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Índice

Generative AI vs. Teachers: insights from a literature review

IA generativa versus profesores: reflexiones desde una revisión de la literatura

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ABSTRACT

The growing integration of artificial intelligence in universities is reshaping higher education, particularly through the use of chatbots and generative language models. This article conducts a literature review, applying PRISMA guidelines to 155 peer-reviewed articles, to examine the advantages, limitations, and pedagogical applications of AI compared to human teaching. Three main scenarios of impact on educational practices were identified: a) Loss of certain traditional aspects of teaching, such as exclusive information transmission and reporting tasks, b) Transformation of roles, including control over educational content and the didactic contract, c) Emergence of new elements, such as personalized learning and innovative evaluation approaches. Despite its potential to automate processes and save time, chatbots cannot replicate essential human qualities like empathy and adaptability. Therefore, their optimal integration requires thorough pedagogical analysis to balance innovation with educational effectiveness. This work is valuable for researchers, educators, and instructional designers seeking to understand how to leverage AI without compromising teaching quality. It represents a crucial step toward the development of AI integration strategies grounded in solid pedagogical principles.

RESUMEN

La creciente integración educativa de la inteligencia artificial está reconfigurando la educación superior, especialmente a través del uso de chatbots y modelos de lenguaje generativo. Este artículo realiza una revisión de la literatura, aplicando las directrices PRISMA a 155 artículos revisados por pares, para examinar las ventajas, limitaciones y aplicaciones pedagógicas de la IA en comparación con la enseñanza humana. Se identificaron tres principales escenarios de impacto en las prácticas educativas: a) Pérdida de ciertos aspectos tradicionales de la enseñanza, como la transmisión exclusiva de información y tareas de reporte, b) Transformación de roles, incluyendo el control sobre contenidos educativos y el contrato didáctico, c) Emergencia de nuevos elementos, como la personalización del aprendizaje y enfoques innovadores en la evaluación. A pesar de su potencial para automatizar procesos y ahorrar tiempo, los chatbots no replican cualidades humanas esenciales como la empatía y la adaptabilidad. Por ello, su integración óptima requiere análisis pedagógicos profundos que equilibren innovación y efectividad educativa. Este trabajo es valioso para investigadores, docentes y diseñadores educativos interesados en entender cómo aprovechar la IA sin comprometer la calidad de la enseñanza. Representa un paso crucial hacia estrategias de incorporación de IA basadas en principios pedagógicos sólidos.

1. Introduction

In recent times it has become more and more common or frequent to hear about pilot implementation experiences of chatbots in education, as part of a growing and increasingly complex trend of incorporating digital technologies to support teaching and learning (Chen et al., 2023; Tlili et al., 2023).

In this regard, Salvagno et al. (2023), mention that chatbots are programs capable of generating a specific conversation with people, through natural language processing. Chatbots, which can link text as well as voice, can recognize expressions, understand perspectives, and offer insights from ongoing feeding or training processes based on their users' responses and interactions. In other words, chatbots are considered a software tool that allows interaction with users regarding a certain topic or also on a specific domain in a natural and conversational way through text and voice (Smutny & Schreiberova, 2020). They have been used for many different purposes, in a wide range of domains, and education has not been the exception.

The few and most recent investigations in this regard and the information available in the press and academic networks indicate that there is a lot of confusion and fear regarding the use of these digital tools, mainly related to plagiarism (King, 2023) and, in general, to the loss of relevance of many of the learning and evaluation activities that have traditionally been provided to students (Surahman & Wang, 2022).

In this scenario, it is vitally important to offer a reflective approach from a pedagogical perspective on this matter, so that it is useful for researchers and educators, and thus identify its possibilities and main risks for its proper implementation in the framework of higher education. The path to understanding, at least in an incipient way, the potential and risks of using chatbots in education, it seems that almost everything is still to be done, according to what is indicated in Figure 1, where the research panorama is shown in this subject, published in peer-reviewed journals indexed in Scopus.

