EXPERIENCES IN TRAINING TEACHERS AT UNIVERSITIES IN BAJA CALIFORNIA ON GENERATIVE AI

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ABSTRACT

This study explores the integration of generative artificial intelligence, especially models such as ChatGPT, into teacher training, highlighting both the promises and challenges of adopting advanced technologies in an educational context. Through a course titled "Introduction to Generative Artificial Intelligence for Teachers," 97 educators from various universities in Baja California participated, spanning a wide range of ages. The qualitative methodology adopted allowed an in-depth exploration of teachers' perceptions, experiences, and expectations regarding AI in education. Results showed a generally positive evaluation of the course, with significant emphasis on the importance of AI in transforming educational practices. Approximately 41.38% of the comments highlighted the potential of gen AI to support and enhance teaching and learning. Additionally, there was a clear interest in deepening knowledge about AI, as well as a need for ongoing training strategies. However, the study also emphasizes critical reflections on the ethical and practical challenges of integrating AI into education, underscoring the importance of a reflective and ethical approach. The demand for gen AI training by educational institutions indicates a global trend toward the adoption of these technologies. The study concludes with recognition of the potential of AI to enrich pedagogy, provided that the associated risks are considered, and ethical and effective adoption is promoted.

KEYWORDS

Generative Artificial Intelligence, Education, Teacher Training, Ethical Reflections, Technological Adoption.

1. INTRODUCTION

Teachers and students are encountering Artificial Intelligence (AI) technologies in various forms, such as intelligent tutoring systems, smart learning environments, and social robots. These technologies offer promising avenues for enhancing educational experiences, enabling personalized learning, and assisting teachers in managing classroom activities and assessments more efficiently (Ahmad et al., 2021). However, the adoption of AI in education has not been without challenges. Concerns have been raised about the need for a deeper connection between AI developers and learning science experts to ensure that AI technologies genuinely enhance the quality of teaching and learning (Bates et al., 2020).

In 2023, generative AI (GenAI), particularly models like ChatGPT, marked a year of significant advancements and generated both optimistic expectations and concerns across various sectors, including education and technology. According to McKinsey, expectations about the impact of

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GenAI are high, with predictions of significant or disruptive changes in the nature of competition in various industries within the next three years. The technology and financial services sectors are most likely to expect disruptive changes, although the impact will vary by industry. Knowledge-based industries such as banking, pharmaceuticals, medical products, and education are expected to be the most affected, anticipating a value addition of up to 9% of global industry revenue for tech companies and up to 5% in other mentioned sectors (McKinsey, 2023).

Despite the optimism, many organizations are not yet adequately preparing for the risks associated with the adoption of GenAI, such as inaccuracies, cybersecurity issues, and regulatory compliance. Less than 21% of organizations adopting AI have established policies to regulate the use of GenAI technologies by their employees, and only 32% are addressing the risk of inaccuracies, which is concerning given that this risk is cited more frequently than risks related to cybersecurity and regulatory compliance (McKinsey, 2023).

Moreover, GenAI is leading to a shift in talent needs related to AI, with a notable emergence of roles such as machine learning engineers and AI data scientists, but also showing a new demand for AI-related software engineers and prompt engineering experts, indicating a market adjustment toward specific skills facilitated by the adoption of GenAI (McKinsey, 2023).

The use of ChatGPT and other AI systems in science has been notable in 2023, affecting both positively and negatively. On one hand, these tools offer potential to transform education and scientific publishing, but concerns have also arisen about the dishonest use of ChatGPT in scientific publications. This mixed landscape reflects the complexity of integrating these advanced tools into established practices, requiring a careful balance between leveraging their capabilities and mitigating associated risks (Van & Webb, 2023).

From an institutional perspective, the adoption of AI in education requires a reflective approach that considers pedagogical goals, ethical implications, and the inclusivity of technology. Organizations such as UNESCO (2023) and the U.S. Department of Education (2023) have been instrumental in guiding the ethical use and integration of AI in education. They emphasize the importance of multidisciplinary research and the need for educational institutions to adopt modern teaching methods and technologies. UNESCO, in particular, has highlighted the potential of AI to address educational challenges and innovate teaching and learning practices while advocating for policies that ensure equitable and inclusive use of AI technologies.

