the organization of information and the subsequent preparation of academic documents.

The aforementioned leads to the imperative approach of generating educational spaces where academic processes are educated and accompanied with artificial intelligence, a proposal in which authors such as Peñaherrera et al (2023) propose that teaching in artificial intelligence should be marked in three spaces: learning with artificial intelligence, learning about artificial intelligence and training for artificial intelligence; since there are concerns about the use that can be made of AI in educational contexts, such as biases that instead of generating educational advances generate discrimination since the training of machine learning algorithms is carried out with data from certain contexts and people, which could lead these systems to internalize partial or discriminatory criteria typical of those sources (Jara & Ochoa, 2020)

The results also reflected that there is a lot of misinformation among students and teachers regarding the use of AI, which has been proposed by various authors as the tool of the twenty-first century (Obregon & Onofre, 2023; Vera, 2024;) so that in the educational institution spaces

for training in the use and management of ICTs in teachers must be generated due to their role of serving as mediators and reflectors of the use of these technologies;

AI challenges and limitations

The use of Artificial Intelligence today represents a great challenge for both teachers and students in classrooms, since, despite the fact that it has already been implemented for several years, there is still a long way to go. In this research, it was evident that the institution manifests difficulty in accessing the free Internet for students, which generates the discussion of how technology can be made an efficient tool if access to AI is limited. As mentioned (Haristiani, 2019), despite the fact that artificial intelligence can be adjusted according to the individual needs of students, the challenge arises to ensure that systems can offer genuinely personalized, accessible, and effective teaching. To achieve this, it is necessary to combine technology and pedagogy effectively to understand the learning styles, individual preferences, and specific needs of each student.

The report provided by the article Education (2019) under the title of 'Recognizing individual differences' emphasizes that each student is unique and learns differently. Therefore, it is crucial for educators to consider the environment in which they find themselves in order to identify and apply various strategies that facilitate meaningful learning. It is essential that teaching adapts to the needs of students instead of expecting students to adapt to it, thus understanding their requirements and their learning process, however in this research it was found that for some teachers, the implementation of technology in the individualization of learning is still not relevant in the development of their classes and students perceive it in this way. which generates ignorance of all the opportunities generated by tools as useful as artificial intelligence.

In addition, in this work it was found that some students consider that the use of AI has ethical implications which, according to them, can go against the correct form of research to which they are accustomed, making them feel little involved in their own learning and dependent on what a third party provides them. This leads us to argue that the fact that artificial intelligence provides multiple advantages in the learning process also raises challenges and dilemmas. An example of this is the presence of cultural bias in AI algorithms and the absence of real human interaction. These are crucial aspects that must be addressed to ensure learning that is inclusive and fair for all users (Gomes, 2020). This means that the information that results from AI searches provides information that may be inappropriate for those who receive it and exceeds the limits that teachers and students initially wish to address.

Among the findings found in this research, there is also concern about the scarce involvement of the students themselves at times when it is necessary to use artificial intelligences as an educational resource either for research, as previously mentioned, but also for the resolution of problems posed in the different subjects. In relation to this, the lack of critical thinking as a latent risk is clearly evidenced, as Jara and Ochoa (2020) point out, it can then be understood that the decrease in human interaction is perceived as another of the challenges to be faced with the application of AI in the educational field (Ahmad et al., 2021).

Data security in the use of AI is also a concern expressed by the students in the study carried out, as mentioned (Díaz, 2018), software development organizations must guarantee not only the

security of their systems, but also the privacy and integrity of the data of their customers and users, however, it is a topic for discussion since with the increase in the data collection capacity of AI and the request for personal data for use, it will always be in doubt whether that data is really protected or can be filtered for use by third parties. As mentioned (Santos, 2017), those who provide artificial intelligence services must establish action procedures for the prevention, detection and contingency of data; knowing that not all people, administrations and companies will have the knowledge and economic and technical means to carry them out by themselves. However, the safest thing to do is always to be cautious with the information that is shared in applications or pages that request data, especially nowadays where artificial intelligences are growing and their number of pages dedicated to the subject is constantly growing.