Figure 1

Published articles on "chatbots AND education" in peer-reviewed journals indexed in Scopus
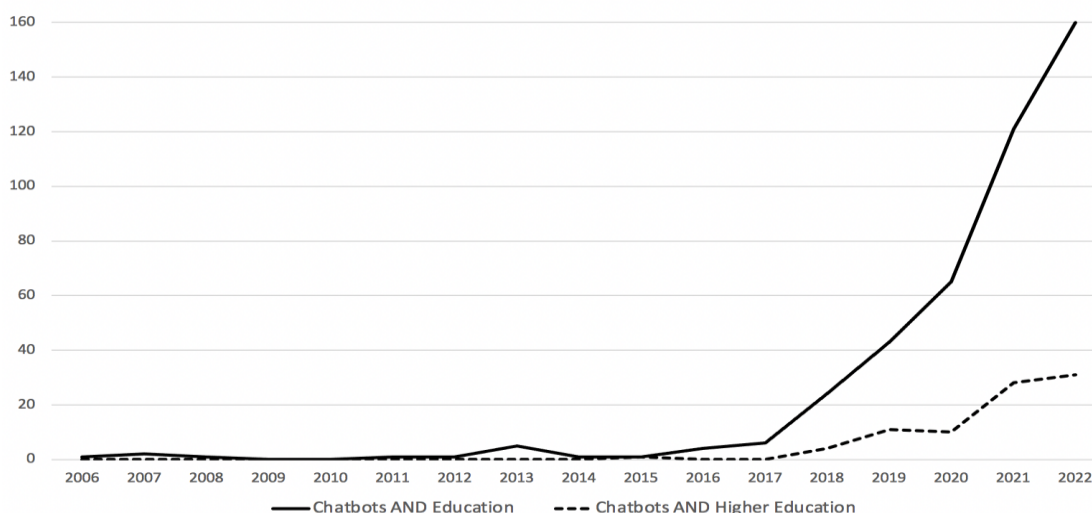
Figure 1 highlights that investigative interest in the use of chatbots in education has grown exponentially over the past 5 years. However, the number of articles published per year is still relatively low, with an average of just over 100 articles per year in the last four years. These findings suggest that there is still a great deal of research to be conducted in this area, despite the increasing interest.

Enthusiasts of technological advancements believe artificial intelligence (AI) is a permanent fixture in our society, supported by research findings and its current growth and presence in various aspects of human life (S. Lee et al., 2022). The majority of AI initiatives aim to achieve permanent improvement, thus increasing expectations for its continued use. The integration of intelligent algorithms has revolutionized digital technologies in our daily lives, particularly through automated problem-solving processes (Raphael, 2022) and personalized digital services (Maksimova et al., 2021).

However, AI also raises concerns such as privacy (Hu & Min, 2023), information security (S. Lee et al., 2020), bias and the reliability of decision-making systems (Qiu et al., 2022; Sun et al., 2022), issues discussed from different critical perspectives. Among the recent AI developments are chatbots, also known as conversational robots, agents, or personalized assistants, which interact and "talk through text" with human users. They have been used mainly in customer service systems (Antonio et al., 2022), personal and home assistance, e-commerce, marketing and business management (Reis et al., 2022), transportation and logistics (Aksyonov et al., 2021) and citizen-government interaction.

Chatbots are based on natural language models, which assimilate human language structure, identify patterns, make predictions, and generate conversational responses through training with large data amounts and algorithms (C.-C. Lin et al., 2023). There are two types: "open" or general, available to the public and answering various topics; and "closed" or specific, designed for particular fields like customer service or patient care (Wilson & Marasoiu, 2022). Their creation requires substantial information to answer diverse user questions and constant updating and training to keep responses relevant, involving significant time and cost (Al-Tuama & Nasrawi, 2022).

