

The utilization of generative artificial intelligence in the professional development of teachers

La utilització de la intel·ligència artificial generativa en el desenvolupament professional del professorat

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Abstract

This study focused on the integration of generative artificial intelligence, represented by ChatGPT, as an educational tool in teacher training courses in Brazil and Spain. The aim was to explore how this tool could promote cognitive and critical skills among future educators. A case study with participant observation was conducted to investigate two experiences of pedagogical activities applied in the classroom using ChatGPT, focusing specifically on teacher training. The activities involved debates and ethical reflections on the presence of AI (artificial intelligence) in education, fostering engagement and active participation among students. The results highlighted the effectiveness of ChatGPT in creating adaptable educational stimuli that promote the development of critical and reflective thinking. However, they also pointed out ethical challenges such as privacy issues and algorithmic bias. The conclusions emphasized the potential of ChatGPT as a tool for developing personalized activities aligned with constructivist approaches. The research indicates that the ethical and responsible incorporation of AI in

education can drive more interactive and personalized learning, albeit requiring meticulous ethical considerations.

Keywords

Generative artificial intelligence, ChatGPT, teacher training, critical thinking, argumentative skills, ethics.

Resum

Aquest estudi es va centrar en la integració de la intel·ligència artificial (IA) generativa, representada per ChatGPT, com a eina educativa en cursos de formació de mestres al Brasil i a Espanya. L'objectiu era explorar com aquesta eina podia promoure habilitats cognitives i crítiques entre els futurs educadors. Es va realitzar un estudi de cas amb observació participant per investigar dues experiències d'activitats pedagògiques aplicades a l'aula mitjançant ChatGPT, centrant-se específicament en la formació del professorat. Les activitats van implicar debats i reflexions ètiques sobre la presència de la IA en l'educació, fomentant el compromís i la participació activa entre els estudiants. Els resultats van posar de manifest l'eficàcia de ChatGPT en la creació d'estímul educatius adaptables que promoguin el desenvolupament del pensament crític i reflexiu. No obstant això, també van assenyalar reptes ètics com qüestions de privacitat i biaix algorítmic. Les conclusions van posar l'accent en el potencial de ChatGPT com a eina per desenvolupar activitats personalitzades alineades amb enfocaments constructivistes. La investigació indica que la incorporació ètica i responsable de la IA a l'educació pot impulsar un aprenentatge més interactiu i personalitzat, tot i que requereix consideracions ètiques meticuloses.

Paraules clau

Intel·ligència artificial generativa, ChatGPT, formació del professorat, pensament crític, habilitats argumentatives, ètica.

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1. Introduction

This article analyzes the experience of generative artificial intelligence (AI) applied as an educational tool in activities of two introductory courses in higher education in two distinct learning environments, a university in Rio de Janeiro (Brazil) and another one in Catalonia (Spain). The central objective was to employ OpenAI's ChatGPT 3.5 to stimulate the cognitive and critical skills of students, especially those preparing to become teachers. The experiment aimed to integrate emerging technologies into the educational context, exploring their potential to enrich the professional development of teachers.

The choice of ChatGPT (generative pre-trained transformer) was motivated by its generative and conversational characteristics and its potential to observe the improvement of critical and argumentative skills of students, i.e. their ability to understand ideas, comprehend problems and apply work plan solutions (Organization for Economic Cooperation and Development [OECD], 2015). As a large language model (LLMs), besides reducing repetitive practices and stimulating dialogic construction (Sichman, 2021), ChatGPT is capable of understanding and generating language similar to that of humans (Ramos, 2023). Its command-based action mechanism also acts as a learning facilitator. As commands are entered, the tool reuses the training data from that conversation to solve new problems, which stimulates the student in the process of knowledge acquisition. This transforms the tool from one of intuitive use to one that triggers different stages of complexity of thought.

Contributions from authors outline the trends and challenges associated with the use of generative AI in education. The study took as its premise those who advocate the improvement in critical and argumentative capacities. For active participation in the social world, essential skills of effective communication, mobilization, negotiation, moderation and collaboration demand the development of these capacities beforehand.