The results also show that some students had not had any interaction with the different AIs, either due to ignorance of them or because the institution does not promote their use. As mentioned (Magallanes, 2023), AI is often perceived as an enigmatic and complex technology, which can make it difficult to understand for those who are not familiar with it. Therefore, it is essential to provide proper training to educators and students so that they can take full advantage of the benefits it offers. This is why it is understood that, although artificial intelligence can facilitate access to learning, it is essential to address technological disparities and ensure that all students have the same opportunities to take advantage of these tools. Device availability, internet connection, and socioeconomic differences can restrict access for certain students, potentially exacerbating already existing educational inequalities (Xie et al., 2022). A key challenge is to ensure that both educators and students understand how artificial intelligence works and how to interact with it efficiently.

This study also showed that there is a lack of knowledge and appropriation of the use of technology and artificial intelligences on the part of teachers, therefore students state that it is not directly reflected in classes and in the implementation of new learning, in contrast, it is understood that if there are efficient technological instruments, entrusted to competent individuals, they undoubtedly have the potential to improve and make more adaptable the structure and implementation of the curriculum, share knowledge, and strengthen creative and collaborative educational processes (Díaz, 2011).

The lack of training and even acceptance of Artificial Intelligence among teachers, who should be the ones who bring students closer to its use, means that they show limited knowledge about these technologies. According to Cárdenas, J. (2023), these educators may show resistance to incorporating them into their research activities due to the lack of AI training programs, the perception of their complexity or difficulty of use, or an academic culture that tends to be cautious or reluctant to change. This situation could lead to a slow adoption of AI in academia and a less effective use of AI tools for students, therefore, it is imperative that institutions implement training strategies for their teachers, regardless of the areas of study, so that they can benefit from the benefits of new technologies. and likewise students are not limited in terms of their learning and broader knowledge in the different disciplines of study.

5. Conclusions

Students recognize the potential of Artificial Intelligence (AI) to enhance learning and facilitate knowledge acquisition, especially in the search for information and the performance of academic tasks. However, they express concerns about potential loss of engagement and over-reliance on AI for answers, as well as technical, accessibility, and ethical challenges, including data privacy. Despite the willingness to learn and the positive impact of AI on academic performance, misinformation persists about its use and the need to address the limitations of its implementation in the educational field.

The area of biology was strengthened from the reflective field through the search for information in AI, which allowed expanding spaces in the classes to develop processes of analysis and discussion of the acquired content. This shows that AI as a learning tool can be used by the teacher as a streamer of processes in obtaining content and a facilitator of significant reflective environments for the accompaniment of dynamics such as conversations, debates, symposia, seminars that lead them to build part of their environmental awareness.

Although AI is considered a promising tool to facilitate and enhance teaching-learning processes due to the wide range of opportunities it offers, care must be taken with the information it generates, since in many cases biases and misinformation can occur with respect to the approach to issues, which is why it is necessary to generate management spaces in artificial intelligence and regulatory policies that promote the transparency and objectivity in the information they provide, it is also convenient to reach consensus on the use of AI and the generation of committees of programmers where the algorithms that feed AIs are discussed, since the achievement or rethinking of values in society depends on this.

The integration of AI poses challenges for teachers, especially in the evaluation of student work and the adaptation to new teaching strategies. Although students primarily use AI to search for information and complete tasks, technical difficulty and limited access to devices by the institution represent significant obstacles. In this context, it is critical to address misinformation, ethical concerns, and the need for training for both students and teachers, in order to harness the potential of AI effectively and responsibly in the educational environment.

WORKS CITED

Albertín Carbó, P. (2007). Reflective training as a professional competence. Psychosocial conditions for reflective practice. The field diary as a tool. Revista de Enseñanza Universitaria, 30, 7-18.