In education, chatbot use is emerging and generating interest though academic publications are minimal due to novelty (Bailey & Almusharraf, 2021). Initial literature shows positive expectations, focusing on identifying AI developments' intentionality and application in university courses as virtual assistants or tutors, supporting mass or self-directed learning models (Hsu & Huang, 2022), or mediating students' emotional regulation (Benke et al., 2020). While some skeptics exist (Winkler & Söllner, 2018), recent reviews have examined chatbots for Facebook Messenger as learning support (Smutny & Schreiberova, 2020), attempts to use chatbots in education (Kuhail et al., 2023), generative AI research trends in educational praxis (Bozkurt, 2023), chatbot use trends in educational contexts (Hwang & Chang, 2023), and benefits, opportunities, challenges, and perspectives of AI chatbots in education (Labadze et al., 2023). However, a specific review complementing these objectives is required to further explore the potential benefits and suitability of natural language model advancements for higher education.

2. Methodology

According to Carrera-Rivera (2022), conducting a literature review facilitates the identification of specific ideas or patterns of ideas that contribute to understanding extensive

information. In this study, the literature review process followed the phases mentioned by said researcher, and articulated with the guidelines of PRISMA method, as illustrated in Figure 2.

Figure 1

Review method design
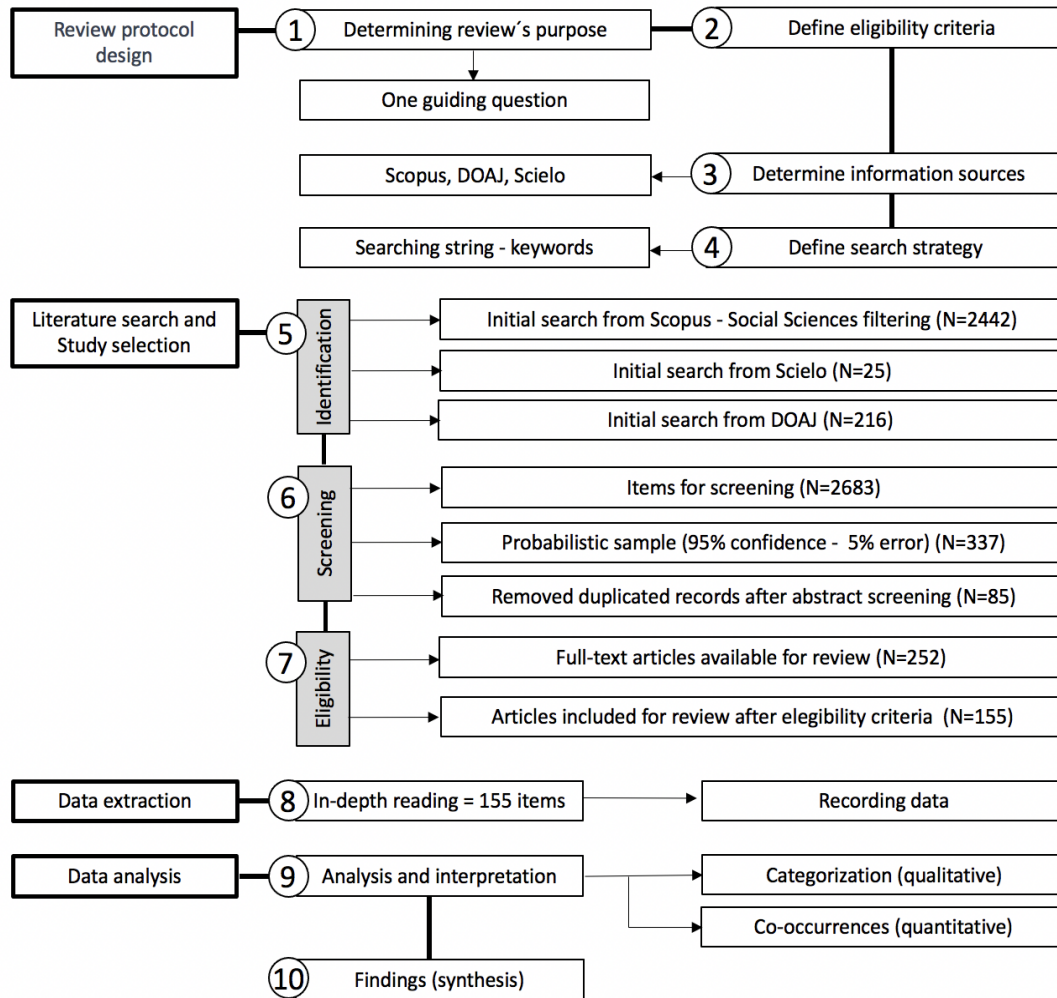
2.1 Review protocol design

