Examination of AI and Conventional Teaching Approaches in Cultivating Critical Thinking Skills in High School Students

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ABSTRACT [1]

At the core of global educational transformation is artificial intelligence (AI), which promises to revolutionize teaching and learning. This is especially significant in Latin America, notably in Peru, due to the country's dedication to enhancing its educational system and fostering critical skills in students. At this conference, we present a case study comparing AI and traditional learning methods in secondary education, focusing on critical thinking development. This study examines AI's role in fostering critical thinking and evaluates its ethical and practical challenges.

Critical thinking is vital in modern society, enabling individuals to analyze, evaluate, and solve problems effectively. Across Latin America, there is an effort to develop this skill from an early age. In Peru, where the educational system faces challenges like the digital divide and unequal access to quality education, developing critical thinking is crucial for preparing citizens to tackle 21st-century challenges. AI, with its ability to personalize and optimize learning, offers an opportunity to enhance education in Peru but also raises questions about its impact on critical thinking development.

Keywords: Artificial Intelligence, Critical Thinking, Education, Peru, Transformation.

1. THE CASE STUDY

[1] presented a systematic review of the literature comparing the effectiveness of artificial intelligence (AI) with traditional learning methods in developing critical thinking in Peruvian secondary education. The authors reviewed existing literature and highlighted the ethical and practical concerns associated with implementing AI in classrooms. Their study suggests that although AI can offer benefits in terms of personalization and efficiency, it might also lead to an over-reliance on instant responses, potentially reducing students' problem-solving and analytical skills.

Therefore, the main objectives of this conference are to explore the benefits and challenges of AI in secondary education and evaluate its impact on the development of critical thinking. We will analyze how AI compares to traditional methods in promoting critical thinking and consider the ethical and practical implications of its implementation. Additionally, we will discuss strategies for responsible integration of AI in classrooms that respect the principles of critical thinking and human interaction. Finally, we will offer recommendations for educators and educational policies aiming to leverage the advantages of AI without compromising the quality of learning and the comprehensive development of students.

We start from the definition of artificial intelligence (AI), understood as the ability of machines to perform tasks that normally require human intelligence, such as learning, reasoning, and self-correction. In education, AI manifests through tools and platforms that personalize learning, with one of the most used being ChatGPT, which allows for immediate feedback. There are also other tools that support and automate administrative tasks, such as intelligent tutoring systems, which use algorithms to adapt study materials to students' individual needs, while virtual assistants, like chatbots, can offer 24/7 support for academic queries and doubts.

Critical thinking is a complex cognitive skill that involves the ability to analyze, evaluate, and synthesize information to form well-founded judgments. In education, developing critical thinking is essential to prepare students for professional and civic life. Educational literature has emphasized the importance of fostering critical thinking through teaching methods that promote reflection, debate, and problem-solving. Research such as that by [2] and Paul and [3] has proposed models to evaluate and develop critical thinking in the classroom, highlighting the need for an educational environment that encourages curiosity and inquiry.

In secondary education, the comparison between AI and traditional teaching methods reveals both opportunities and challenges. AI can offer a level of personalized learning that traditional methods cannot always match,

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[1] In this initial footnote, on the first page, the acknowledgement will be made to the peer-editor of the final version of the paper. Peer-editors are preferred to non-peer-editors, especially regarding the language proofreading. The reasoning supporting this preference can be found in the two-page annex of the document posted at www.iiisci.org/journal/sci/Quality-Assurance.pdf?var

adjusting educational content to students' individual learning needs and pace. However, the literature also warns about the potential negative effects of AI on developing critical thinking. For example, [4] and [5] suggest that an over-reliance on AI tools can lead to a decline in students' ability to think critically and solve problems independently.

In contrast, traditional methods, including class discussions, teamwork, and assignments that require research and analysis, have been shown to be effective in promoting critical thinking. These methods encourage interaction between students and teachers, which is crucial for developing high-level cognitive skills. Research by [6] and [7] has demonstrated that open discussion and the confrontation of ideas are fundamental components of critical thinking.