However, from Bloom's perspective (Anderson & Krathwohl, 2001), the hierarchical process of skill acquisition from lower order (remembering, understanding, applying) to higher order (analyzing, evaluating, creating) is not sufficient to grasp the dynamic and the adaptable flow of thought during learning, producing varied responses from

students in educational interactions. The perspective of Marzano and Kendall (2007) suggests a more holistic and multidimensional approach to the development of capacities and highlights three dimensions: cognitive, metacognitive, and self. In the self dimension, there is the level of self-awareness, that is, the moment when students decide to begin their learning process, being intrinsic to the attitude of implementing a proposed activity. Then, in metacognition, the student organizes the cognitive process, that is, defines goals, plans how to learn, and applies the learning strategies established by the teacher. These strategies seek to mobilize the cognitive dimension, organized into levels of remembering (naming and executing information), understanding (identifying and categorizing), analyzing (using, relating, and generalizing what has been learnt to create new knowledge), and using knowledge (applying it in a specific situation, making decisions, investigating, solving problems). One of the points of attention in this approach is the valorization of continuous feedback and formative assessment.

Through this perspective, one starts to consider how generative AI can serve as a facilitator in the learning cycle, covering knowledge acquisition, deepening, and creation. Wang and Zhang (2022) observe that tasks generated by AI stimulate students' analysis and creativity, encouraging them to question, criticize and construct arguments more effectively. Interaction with ChatGPT can promote these skills, preparing students to be critical thinkers and lifelong learners.

Curiosity, an essential attribute in learning, is driven by the desire to know (Rubinstein, 2019). ChatGPT can awaken this curiosity, offering experiences that stimulate the desire to explore the unknown (Ramos, 2023). The use of ChatGPT for personalized learning (Rosenberg *et al.*, 2021) not only adapts to students' needs but also promotes the metacognitive dimension, encouraging active questioning and knowledge seeking.

Generative AI can create dynamic and adaptable teaching materials (Berner *et al.*, 2020), enhancing student engagement. Santos and Silva (2023) highlight how ChatGPT can support language teaching, facilitating real-time interactions. Almeida and Rocha (2024) explore how AI enhances socio-emotional skills like empathy and collaboration in activities that simulate real scenarios, aiding students' cognitive development.

Considering the ethical aspects of using AI in education, Rodrigues and Rodrigues (2023) emphasize the importance of regulations to ensure the responsible use of technology. Santaella (2023) highlights the need to develop ethical and moral principles in AI use. According to Kohlberg's theory (1981), ChatGPT can guide the ethical development of students by offering experiences that stimulate ethical reasoning at different stages of moral development.

In this respect, it becomes imperative that the adoption of technologies such as ChatGPT should be evaluated as a means of educational stimulation, from the standpoint of cognitive and critical skills development, essential for 21st-century teachers given the need to offer solutions within the scope of the UN Sustainable Development Goal (SDG) 4, Quality education (2015).

Therefore, this empirical report aims to verify the interaction between generative AI ChatGPT and the development of students' competences during their professional teacher training course and seeks: *a*) To enhance curiosity and the desire to know through the use of ChatGPT, reducing the common inhibitor among students of asking questions – an essential attribute for learning; *b*) To enable the instrumentalization of the learning cycle – acquiring, deepening and creating knowledge, e.g. to deal with problems, from the simplest to the most complex, mobilizing higher and lower mental skills; and *c*) To consider the tool as a means of moral and critical development.

2. Needs analysis

Technological advances reshape educational practices, demanding continuous revision of teaching methodologies. Teacher training needs to integrate generative artificial intelligence (AI) into the educational curriculum. This analysis highlights the need to investigate the impact of generative AI on the development of critical skills in future teachers. There is a gap in the application of advanced technologies in pedagogical methods within the context of higher education for teacher training. Generative AI offers personalized learning and innovative insights but its effectiveness in teacher training has not yet been widely explored. The proposed experiment integrates generative AI into specific activities of teacher training courses. The lack of exposure to and training in emerging technologies may result in teachers being ill-prepared for contemporary educational challenges. A case study investigated the use of ChatGPT

3.5 at two universities to examine the development of the students' skills. Participants were selected based on the relevance and diversity of their previous experiences. Age and gender variation did not affect the results. Participants were informed about the nature of the research and the confidentiality of personal data was ensured.

3. Context

The use of ChatGPT 3.5 as a learning tool was applied in 2023 in two different disciplines, both introductory to the professional teacher training course: Foundations of Education: History, Politics, and Culture at a university in Rio de Janeiro, Brazil (Case 1) and Research and Innovation in Educational Practice at a university in Catalonia, Spain (Case 2). While Case 1 used the tool to generate questions during teachers' learning stages, Case 2 used it for an ethical reflection on AI in education. This scenario enabled a shared study of the experiences conducted.