The initial stage of the literature review involved determining its purpose, which aimed to identify the key transformations in teaching practices resulting from the increased utilization of chatbots and other developments in artificial intelligence. To guide this review, a research question was formulated: "What are the effects of chatbot implementation on teacher practice?" Following the research question, the next step involved selecting appropriate sources of information.

Scopus, a comprehensive journal database known for its rigorous review and editorial processes, was chosen due to its broad coverage and diverse range of journals, taking into

account Scielo and DOAJ as complementary databases. According to Pranckutė (2021), these databases have high academic and scientific recognition due to the rigor of their blind peer review processes and have very strict editorial policies, ensuring good quality of the sources to be reviewed. On the other hand, this set of databases provides broad thematic coverage and a high number of high-impact journals to work with. Finally, especially Scopus, offers reviewers a set of data analysis tools that are very useful in the initial stages of the review.

To address the review question, a keyword string was applied in Scopus, comprising the following terms: TITLE-ABS-KEY ("teacher practice" OR "teaching practice" OR teaching) AND (chatbots OR "artificial intelligence") AND (LIMIT TO SUBJAREA,"SOCI").

2.2 Literature search and study selection

In this phase, three characteristic processes of the PRISMA method were applied: identification, screening, and eligibility.

The initial search yielded a total of 2683 documents after social science filtering (Scopus=2442, Scielo=25, and DOAJ=216). To ensure a suitable sample for further analysis, a probabilistic representative sample of 337 documents was calculated, with a 95% confidence level and a 5% margin of error.

For the calculation of this sample S, the following formula was applied, where N = the size of the initial set of documents, e = the margin of error, and z = z score, which is defined as the number of standard deviations that a given proportion deviates from the mean.

$$S=\frac{\frac{z^2 xp(1-p)}{e^2}}{1+(\frac{z^2 xp(1-p)}{e^2 N})}$$

Finally, 85 duplicated articles (repeated in the databases) were eliminated.

As part of the eligibility step, an abstracting process was conducted, in which the following inclusion/exclusion criteria were applied to ensure the relevance and quality of the included studies. (1) they directly addressed the use of chatbots or artificial intelligence in educational contexts from a pedagogical perspective; and (2) they presented empirical data supporting the reported findings. Additionally, articles had to be published in peer-reviewed journals indexed between 2015 and 2023 and written in English or Spanish. As exclusion criteria, duplicate studies, theoretical reviews without empirical data, and works that did not offer clear contributions to the review's objective were discarded. These criteria ensured a pertinent, up-to-date, and methodologically sound research corpus. The documents that met these criteria comprised the set of documents subjected to in-depth reading (n=155).

To ensure the rigor of this review, a systematic evaluation of the quality of the included studies was conducted. Each article was assessed based on thematic relevance, applied methodology, and the robustness of the reported findings. The evaluation was focused on parameters such as clarity of objectives, validity of methods, reliability of data collection and analysis, and well-supported conclusions. This evaluation allowed prioritization of studies

that provided significant and well-documented contributions to analyzing the effects of chatbots in education.

2.3 Data Extraction and Analysis

The data extraction phase involved meticulously reading each selected article and recording relevant information in a documentation matrix, where the data was systematically analyzed. The data analysis followed a mixed approach combining qualitative (grouping and categorization) and quantitative techniques (analysis of frequencies or co-occurrences). Initially, open coding was applied to identify emerging concepts and patterns, which were then organized into main thematic categories through inductive analysis. Subsequently, axial coding was employed to establish relationships between categories, enabling a deeper understanding of the studied phenomena.