Globally, various countries are at different stages of integrating AI into their education systems. Although specific country-level data was not highlighted in the sources, the general trend indicates a growing recognition of the potential of AI to transform educational practices. Leading countries in the development and application of AI technology, such as those in North America, Asia, and parts of Europe, are likely at the forefront of incorporating AI into education. These regions have historically been quick to adopt new technologies in education, driven by a combination of government support, institutional interest, and technological infrastructure (World Economic Forum, 2024; UNESCO, 2023).

In this context, the aim of this article is not only to delve into the importance or analysis of the use of AI but also to explore the opinions and perceptions of teachers who have already been trained in this area on the application of GenAI in educational practice, as various institutions in Baja California are requesting training for teachers to understand what GenAI is, what ChatGPT is, and .any other AI-enhanced application, based on personal experience and adopting an action-research approach

2. METHODOLOGY

This study is qualitative research (Hernández et al., 2014), with a sampling of volunteers who took the online course titled "Introduction to Generative Artificial Intelligence for Teachers," involving teachers aged between 24 to 66 years, totaling 97 participants (see Table 1). The case study design allows for an in-depth exploration of the phenomena within their real context, which is ideal for understanding the perceptions, experiences, and potential changes in the pedagogical practices of teachers following the course, especially when observing at a specific time (Hernández et al., 2014).

Table 1. Statistical Data of Participants

Age Range	Number of Participants	Percentage (%)
20-29	9	9.28%
30-39	20	20.62%
40-49	37	38.14%
50-59	24	24.74%
60-69	7	7.22%

Note: Own elaboration.

The process of this study was as follows, which could be defined as the specific objectives of the research:

1. Specific aspects to observe were defined, such as the level of participation and learning strategies employed by the teachers, aligning with the methodology proposed by McNiff (2013) for effective observation, see Table 2.
2. A questionnaire was developed through Google Forms to systematically record the behaviors, questions, and discussions generated by the teachers during the training, following the recommendations of Kemmis and McTaggart (1988).
3. It was identified how teachers interact with the AI content presented during the training, online.
4. Reactions, interactions, and the level of engagement of the teachers with the proposed activities were observed.
5. The study concluded with a course evaluation questionnaire, on a scale of 1 to 5.
6. A folder of evidence was compiled on the teachers' prior knowledge and perceptions regarding AI.
7. The final stage was the analysis of the results, where an ANOVA was applied to compare the ages and the scores given to the course.

Table 2. Construct for Observing Key Aspects of the Course

No.	Aspect to Observe	Key Elements
1	Initial Perceptions about Generative Artificial Intelligence	Prior knowledge, course expectations, attitudes towards technology
2	Learning Experience	Interaction with content, participation, support received
3	Changes in Understanding of GenAI	Increase in knowledge, understanding of applications, recognition of challenges
4	Impact on Pedagogical Practices	Intention to integrate AI, ideas for application in the classroom, changes in methodology
5	Perceptions about the Future of Teaching and GenAI	Expectations about the role of AI, ethical concerns, training needs

Regarding the characteristics of the course, it totalled 20 hours, however, a total of 3 courses were taught, involving four universities:

1. Faculty of Humanities and Social Sciences of the Autonomous University of Baja California (UABC).
2. Center for Technical and Higher Education (CETYS University).
3. University Center of Baja California (CUBC).

On the other hand, the contents of the course adapted a simple structure, which can be seen in Table 3.

Table 3. Topics and Hours of the Course

No.	Topic	Time	Type of Activity
1	What is AI and What is the Difference with Generative AI?	2 hours	Theoretical
2	Ethical and Philosophical Aspects	2 hours	Theoretical
3	Can it be Cited and Referenced?	1 hour	Theoretical
4	Text Applications	4 hours	Theoretical
5	Image Creation Applications	2 hours	Practical
6	Video Creation Applications	2 hours	Practical
7	Audio Creation Applications	2 hours	Practical
8	Gif and Programming Applications	2 hours	Practical
9	Research Applications	2 hours	Practical
10	Other Studies	1 hour	Theoretical
Total	20 hours		

Finally, an ANOVA was conducted to verify these scores, revealing no statistically significant differences in course ratings across age groups. This suggests that the course was well-received by all age groups. However, to strengthen the study's methodology and ensure a more detailed and contextualized interpretation of this data, the following improvements are recommended: expand the sample size, use segmentation, conduct longitudinal evaluations, or employ additional mixed methods such as correlation or regression analysis.