Case 1 (Rio de Janeiro)

Students of Pedagogy and degree courses in History, Literature, and Biology who were enrolled in this discipline carried out the "Stage 1: engagement – identifying big ideas" activity, which was part of the challenge-based learning (CBL) methodology, adapted from the Apple Classrooms of Tomorrow-Today project (2008) and articulated with the pedagogy of problematization (Freire, 1996). Classes were organized on the basis of the three CBL stages: 1) Engagement: observing challenges within their context, identifying key ideas, and asking relevant questions; 2) Investigation: systematizing data, knowing where to investigate; and 3) Action: solving the challenge, acquiring in-depth knowledge of the area, and creating applicable solutions, followed by the evaluation of results. The selection of Stage 1 for ChatGPT's use was aimed at enhancing the development from a big idea to formulating an essential question and proposing a challenge related to SDG 4, fostering solutions through the curriculum. The activity encouraged engaging with big ideas, crafting questions, and organizing challenges. Students were informed about the curriculum, SDG 4 (in the opening class), the CBL methodology, and the limits and role of ChatGPT (in class 1 of the activity).

The benefits aimed to stimulate critical thinking and argumentative skills regarding educational challenges. Stage 1 of CBL revealed a need for refined questioning and idea organization skills, and enhanced group collaboration in education.

Case 2 (Catalonia)

Future primary school teachers at a university in Catalonia participated in the introductory activity in the discipline Research and Innovation in Educational Practice. The main objective was to engage students with the theme of ethics in educational technology, focusing specifically on the use of artificial intelligence (AI) in the context of primary education.

The 56 students were grouped to investigate various aspects of AI use in elementary education, such as virtual assistants in classrooms and adaptive learning platforms for children, among others. As part of the introductory activity, they used the free version of ChatGPT 3.5 to generate relevant questions related to the ethical aspects of AI use in primary education. Each group used ChatGPT to create questions and discuss different points on the assigned topic. They reviewed the responses generated by ChatGPT and selected the most relevant questions for discussion. During class, each group presented its questions generated by ChatGPT and conducted a debate on the ethical and social aspects of AI use in primary education.

Students deliberated on the potential positive and negative impacts of these technologies, considering ethical aspects, inclusion issues, and children's privacy, among other relevant points. After group discussions, a classroom debate was held, allowing each group to share the key points discussed during their sessions. As a concluding activity, students composed individual written reflections on the debate, highlighting the main insights gained, ethical issues raised, and possible approaches to ethical and responsible use of artificial intelligence in primary education.

The expected benefits were to stimulate critical analysis and reflection on the ethical implications of AI use in primary education; to foster debate, argumentation and critical thinking among future teachers; and to encourage different perspectives when addressing ethical issues related to the implementation of innovative educational technologies in primary education. This introductory activity gave future teachers an

initial insight into the importance of ethics when integrating technologies such as artificial intelligence into the primary educational environment, preparing them for more in-depth research and innovative approaches in educational practice throughout the course.

4. Experience

The use of the tool occurred in two distinct learning situations: Case 1 (Rio de Janeiro) and Case 2 (Catalonia), as reported below. To monitor experiences and verify the improvement in critical and argumentative thinking, three articulated dimensions were considered: 1) Self: active engagement and mobilization to learn during the proposed activities; 2) Metacognitive: how learning strategies were applied and choices were made during the process; and 3) Cognitive: the development of critical and argumentative thinking and problem-solving proposed in each experience. The possibility of improving critical reflection regarding the use of the tool was also evaluated, specifically in Case 2, considering the elaboration of a more complex understanding based on universal ethical principles (post-conventional stage).

Case 1

Implementation of “Step 1: engagement – identifying big ideas” of the CBL methodology, lasting 3 sessions of 4 hours each. Class of 47 students divided into 14 teams (free choice). Objective: To develop the essential question, and to move from big ideas to a concrete and actionable challenge.

Session 1: Identification of big ideas (4 hours)

Content: Identification of big ideas through essential questions and reading materials (SDG 4 goals in the Brazilian scenario, pre-reading lecture material *Pedagogy of Autonomy* by Paulo Freire, Chapter 1, and syllabus content).