The analysis of co-occurrences involved examining how often specific themes or keywords appeared together within the same article or section. A co-occurrence matrix was created to quantify and visualize the relationships between different concepts. For instance, themes such as "pedagogical transformation, "personalized learning," and "student engagement" were frequently linked, indicating a strong interrelation in the context of AI applications in education. This step was facilitated by using specialized software for text analysis, ensuring precision and consistency. Finally, the results of the frequency and co-occurrence analysis were synthesized into a visual representation, such as heatmaps or network diagrams, to highlight the most significant connections and patterns.

The final phase of the review encompassed synthesizing, interpreting, and compiling the results into a coherent text. The findings were structured according to the IMRaD (Introduction, Methods, Results, and Discussion) format, facilitating a comprehensive understanding of the research outcomes. In this stage, both qualitative and quantitative analyses were performed, ensuring a rigorous examination of the collected data. The researchers meticulously analyzed the data for accuracy and relevance, extracting key insights and trends. Subsequently, the synthesized findings were interpreted to provide a deeper understanding of the research subject. Finally, the researchers organized and compiled the results into a cohesive text, presenting the methodology, results, and subsequent discussions systematically and logically.

3. Analysis and results

3.1 Main effects of chatbot implementation on teacher work

The Figure 3 provides a visual representation of the key themes and concepts emerging from the analysis of the integration of artificial intelligence and chatbots in education.

Figure 3

Key themes and concepts related to results

One of the first issues identified in the literature regarding AI-based tools is the emotional response to their implementation. While 35.6% of studies express a hopeful and positive outlook on chatbots in education, 28.2% reflect feelings of risk and distrust, often echoed in the media. Aoun (2017) highlights that AI and robotics have outperformed humans in specific tasks, prompting reflection on roles where humans excel, such as fostering creativity and adaptability, and discouraging outdated training practices. This perspective is supported by López Regalado et al. (2024) and Villegas-José and Delgado-García (2024).

As documented in 67.3% of reviewed studies, chatbots are increasingly used in education for tasks such as administrative support and dropout prediction. They also assist teaching by addressing student doubts and simplifying complex topics (K.-C. Lin et al., 2023). Moreover, 28.7% of articles emphasize that automating repetitive tasks for teachers can improve teaching quality by freeing time for course design and personalized feedback (Su & Yang, 2023). Chatbots also encourage student participation by providing a pressure-free environment for inquiries.

In massive education models like MOOCs, chatbots play a complementary role, simulating teacher-student interactions otherwise limited by scale. Although only 7.4% of studies explore chatbots in MOOCs, their relevance in digitally mediated learning is notable, as noted by Li (2022) and Bachiri and Mouncif (2023). These findings underscore the dual potential and limitations of chatbots in education, requiring further exploration.

3.2 Disruption-related results

According to Aoun (2017), from time to time technological developments appear on the human scene with sufficient capabilities to radically transform life in all its dimensions. It happened with industrialization and mechanization coming from steam technology, with electricity, with the Internet, and now, with robotics and artificial intelligence. In this regard, those who have followed up on these phenomena agree that the arrival of these technologies, in terms of work and professional spaces, always means that some are lost, and some are transformed or emerge (Mesquita et al., 2021).

Such reflection, taken to the subject that has been exposed in this text, puts us in a position to ask ourselves: Because of artificial intelligence... What issues of a teacher will be lost? What should be transformed? What new roles should the teacher assume? In other words, what would a teacher do better than a robot or an artificial intelligence system?

Therefore, throughout some of the results of this review, we want to address possible answers to these questions, which become essential for teachers´ relevance within an educational system that is taking increasingly decisive steps toward the structural incorporation of transformative technologies such as artificial intelligence. From this point of view, we have organized the following results.

The Figure 4 provides a visual representation of the disruption-related results.