Thus, AI has the potential to revolutionize secondary education by offering unprecedented personalization of learning and efficiency in educational management. However, it also raises questions about its ability to replicate the depth of human interactions and the promotion of critical thinking inherent in traditional teaching methods. The literature suggests that a balance between technology and human pedagogy is essential to harness the benefits of AI without compromising the holistic development of students.

2. ANALYSIS OF HOW AI COMPARES TO TRADITIONAL METHODS IN SECONDARY EDUCATION.

The case study we are reviewing utilized a research methodology that combines a systematic literature review with an analysis of relevant documents. Researchers employed selectivity criteria based on thematic relevance and source quality, using databases like Scopus and Dialnet. Initially, 1002 documents were identified, with a first screening narrowing it down to 530 documents that included keywords such as "Education" and "Artificial Intelligence." A second review focused on 121 documents addressing "Education," "Artificial Intelligence," and "Critical Thinking." Ultimately, 22 articles specifically related to "Secondary Education," "Artificial Intelligence," and "Critical Thinking" formed the basis of the study's analysis.

The systematic review methodology provided a robust framework for evaluating literature and drawing evidence-based conclusions. The study ensured validity through an exhaustive review of reliable sources, although literature availability might introduce selection bias. Reliability was established through methodological transparency and replicability. However, internal validity could be affected by subjectivity in document selection and evaluation, necessitating a rigorous approach to minimize bias.

Ethical considerations emerged as fundamental in this research context. The study underscored the importance of protecting student data privacy and ensuring informed consent. It emphasized addressing equity in technology access and AI benefits, avoiding perpetuating existing inequalities. Addressing potential biases in AI data and algorithms is crucial to ensure fairness in educational systems integrating technology. Thus, ethics must guide all research stages, from study design to implementing conclusions in educational practice.

The case study presented comparative research on AI and traditional learning methods' effectiveness in developing critical thinking among Peruvian secondary education students. The authors highlighted AI's challenges and promises in Peru's educational context and set objectives to demonstrate AI's contribution to critical thinking and compare it with traditional methods.

The study's findings suggest that AI, as currently implemented, does not adequately contribute to critical thinking development compared to traditional educational methods, which emphasize human interaction and deep reflection. However, AI's potential to enhance education exists if integrated responsibly and ethically, combining the best of both approaches.

This study's strengths include its systematic methodology and critical literature analysis. It addresses a crucial educational issue with practical implications for policy and teaching. However, it could be complemented by application research to provide specific data on AI's real classroom impact and explore effective AI integration strategies in secondary education.

Overall, this case study offers valuable insights into AI's use in secondary education in Peru and its impact on critical thinking development. Despite some limitations, its critical approach and systematic methodology significantly contribute to understanding AI's challenges and opportunities in Latin American education.

3. DISCUSSION OF RESULTS

The findings from this case study indicate that AI does not significantly enhance the development of critical thinking compared to traditional methods. This observation aligns with various studies examining technology's impact on education. For instance, [8] pointed out that an overdependence on AI tools could diminish students' critical thinking abilities. Likewise, [9] warned about AI negatively affecting students' capacity to solve problems independently.

However, it's crucial to also consider research highlighting AI's potential benefits in education. Authors like [10] have suggested that AI can personalize learning and enhance educational quality. The case study offers a

balanced perspective, acknowledging both the promises and challenges of AI in education.

The study's results have significant practical implications for AI's integration into secondary education. They suggest a cautious and balanced approach, ensuring AI complements rather than replaces traditional methods. Educators need to be trained to use AI effectively and ethically, integrating it into the curriculum in ways that promote, rather than hinder, critical thinking.

Additionally, AI should enrich the educational process by providing tools that help students investigate, analyze, and synthesize information effectively. For instance, AI could offer personalized feedback or create adaptive learning environments tailored to individual student needs.