Activities: Debate on reading materials. Ideas articulated into keywords: education and citizenship, education and power, education and ethics, education and technology. Formulation of a question without the tool. Use of ChatGPT to produce questions.

Methodology and duration: 1 hour of debate and question production in groups. Then each student had 1 hour to produce 2 or 3 questions with the tool. Final 2 hours for group work – each member shared their questions, then the team selected the best

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big idea: “What is your big idea?”. In the next stage, students refined this idea, aligned with the four keywords of the syllabus and/or SDG 4. Some example commands to ChatGPT were: “Create a table with keywords and ideas (all questions from team members)” (Team 8); “What is the relationship between the following text (their copied extracts from Freire’s book), SDG 4 and education challenges?” (Team 3); “Select a question about education problems that helps with SDG 4” (Team 7); “What is the most relevant challenge to address education among these (to choose from answers from group members)” (Team 11); “Which of the ideas about education and citizenship was closest to SDG 4.5?” (Team 6).

Evaluation: Production of questions without the tool and with the tool on an individual basis.

Session 2: Development of the essential question (4 hours)

Content: Development of the essential question. Improvement of previous ChatGPT commands. Reflection on SDG 4 goals.

Activities: Debate based on the developed questions. Articulation with specific SDG 4 goals. Group formulation of the question to refine the previous one. Improving commands in ChatGPT with interrogative pronouns and clauses (why, what if, how).

Methodology and duration: Each group had 1 hour for debates and to clarify doubts and 2 hours to summarize the creation of the ChatGPT command corresponding to the previous question and to incorporate a specific SDG 4 goal. These commands were saved in the account of the user who generated them. Then students developed a more specific question from the defined big idea/preliminary question and the linked SDG 4 goal, inspired by the example question: “Why is this big idea X important to solve the problem in school Y with characteristics Z?”. These experiments allowed participants to prioritize and categorize questions using ChatGPT, evaluating them as more or less relevant according to the context. Example: “If teenagers with ASD (autism spectrum disorders) had access to inclusive methodologies, could this ensure equity in access to and permanence in high school?” (Team 6). 1 hour for reading guidance for the next session.

Evaluation: Group’s essential question prioritized according to a specific SDG 4 goal.

Session 3: The challenge and reflections for the next phase (4 hours)

Content: Reading and analysis of academic texts to develop consistent questions. Creation of challenging questions based on summaries of academic articles. Debate.

Activities: Analysis of the texts indicated for the session to refine the answer to the essential question chosen by the group. Use of the tool to link the summary of an academic article with the question chosen by each team, forming the question that generates the challenge.

Methodology and duration: 2 hours for teacher-group clarification of the researched academic text used for refining the possible answer to the proposed challenge. 2 hours for debate and a brief oral presentation with conclusions. Each team asked questions to an opposite group determined at random. At the end of the Step 1 activities, each group presented their intentions or action plans based on their central question. The essential question formulated by the groups led to a specific preliminary answer or solution, initiating an investigation to be developed in Step 2.

Evaluation: Creation of the challenge aligned with the syllabus.

Case 2

Implementation of a plan that allows for a progressive in-depth introduction to ethical issues related to the use of AI in primary education, encouraging critical reflection and active participation of students throughout the four sessions.

The activity “Exploring ethics in the use of artificial intelligence in primary education” lasted for four one-hour sessions. The general objectives considered were: 1) To introduce elementary education students to the ethical debate about the use of artificial intelligence (AI) in education; and 2) To promote critical reflection on ethical and social issues related to the integration of AI in the classroom.

Considering a total of 56 students in a university course for primary school teacher training, the following format was planned for each activity:

Session 1: Initial session (1 hour)

Content: Introduction to the discipline. Basic concepts of ethics in educational technology. Formation of research groups.

Activities: Course Exploring Ethics in AI in Primary Education and presentation of activities. Brief explanation of ethics in educational technology. Formation of groups and assignment of different aspects of AI in primary education for research. Use of ChatGPT to generate initial questions about ethics in the use of AI in education.

Methodology and duration of intervention: Students were divided into groups of approximately 7 to 8 members. The first 20 minutes were devoted to a brief introduction to the discipline and basic concepts of ethics in educational technology. Then, 10 minutes were allocated for the formation of research groups and the presentation of different aspects of AI in primary education for research. The next 20 minutes were used for a practical activity, such as generating initial questions about ethics in the use of AI in education, using ChatGPT. The last 10 minutes were reserved for group discussions about the generated questions and to define the next steps in the research.