Figure 4

Disruption-related results
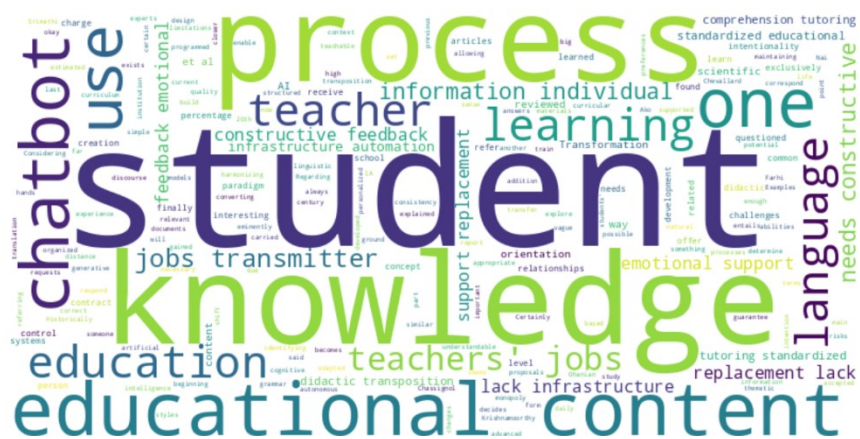
3.2.1 About what teachers will miss out on due to chatbots

By acknowledging that the scope of pedagogy encompasses education in its entirety, it becomes evident that many of the challenges commonly encountered in educational practices are likely to be impacted by the emergence of robust digital technologies such as Artificial Intelligence. Consequently, a pedagogical perspective must be employed to analyze and understand these changes in a natural and composed manner. This will aid in the adaptation to new discourses and professional practices of teachers. Here are some issues found in the literature about that:

Loss #1: The teacher's role as a transmitter of information.

Since the mid-1990s, concerns have emerged about digital technologies threatening teachers' jobs. Literature (72.8%) highlights the growing role of AI in education, providing students access to vast information in diverse formats and fueling tensions between teachers and chatbots (Malik et al., 2021; Safadel et al., 2023). However, the idea that chatbots will eliminate teachers' roles as information transmitters is debated.

Chatbots currently lack the ability to recognize individual student characteristics, limiting their capacity to adapt to diverse learning needs. In contrast, teachers excel at personalizing instruction, offering feedback, and providing emotional support—roles that AI cannot fully replicate (Meng & Dai, 2021).These human-centered elements remain central to effective education.

Nonetheless, chatbots could replace the informational role of some teachers by providing precise and readily accessible content. This is more likely in contexts where teaching focuses solely on delivering information. However, in regions with limited digital infrastructure, teachers remain essential as content transmitters. This underscores that while AI can supplement education, its impact is shaped by context, infrastructure, and teaching approaches. The relationship between AI and educators should focus on complementarity rather than replacement, ensuring that human-centric teaching continues to enrich educational experiences.

Loss #2: Homework exclusively related to reporting data or information.

Chatbots provide students with immediate access to information and answers, eliminating the need to spend hours searching across various sources. As noted in 17.4% of reviewed articles, this capability allows students to quickly obtain necessary information through text chats, streamlining tasks that previously relied on extensive data gathering. Consequently, assignments focused on reporting information have become less relevant, enabling both students and teachers to focus more on tasks that involve analyzing and understanding the acquired information, as noted by Fidan and Gencel (2022) and Malik et al. (2021).

This shift necessitates a transformation in the design of homework and educational activities. Assignments should aim to strengthen students' abilities rather than diminish their learning opportunities due to over-reliance on chatbots. Moreover, higher education institutions should consider adopting tools for similarity verification and detecting machine-generated writing. This would introduce scenarios where artificial intelligence is used to identify AI-generated content.

However, the emphasis in evaluation should shift away from the production of text itself. Instead, the focus must be on students' ability to comprehend, analyze, and engage with the text. This ensures that educational assessments prioritize critical thinking and understanding over rote production, aligning learning objectives with the evolving use of AI technologies in education.

Loss #3: Evaluation for all equally based solely on memory.