3. RESULTS

We can begin by noting that there was no significant difference in the reactions of the teachers according to the university, as all exhibited surprise and interest. According to Table 4, concerning the categorized results of the course, the perception and reception of the course "Introduction to Generative Artificial Intelligence for Teachers" by educators reflect a substantial recognition of AI's potential to transform educational practices. This is in line with previous observations about the promise of technologies such as intelligent tutoring systems and smart learning environments to enhance the personalization of learning and the efficiency of classroom management (Ahmad et al., 2021). This optimism is tempered by an awareness of the inherent challenges in adopting AI in education, highlighting the need for closer collaboration between AI developers and pedagogy experts to ensure that the deployment of these technologies effectively enhances teaching and learning (Bates et al., 2020).

Table 4. Categorized Results

Category	Description of the Category	Percentage (%)
Importance of AI in Education	Comments that highlight how AI can support and transform educational practices, improving teaching and learning.	41.38%
Requests for Information or Improvements	Requests for more details about AI tools, improvements to the course, or extensions of the same for greater understanding.	17.24%
Positive Experiences and Perceptions	Opinions that reflect satisfaction with the course, as well as the recognition of the added value of AI in educational contexts.	27.59%
Critical Reflections on AI	Reflections on ethical, social, and access challenges related to the use of AI, as well as its future impact.	10.34%
Appreciations and General Evaluations of the Course	Expressions of gratitude towards the facilitator and general appreciation of the course, highlighting its usefulness and organization.	17.24%
Specific Suggestions for Follow-up	Concrete proposals for future activities, workshops, or additional content that participants wish to explore post-course.	13.79%

The most prominent category of comments, "Importance of AI in Education" (41.38%), showcases the strong recognition among teachers of the transformative potential of AI, resonating with the optimistic expectations about the impact of generative AI in various sectors, including education, as reported by McKinsey (2023). The satisfaction expressed by the participants and their desire to deepen their understanding of GenAI reflect a general trend towards adopting new technologies in education, highlighting the need for ongoing training strategies to enable educators to effectively integrate these tools into their teaching practices.

However, the critical reflections on AI (10.34%) underline the importance of addressing the ethical and social challenges associated with its use in educational contexts. This concern aligns with warnings about the need to prepare for risks associated with the adoption of GenAI, such as inaccuracies and cybersecurity issues, emphasizing the importance of establishing policies to regulate its use (McKinsey, 2023).

The demand by educational institutions in Baja California for training in generative AI underscores the current relevance of this topic in the educational field. The insights provided by teachers who have participated in the course highlight the urgency of addressing both the opportunities and challenges of integrating AI in education. This approach echoes the call from organizations such as UNESCO (2023) and the U.S. Department of Education (2023) for a reflective and ethical adoption of AI technologies in education, stressing the importance of multidisciplinary research and the development of policies that ensure equitable and inclusive use of these technologies.

The enthusiastic response from teachers to the course indicates a promising pathway for the effective integration of emerging technologies in education, suggesting a future in which generative AI, like ChatGPT, can be leveraged to enrich teaching and learning, aligning with global efforts to innovate educational practices while addressing their ethical and practical implications (World Economic Forum, 2024; UNESCO, 2023).

On the other hand, Table 5 illustrates how the complete course was rated according to age range. Participants from different age groups rated the course positively, with average scores varying

slightly among the groups. Participants aged 50-59 and those over 60 gave the highest ratings, with averages of 4.96 and 5.00 respectively, suggesting a particularly high appreciation of the course among these age groups. Younger participants, in the 20-29 and 30-39 age ranges, also provided high ratings with averages close to 4.9. These results indicate that, regardless of age, participants recognize the value and importance of the course, although there is a slight trend towards higher ratings in the older age groups.