Ahmad, S. F., Rahmat, M. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial Intelligence and Its Role in Education. Sustainability, 13(22), Article 22. https://doi.org/10.3390/su132212902

Atlas.ti (2024). Qualitative analysis software. Retrieved from https://www.software-shop.com/producto/atlas-ti#collapseSix

Ayanwale, M. A., Sanusi, I. T., Adelana, O. P., Aruleba, K. D., & Oyelere, S. S. (2022). Teachers' readiness and intention to teach artificial intelligence in schools. Computers and Education: Artificial Intelligence, 3, 100099. https://doi.org/10.1016/j.caeai.2022.100099

Benavidez, P. N. E., Pérez, C. V. V., & Pérez, R. A. V. (2019). Artificial intelligence as open educational resources. Edwards Deming Science and Education Technology Journal, 3(1), 36-49.

Cabrera, M. A. (2022, 10 18). Artificial Intelligence: a complement in education. Neuronum Journal, 8(4), 133 - 135. https://eduneuro.com/revista/index.php/revistaneuronum/article/view/481/544

Cárdenas, J. (2023). Artificial Intelligence, Research and Peer Review: Future Scenarios and Action Strategies. Revista Española de Sociología, 32(4), a184. https://doi.org/10.22325/fes/res.2023.184

Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. Computers and Education: Artificial Intelligence, 4, 100118. https://doi.org/10.1016/j.caeai.2022.100118

De la Parra Paz, E. (2004). Life inheritance for your children: integral growth with NLP techniques. Grijalbo.

Díaz San Juan, L. (Compiler). (2011). Observation. Faculty of Psychology. National Autonomous University of Mexico. Retrieved from http://www.psicologia.unam.mx/documentos/pdf/publicaciones/La_observacion_Lidia_Diaz_Sanjuan_Texto_Apoyo_Didactico_Metodo_Clinico_3_Sem.pdf

Díaz, J. (2011a). Physical Education and its teachers in the framework of competency-based teaching. pp. 15-30. In Physical Education. Conceptual reflections towards curricular integration. Medellín: Funámbulos Editores.

Education. (2019). Effective teaching. Retrieved from https://www.education.wa.edu.au/search?q=effective+teaching#_ws_search

Felder, R. M. (1998). Learning and Teaching Styles In Engineering Education. Journal of Engineering Education, 78(7), 674-681. https://www.engr.ncsu.edu/wp-content/uploads/drive/1QP6kBI1iQmpQbTXL-08HSl0PwJ5BYnZW/1988-LS-plus-note.pdf

New Generations Foundation. (2023). Chat GPT: a new way of understanding education?. Public policy program. Education, Culture, Science and Technology Area. Public Policy No. 382. January 2023

Gardner, H. (1993). Frames of mind: the theory of multiple intelligences. Basic Books. http://biblioteca.udgvirtual.udg.mx/jspui/bitstream/123456789/593/1/Estructura%20de%20la%20mente.%20teoria%20de%20las%20Inteligencias%20multiples.pdf

Gómes, A. (2020). Impact of Artificial Intelligence on the visual design process. Complutense University of Madrid.

González, G. G. (2023). The impact of artificial intelligence on education: transforming the way we teach and learn. Qurriculum Magazine, 36; July 2023, pp. 51-60; ISSN: e-2530-8386

Guacán, R; Miguez, R; Lozada, R; Jacome D; Cruz, W. (2023). Artificial Intelligence Used as a Resource for Learning. Ciencia Latina Multidisciplinary Scientific Journal. Volume 7, Number 4.July-August, 2023. https://doi.org/10.37811/cl_rcm.v7i4.7561

Haristiani, N. (2019). Artificial Intelligence (AI) Chatbot as Language Learning Medium: An inquiry. Journal of Physics: Conference Series, 1387(1). https://doi.org/10.1088/1742-6596/1387/1/012020

Jara, I., Ochoa J. (2020). Uses and effects of artificial intelligence in education. Inter-American Development Bank (IDB). May 2020. http://dx.doi.org/10.18235/0002380

Lomax, P. (1990). Managing Staff deve/opment in Schools. Clevedon. Multi-Lingual Matters.