Evaluation: During this session, the active participation of students in forming research groups and generating initial questions about ethics in the use of AI in education was assessed. Additionally, students' conceptual understanding of the basic concepts of ethics in educational technology was verified.

Session 2: Ethical group debate (1 hour)

Content: Discussion about specific ethical issues related to AI in primary education.

Activities: Group presentation of questions generated by ChatGPT. Group discussions on specific ethical issues assigned to each team. Discussion of key points raised in each group. Review of the topics discussed in the previous session. The first 15 minutes were dedicated to the group presentation of questions generated by ChatGPT. Then, 30 minutes were provided for group discussions on specific ethical issues assigned to each team. The last 15 minutes were reserved for a classroom discussion on the key points raised in each group and for synthesizing the discussed ideas.

Evaluation: The active participation of students in group debates, their ability to present well-founded arguments and respect divergent opinions was evaluated. The quality of the arguments presented and collaboration in groups was also observed.

Session 3: Extended debate and discussion (1 hour)

Content: Summary of debates conducted by the groups. Reflection on different ethical perspectives.

Activities: Presentation of the main conclusions and discussions of the groups. Extended classroom discussion on the different ethical and social aspects addressed. Encouragement of participation from all students in the discussion.

Methodology and duration of intervention: The session began with a summary of the debates conducted by the groups in the previous session. The first 20 minutes were devoted to presenting the main conclusions and discussions of the groups. Then, an extended classroom discussion on the different ethical and social aspects addressed was performed, encouraging participation from all students. The last 20 minutes were reserved for students' individual reflection on the discussed ethical perspectives and for drafting a personal summary of the main ideas discussed.

Evaluation: During this session, the evaluation focused on students' ability to present the main conclusions of the previous debates, to contribute to the extended classroom discussion, and to reflect on the discussed ethical perspectives.

Session 4: Reflection and conclusion (1 hour)

Content: Final reflection on debates and discussions. Identification of ethical approaches to integrating AI in primary education.

Activities: Written individual reflection on debates, emphasizing insights and ethical considerations. Classroom discussion on possible ethical approaches to integrating AI in primary education. Conclusion of the activity with a summary of reflections and conclusions reached.

Methodology and duration of intervention: The session started with a final reflection on the debates and discussions of the previous sessions. The first 15 minutes were devoted to classroom discussion on possible ethical approaches to integrating AI in
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primary education. Then, 30 minutes were provided for students' written individual reflection, emphasizing insights and ethical considerations. The last 15 minutes were reserved for concluding the activity with a summary of reflections and conclusions reached, encouraging students to share their reflections and insights.

Evaluation: The quality of students' written individual reflections on previous debates and discussions, as well as their participation in classroom discussion on possible ethical approaches to integrating AI in primary education, were evaluated. The students' ability to synthesize reflections and conclusions into a final summary was also observed.

Throughout the process, active participation of students in debates and discussions, the quality of individual reflections and contributions to classroom discussion, and the observation of engagement, argumentation, and respect for different perspectives during activities were also evaluated.

5. Results

The integration experience of a ChatGPT tool revealed impacts on the dimensions of engagement, metacognition, and cognition of students, and on the promotion of critical reflection on the ethical use of technology.

In Case 1 (Rio de Janeiro), there was a notable improvement in the students' ability to formulate essential questions during debates after the introduction of ChatGPT. Previously, questions were usually generic, whereas afterwards they became more specific and aligned with the Sustainable Development Goal (SDG) 4. This reflects an advancement in critical thinking and argumentative skills of the students as well as a greater awareness of complex educational issues. One difficulty faced was deciding the group's main idea but those who used ChatGPT to prioritize and categorize questions achieved better results, producing more elaborate questions. The alignment of questions with the curriculum encouraged research and thematic analysis. The organization and categorization of questions with the support of ChatGPT allowed the exploration of connections between different concepts of the curriculum and the objectives of SDG 4. For example, Team 12, after investigating SDG 4, Target 4.6, formulated a central question aimed at addressing specific challenges of literacy and mathematical learning in low-literate adults. Collaboration in groups to debate and

refine essential questions promoted active engagement of students in their learning and demonstrated a commitment to solving real educational problems.