In consideration of the above, a third issue was extracted from the literature reviewed (8,2%) that focused on the assessment of learning. So, when a student relies on chatbots to report information, the evaluation mechanisms focused on said processes would no longer make sense. For this reason, in the evaluation framework, it will be important to resort to other ways of assessing learning results, such as discussions, debates, projects, portfolios, or practices that, in addition to allowing verification of the authenticity of the student's intellectual production against the possibility of using chatbots, allow the teacher

to identify their performance directly. Some research that addressed these topics are Ledwos et al. (2022) and Chou (2023).

This is nothing more than the claim of formative assessment over the summative so that through it the various possibilities of AI are used as part of learning assessment activities.

On the other hand, involving chatbots and other developments based on artificial intelligence in the evaluation of learning could lead to the implementation of evaluation processes where different evaluation methods and instruments are applied to different students. Perhaps we are at the beginning of the fall of the homogenized and standardized evaluation.

3.2.2 About transformations that will affect teachers due to chatbots

Some of the issues that will tend to be transformed due to the progressive use of chatbots in education are related to what Zambrano (2005) points out about Pedagogy, in terms of conceiving it as a discourse on relationships between teachers, students, the school and social environment and the forms of the orientation of knowledge that take place.

Transformation # 1: About control over the intentionality and orientation of educational content.

Considering the above, a few percentage of the articles reviewed (5,8%), report that the use of chatbots in education has to do with the transfer of the monopoly of control that teachers and the school institution have had so far over the intentionality and orientation of the students' learning content. Historically, students receive during their school life a set of structured knowledge in the form of curricular proposals, which someone has estimated correspond to what should be learned. So, with what intention has the curriculum been organized like this? Is it okay for one vague person to determine what another person should learn? Who decides this? Certainly not the student. This is something that has not been questioned enough and that is accepted as part of the current paradigm of education and that, due to the use of artificial intelligence developments in education, is beginning to be questioned. Some of the above can be found in Farhi et al. (2022) or Chassignol et al. (2018).

In this sense, the chatbot can offer a personalized learning experience, adapted to the needs and preferences of the student, allowing them to explore and build their knowledge in a more autonomous way (Srimathi & Krishnamoorthy, 2019). However, this paradigm shift also entails certain challenges and risks, one of the main ones being maintaining a high level of quality and consistency in content and learning orientation, since the chatbot cannot always guarantee that students receive the correct and relevant information.

Transformation # 2: Who will be in charge of the didactic transposition?

A small percentage (4.2%) of reviewed documents address educational content creation processes, specifically focusing on didactic transposition. This concept, developed in the 20th century, describes the transformation of scientific knowledge into teachable material and ultimately into knowledge that students can understand and learn (Chevallard, 1998). This "translation" process ensures content aligns with students' cognitive

development, language, and prior knowledge, traditionally managed by teachers or subject-matter experts.

Generative AI is now playing a role in didactic transposition, as natural language models are designed not only to provide answers but also to simplify and explain scientific knowledge in accessible terms. This linguistic capability positions AI as a valuable tool in harmonizing complex concepts with everyday language.

Moreover, AI systems can be trained to identify individual learning styles, limitations, and abilities, allowing the transposition process to cater more closely to each student's needs. This enables a more personalized approach to learning, complementing teachers' roles in content adaptation. By supporting these processes, AI has the potential to enhance educational content delivery, ensuring accessibility and relevance. Examples of such AI applications in content creation are discussed by Ohanian (2019) and Ako-Nai et al. (2022), demonstrating its growing influence in educational innovation.

Transformation# 3: The didactic contract.

Finally, the last few of the articles reviewed (3,7%) refer to potential changes in teacher-student relationships. Regarding this, in the context of the use of chatbots in education, the "didactic contract" becomes an important concept related to such relationships, with big and complex challenges ahead.

Didactic Contract refers to the tacit agreement between the teacher and the student about what is expected to happen in the classroom and how learning will take place. This contract establishes the rules and expectations for learning and can influence how chatbots are used in the classroom (Caldeborg et al., 2019).

In the context of the use of chatbots in education, the didactic contract can be challenged by the introduction of new technological tools. For example, students may expect a more personalized interaction with the chatbot, which may require the teacher to adapt their teaching approach and strategies to meet those needs. Research related to changes in classroom relationships can be found in Garito (1991) or Lo et al. (2021).