Magallanes Ronquillo, K. K., Plúas Pérez, L. del R., Aguas Veloz, J. F., & Freire Solís, R. L. (2023). Artificial intelligence applied to educational innovation in the teaching and learning process. LATAM Latin American Journal of Social Sciences and Humanities, 4(2), 1597–1613. https://doi.org/10.56712/latam.v4i2.706

Mata, M. V. (2023, 07 15). ChatGPT: Uses and opportunities of teaching-learning at the Upper Middle Level. Academic Diversity, 3(1), 90 -112. https://diversidadacademica.uaemex.mx/article/view/21745

Mendiocoa, G. (2003) On theses and theses: lessons in teaching-learning. Buenos Aires: Espacio. (Ch. VII The Work with Data, pp. 137-152; Ch. VIII. The writing of the thesis, pp. 155-170; Chapter IX The presentation and defense of the thesis. Relatos de experiencias pp. 177-187)

Ministry of National Education of Colombia. (2022, August 11). Applications of artificial intelligence in education. In Colombia he learns. Retrieved from https://www.colombiaaprende.edu.co/agenda/tips-y-orientaciones/aplicaciones-de-la-inteligencia-artificial-en-la-educacion

Moreno Padilla, R. D. (2019). The arrival of artificial intelligence in education. Journal of Research in Information Technologies: RITI, 7(14), 260-270. ISSN-e 2387-0893. Technological University of Pereira.

Murtaza, M., Ahmed, Y., Shamsi, J.A., Sherwani, F., & Usman, M. (2022). AI-based personalized e-learning systems: Issues, challenges, and solutions. IEEE Access.

Nivela Cornéjo, M. A., Echeverría Desiderio, S. V., & Otero Agreda, O. E. (2020, September). Learning styles and artificial intelligence. Pole of Knowledge, 5(9), 222-253. http://dx.doi.org/10.23857/pc.v5i9.1686.

Obregon, L., Onofre, C., Pareja, E. (2023). The Impact of Artificial Intelligence in Education, FIPCAEC (Issue 39) Vol. 8, No 3, pp. 342-354

Ocaña-Fernández, Yolvi, Valenzuela-Fernández, Luis Alex, & Garro-Aburto, Luzmila Lourdes. (2019). Artificial intelligence and its implications in higher education. Purposes and Representations, 7(2), 536-568. https://dx.doi.org/10.20511/pyr2019.v7n2.274

Rodríguez, L., & López, E. (2005). Social representations of environmental conservation in the community of La Flor de Marqués de Comillas, Chiapas. Horizonte Sanitario, 4(2), 1-12.

Rodríguez, A., Orozco, K., García, J., & Rodríguez, S. (2023). The implementation of artificial intelligence in education: Systematic analysis. Mastery of the sciences. Volume 9, Number 3, pp. 2162-2178

Sanabria-Navarro, J., Silveira-Pérez, Y., Pérez-Bravo, D., & Cortina-Núñez, M. (2023). Incidences of artificial intelligence in contemporary education. Comunicar: Scientific Journal of Communication and Education, 77. https://dialnet.unirioja.es/servlet/articulo?codigo=9010092

Santos, M. (2017). Legal regulation of robotics and artificial intelligence: challenges for the future. Revista Jurídica de la Universidad de León, no. 4, 2017, pp. 25-50

Turing, A. (1950). Computing Machinery and Intelligence. (236th ed., Vol. 59). http://www.jstor.org/stable/2251299

Vera, F. (2024). Undergraduate students' interactions with generative artificial intelligence: a case study in a Mexican technology company. Electronic magazine transform. Volume 4, Number 4. December 2023

Xie, Y., Liu, Y., Zhang, F., & Zhou, P. (2022). Virtual Reality-Integrated Immersion-Based Teaching to English Language Learning Outcome. Frontiers in Psychology, 12(February), 1–10. https://doi.org/10.3389/fpsyg.2021.767363