In Case 2 (Catalonia), the exploration of ethics in the use of artificial intelligence in basic education engaged students in critical reflections on ethical and social issues. The progression of classes, from the introduction of basic concepts to expanded ethical discussions, allowed students to develop a complex understanding of the subject. The activities encouraged active engagement, with students forming consistent opinions, respecting differences, and collaborating to find ethical solutions for the integration of AI in education. Assessments indicated an increase in students' ability to apply ethical concepts to real scenarios, a crucial skill for future educators. The final reflection highlighted the importance of ethical approaches in technological integration, evidencing an advanced stage of ethical understanding. This translated into: 1) Student engagement: high involvement was observed during activities, stimulated by ChatGPT to generate initial questions; 2) Participation in discussions and debates: students demonstrated active participation, presenting well-founded arguments and multiple perspectives on ethical issues related to the use of AI in elementary education; 3) Individual reflections: written reflections revealed significant insights into ethical concerns, with an understanding of implications and consideration of diverse viewpoints; 4) Variety of perspectives: diversity enriched discussions, demonstrating a broad understanding of ethical and social issues associated with the use of AI; 5) Identification of ethical approaches: students were able to discuss ethical approaches to responsible integration of AI, broadening the understanding of ethical implications involved. This suggests the integration of similar activities in teacher training, preparing them for the ethical use of educational technology.

6. Conclusions and discussion

Our research evaluated ChatGPT as an educational tool to develop cognitive and critical skills, aligned with UN SDG 4. The results showed benefits in the development of these skills but also highlighted challenges, such as the need for guidance in the use of technology and effective integration into the curriculum. Personalization of learning, promotion of curiosity and ethical reflection are fundamental, requiring a reassessment of pedagogical practices. The integration of AI in education reflects

Marzano and Kendall's (2007) holistic approach, emphasizing cognitive, metacognitive, and self-development. The use of AI allows students to ask reflective questions, explore complex themes and develop a sophisticated ethical understanding, promoting meaningful learning. The importance of aligning essential questions with specific goals highlights the need for continuous feedback and formative assessment.

Comparing experiences in Brazil and Spain can provide valuable insights into the effectiveness of the tool in various educational contexts. This may lead to a better understanding of how to adapt and optimize the use of ChatGPT to meet the specific needs of different groups of students and disciplines.

The improvement in the articulation of essential questions by students, observed in the case of Rio de Janeiro, highlights the potential of ChatGPT to enhance critical and argumentative skills, essential for active participation in the social world. This observation is aligned with Anderson and Krathwohl's (2001) perspectives on the importance of transcending lower-order skills to achieve higher-order ones, such as analyzing, evaluating and creating. The Catalan experience, in turn, highlights the role of AI in promoting a more advanced stage of ethical understanding, contributing to the development of ethical awareness among students, as proposed by Kohlberg.

Students' final reflections on the ethical implications of AI in education, especially in the case of Catalonia, echo the concerns of Rodrigues and Rodrigues (2023) about the impacts of AI in education and the need for regulation and collective discussions. This aspect underscores the importance of teaching the critical use of technology to promote responsible and transparent knowledge, in line with Andrew Feenberg's critical theory of technology. Finally, the use of ChatGPT as a pedagogical tool not only enhances student engagement through the creation of dynamic and adaptive contents, as suggested by Berner *et al.* (2020), but also promotes collaboration.

The ability of ChatGPT to facilitate the formulation of questions that stimulate critical thinking and effective argumentation, as seen in the two experiences, resonates with the observations of Wang and Zhang (2022) on how AI-generated tasks can encourage students to think more analytically and creatively. Moreover, the diversity of perspectives and the identification of ethical approaches in discussions about AI in education underpin Rosenberg *et al.*'s (2021) argument, which points to the potential

of personalized learning by using generative language models, meeting students' individual needs and promoting an inclusive and adaptive learning environment. But further studies are still needed, considering the applied collective evaluation scenario.

To advance and improve the integration of ChatGPT and similar technologies in education, it is crucial to conduct more studies to explore further educational and cultural contexts in order to better understand how AI can be more effective in different learning environments. It is also crucial to develop ethical safeguards, investing in clear policies and guidelines to ensure student privacy, minimize algorithmic bias and avoid excessive reliance on technology. Another aspect is to improve personalization and adaptation, working on refining ChatGPT's resources to provide even more adaptable and personalized educational support. Finally, it is relevant to involve teachers and educators in the design of training and resources to help them effectively integrate AI in the classroom to its full potential.

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