4. Discussion and Conclusions

The deployment of AI chatbots in educational settings presents a multifaceted issue that demands profound pedagogical examination. The use of chatbots and AI tools in education introduces significant changes in pedagogical practices. Chatbots can automate repetitive tasks, such as answering common questions, allowing teachers to focus on higher-value activities like lesson design and personalized student support. This shift can foster active learning and collaboration in the classroom. However, these tools require teachers to adapt their roles, acting as facilitators and mediators of responsible technology use. Chatbots promote self-directed learning but demand critical skills to evaluate information. Additionally, assessments must emphasize critical thinking and creativity rather than memory-based tasks. In this regard, the teacher-student relationship remains crucial. While chatbots personalize learning, human interaction fosters empathy, motivation, and emotional support. Effective AI integration must align with pedagogical principles that prioritize holistic student development.

AI-driven chatbots hold significant promise in automating teaching tasks, offering efficiencies and accessibility previously unattainable. Nevertheless, they cannot fully replicate the unique qualities of human interaction essential to education, such as empathy, emotional intelligence, adaptability, and the ability to inspire and motivate learners. Indeed, these deeply human attributes transcend mere information transmission and often resist replication by even the most advanced algorithms.

Therefore, integrating AI chatbots into education requires a critical assessment of their strengths and limitations from a pedagogical perspective. For instance, research should identify areas where chatbots excel, such as automating repetitive tasks, while highlighting their shortcomings, particularly in fostering meaningful human connections. By doing so, educators can leverage chatbots in tasks where automation is beneficial, freeing instructional time for activities that demand the irreplaceable human touch.

In this context, the interaction between generative chatbots and teachers represents a dynamic relationship where both must complement each other's strengths to create an effective educational system. Consequently, future studies should examine chatbot-student interaction designs and explore the impact of chatbot personality and location on learning outcomes and satisfaction. Furthermore, the rapid evolution of AI in education necessitates mechanisms to maximize its potential while addressing challenges such as emotional intelligence and ethical use.

As tools like ChatGPT gain prominence, it becomes evident that guidelines for their responsible adoption are critical (Tlili et al., 2023). Thus, collaboration between educators, instructional designers, researchers, and AI developers is essential to establish pedagogical principles that balance technological innovation with the preservation of human elements. Ultimately, by achieving this balance, emerging technologies can promote improved learning experiences and vital life skills, such as self-regulation, ensuring that AI complements rather than replaces the invaluable role of human educators (Bozkurt, 2023).

4.1 Limitations and Recommendations

This review, while comprehensive, has limitations. Most studies analyzed come from specific, well-resourced educational contexts, limiting generalization to environments with fewer technological resources or differing cultural attitudes toward AI. Besides, the focus on recent studies reflects an evolving landscape, but the long-term impacts of chatbots remain underexplored. Additionally, methodological inconsistencies across studies make direct comparisons challenging. Finally, while frequency and co-occurrence analysis identified key trends, it may overlook deeper nuances. Future research should include qualitative methods, such as case studies, to better understand the contextual and subjective effects of chatbots on education.

On the other hand, to optimize the integration of chatbots in education, institutions should adopt a balanced approach that combines technological innovation with robust pedagogical principles. Teachers should receive training on effectively leveraging chatbots to complement, not replace, their instructional practices. Curricula must be updated to emphasize critical thinking, creativity, and digital literacy, enabling students to navigate AI-enhanced learning environments responsibly. Developers should collaborate with educators to design chatbots tailored to diverse educational contexts, ensuring inclusivity and adaptability. Additionally, further research is needed to explore long-term impacts,

particularly on student engagement and teacher-student dynamics, while addressing ethical concerns such as data privacy and bias.

Author´s Contribution

All the authors participated equally in the following processes according to the CRediT Taxonomy: Conceptualization, data curation and formal analysis, research and methodological design, writing of the original draft and its final review and editing. In addition, Andrés Chiappe is the corresponding author.

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