The discussion also raises the issue of AI complementing or replacing traditional teaching methods. While AI can offer efficiencies and customization not available through traditional means, human interaction, discussion, and personalized tutoring remain crucial for learning and critical thinking development.

AI should be viewed as a complement to traditional methods, providing new ways to interact with study material and peers. Total replacement of human interaction should be avoided to prevent the erosion of critical thinking skills. Instead of viewing AI and traditional methods as mutually exclusive, educators should explore ways to combine them to create rich, effective learning experiences.

This case study offers valuable insights into AI's role in secondary education. By interpreting the results in the Peruvian context and referencing existing research, it's clear that AI holds the potential to enhance education if implemented responsibly and balanced with traditional methods. AI should be seen not as a substitute for human interaction but as a tool to complement and enrich the educational process when used effectively and ethically.

For effective AI integration in classrooms, educators must adopt strategies that leverage the technology's strengths while mitigating potential negative effects. A key strategy is designing learning activities that combine AI tools with traditional teaching methods to foster critical thinking and social interaction. For example, intelligent tutoring systems can offer personalized feedback, while class discussions remain central to promoting dialogue and reflection.

AI can also create adaptive learning environments that cater to students' individual needs, offering challenges and support based on their progress. Educators should design tasks that require information analysis and synthesis to ensure students develop critical thinking skills even when using AI tools.

Training educators in the responsible use of AI is crucial for its effective classroom integration. Training programs should cover not only how to use AI tools but also how to do so ethically and responsibly, including data privacy, student information protection, and preventing bias in AI algorithms.

Educators need to critically evaluate available AI tools and select those that best fit learning objectives and student needs. Training should also emphasize the importance of human interaction and how AI can complement, rather than replace, meaningful educational relationships between teachers and students.

Continuous evaluation of AI's impact on learning is essential to measure its effectiveness and adjust teaching strategies as needed. This involves implementing assessment systems that measure not only knowledge but also skills like critical thinking, creativity, and problem-solving.

Educators and policymakers should establish clear success indicators and evaluation methods to accurately assess AI's impact on learning. This might include collecting data on technology use and its relationship to learning outcomes, as well as conducting case studies and qualitative evaluations to better understand AI's influence on the learning experience.

Thus, AI integration in education offers significant opportunities to enhance educational quality and personalize learning. To realize these benefits, educators must be well-trained in technology's responsible use, AI should be strategically integrated into the curriculum, and its impact on learning must be continually evaluated. This way, AI can become a valuable complement to traditional teaching methods, fostering the comprehensive development of students and preparing the next generation for 21st-century challenges.

4. CONCLUSIONS

Throughout this conference, we have explored the interaction between artificial intelligence (AI) and traditional teaching methods in Peruvian secondary education, with a particular focus on the development of critical thinking. We have analyzed how AI, despite its promises of personalization and efficiency, can present ethical and practical challenges that affect the development of high-level cognitive skills in students.
The research presented in the case study suggests that AI cannot adequately replace the human interactions fundamental to critical thinking. Therefore, the integration of AI in the classroom must be careful and balanced, ensuring that it complements, rather than replaces, traditional educational practices.

Reflecting on the future of secondary education in Latin

America specifically in Peru, it is evident that AI has the potential to positively transform the education system, provided it is used responsibly and combined with human experience. This leads us to the fact that educators, researchers and policymakers must work together to establish ethical guidelines for the use of AI, train teachers in its effective implementation and continually evaluate its impact on learning.

Ultimately, we call to action for educators to take a proactive approach to integrating AI, for researchers to continue exploring the implications of technology in education, and for policymakers to foster a regulatory environment. that ensures equity and ethics in the use of AI. Only through a concerted effort and a deep understanding of the benefits and limitations of AI, will we be able to make the most of this technology to improve education and prepare students for the challenges of the future.

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