Table 5. Statistical Data of Participants and Their Course Evaluation

Age Range	Average Course Rating
20-29	4.89
30-39	4.90
40-49	4.84
50-59	4.96
60-69	5.00

Finally, an ANOVA was conducted to verify these scores, revealing no statistically significant differences in course ratings across age groups. This suggests that the course was well-received by all age groups. However, to strengthen the study's methodology and ensure a more detailed and contextualized interpretation of this data, the following improvements are recommended: expand the sample size, use segmentation, conduct longitudinal evaluations, or employ additional mixed methods such as correlation or regression analysis.

4. CONCLUSIONS

The conclusions derived from this study on the introduction and adoption of GenAI particularly models like ChatGPT, in teacher training reflect a complex, but fundamentally positive landscape in the educational context. Through the participation of teachers in the course "Introduction to Generative Artificial Intelligence for Teachers," a generally high valuation was observed, along with recognition of the potential importance of AI in education, aligning with global trends and expectations about technological integration in teaching and learning.

Recognition of the Transformative Potential of AI in Education: The results show that a large proportion of teachers (41.38%) identified the significant importance of GenAI in education, highlighting its potential to support and transform educational practices. This reflects a shared optimism with global perspectives (McKinsey, 2023) on the ability of AI to innovate in teaching and learning, highlighting the growing need to adopt pedagogical methodologies that incorporate these technologies effectively.

Positive Evaluation of the Course and Recognition of the Need for Ongoing Training: The positive evaluation of the course, particularly notable among older participants, indicates an appreciation of the opportunity to learn about GenAI and its application in educational contexts. The demand for additional information and improvements to the course (17.24%) along with specific suggestions for follow-ups (13.79%) signals an interest in deepening knowledge about GenAI and a need for ongoing training for educators, aligning with the recognition of changes in talent needs related to AI (McKinsey, 2023).

Critical Reflections on AI and Awareness of Ethical and Social Challenges: Although to a lesser extent (10.34%), critical reflections on AI highlight the importance of considering the ethical, social, and access challenges associated with its use in education. This emphasizes the need for a reflective and ethical approach in integrating AI into education, backed by organizations such as

UNESCO (2023) and the U.S. Department of Education (2023), and highlights the complexity of balancing the capabilities of these advanced tools with the potential risks associated.

Institutional Perspective and Support for the Integration of AI in Education: The demand for training in GenAI by educational institutions in Baja California reflects a global trend towards the adoption of new technologies in education. The enthusiastic response of the teachers to the course underscores the relevance of providing institutional support and appropriate policies that promote effective and ethical integration of AI into educational processes.

Equally, certain recommendations could be proposed:

Strengthen Multidisciplinary Collaboration: It's crucial to foster closer collaboration between AI developers, learning science experts, and educators. This would facilitate the creation of AI tools that are better aligned with pedagogical needs and enhance the effectiveness of these technologies in educational settings.

Continuous Training and Knowledge Deepening: Educational institutions must offer ongoing training programs that not only introduce educators to the basic aspects of AI but also delve into advanced techniques and specific AI applications in education. This should include practical workshops and courses that address both the capabilities and ethical challenges of AI.

Development of Inclusive and Ethical AI Policies: In line with guidelines from organizations like UNESCO and the U.S. Department of Education, it's essential for educational institutions to develop and implement policies that regulate the use of AI, ensuring its integration is ethical, inclusive, and equitable.
Ongoing Research and Evaluation: Implement longitudinal studies and systematic evaluations of AI's impact on education. This would aid in better understanding the long-term effects and adapting pedagogical strategies as necessary.

Addressing the Diverse Needs of Students: Leverage AI's personalization capabilities to meet individual student needs. This might include developing intelligent tutoring systems that adapt to different learning styles and competency levels.

Improving Technological Infrastructure: Ensure that schools and universities have the necessary technological infrastructure to effectively integrate AI into their environments. This includes not only hardware and software but also robust connectivity and adequate technical support.

Promoting Awareness of AI Challenges: Educate educators and students about potential challenges associated with AI, such as inaccuracies and cybersecurity issues. Providing training on how to mitigate these risks is crucial for the safe and effective adoption of AI.

Exploring Interdisciplinary Applications of AI: Encourage projects and curricula that integrate AI across different academic disciplines, demonstrating its applicability from natural sciences to the humanities. This could help demystify AI and illustrate its relevance in a variety of educational contexts.

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