

From Calculators to AI: From Parallel to Guideline

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Think about a classroom where every student has their own AI assistant, making learning more personal. It sounds like something from a science fiction movie, but it is actually something that could happen soon. As we get ready to welcome Artificial Intelligence (AI) into schools, we can learn a lot by looking back at how calculators were first brought into classrooms. Calculators were once a big topic of debate and are now a common sight in schools. This paper looks at how calculators went from being new and controversial to an essential part of learning. The introduction of calculators in the classroom can teach us how to bring AI into classrooms in a way that helps teachers and students. By understanding how educators and students adapted to calculators in the past, we can find the best ways to introduce AI in education today.

Literature Review

In today's classroom, it would be hard to envision a math class that does not use calculators at all throughout a school year. However, the start of calculator use in education was not a seamless transition. In 1975, the pocket calculator spread fast due to a decrease in its price (Grinstein and Lipsey). This led to calculators being introduced into the school system and started the debate about calculators. In 1980, Gary Bitter researched how teachers felt about using calculators in their classes. He found that middle school teachers were more okay with calculators than elementary or high school teachers. Bitter then held a two-hour workshop for 84 teachers, showing them how to use calculators in class. After this workshop, he noticed that teachers from all grades had a better opinion about calculators (Bitter). Bitter's study suggests that teaching teachers how to use calculators in lessons can help them feel more comfortable with these devices in schools. Five years after this, the Connecticut State Board of Education became the first district to require calculators on state exams, which was the start of calculators being accepted in education (Libov). By the end of the decade, the majority of teachers agreed that calculators promoted higher-level thinking and questioning (Burrill et al.).

Just like calculators once faced doubts, AI in schools is now being closely examined. Most of the research on AI in higher education comes from areas like computer science and STEM, showing that there is much focus on making AI tools but

not as much on how to use them for teaching (Dogan et al.). This shows that there might be a gap in understanding how to bring AI into different types of classrooms effectively. Also, a survey of 140 teachers in Estonia found that while they know about AI, many are not sure how to use it in their classes. The survey shows that teachers need more information and training about AI (Chounta et al.). This situation is similar



to how teachers felt about calculators at first. They were unsure until they received more training and information. As AI technology grows, it is essential to teach teachers how to use it well. This way, AI might become as important and helpful in classrooms as calculators have become.

Methods

This study aims to discover effective methods for integrating AI into educational settings, drawing insights from the historical introduction of calculators in classrooms. The research involves analyzing existing interviews and studies conducted by educational experts sourced from academic journals and research databases. Keywords such as 'calculator in education,' 'teachers and technology,' and 'AI in school' guide the search for relevant articles. The focus is on research documenting educators' experiences during the early adoption of calculators and their current perspectives on AI in education. In addition to these interviews, the study will also examine secondary sources, including historical accounts of calculators in education and recent studies on the challenges and potential of AI. These sources are selected for their direct relevance to the challenges of integrating new technology in classrooms and their ability to offer practical insights. The objective is to synthesize this information to formulate guidelines for introducing AI into educational environments, drawing on the historical experiences with calculators as a reference.

Findings

The parallel to calculators

The calculators' journey from being controversial to becoming indispensable in education offers valuable lessons for the integration of artificial intelligence. When calculators first came into classrooms, many teachers did not like them, but over time, they proved to be beneficial in enhancing students' learning experiences, particularly in

advanced mathematical concepts. Similarly, despite current beliefs, AI has the potential to improve educational practices significantly if approached the right way.



When the calculator started making its way into the classroom, there was pushback from the teachers. Educators were concerned that it would give students an easy way out of learning basic math, allowing them to rely on the device instead of developing their own problem-solving skills. This fear was widespread; a 1975 survey by Pendelton revealed that a vast majority, “72% of teachers, mathematicians, and non-specialists did not want calculators to be used in high school” (qtd. in Banks 59). The pushback by educators was due to the lack of understanding of how to include calculators in their lesson plans without their concerns coming true. This is supported by the two-hour workshop that Bitter did with teachers, which taught them how to use a calculator in a classroom, and they left with a positive attitude toward the calculator in the classroom. In a recent survey by the EdWeek Research Center, only about 27% of them believe AI will have a good or excellent impact on education. Nearly half of the teachers who responded think that AI will have a bad effect on teaching and learning in the next five years (Langreo). Also, Han's survey found that elementary school teachers are really interested in how AI technology can change the way English is taught. However, their interest is more about personal curiosity than professional use. Also, these teachers are not very resistant to new ideas, but they do feel more anxious than usual about using AI in teaching (Han). Han's study shows that teachers believe that AI will have a bad effect on teaching because of their anxiety about using it, while Chounta et al.'s survey showed that their anxiety comes from a lack of understanding of the technology.

As stated before, calculators were believed to hinder students' critical thinking, and they believed that calculators would lead to a decline in fundamental arithmetic abilities. Today, teachers believe that Artificial Intelligence also compromises critical thinking and problem-solving skills, and they think it will lead to students being totally dependent upon it (Langreo). However, Studies have shown that AI can offer personalized learning experiences, adapting to individual student's needs and pace, much like calculators, which allows for more individualized problem-solving approaches (Dogan et al.). For example, AI tools can provide instant feedback to students, enabling a more interactive learning process. A study by Gayed et al. (2022) highlights tools like "AI KAKU, a Japanese-developed writing assistant, could potentially reduce cognitive barriers for English as a Foreign Language (EFL) learners when producing written text in English" (qtd. in Marzuki 4). By offering real-time translation and grammar suggestions, these tools make the writing process more approachable for learners. Furthermore, AI can assist teachers in creating more engaging and diverse educational content, catering to a wide range of learning styles and abilities. On the other hand, Dogan et al.'s research talks about using AI to analyze data in education (Dogan et al.). Approaching AI this way can improve how teachers use data to know which students need intervention and who is meeting the curriculum.

Discussion

Since AI and calculators follow a similar path with their introduction into education. It will be useful for us to use the same road map that calculators follow to become an essential part of learning in education. Using a similar method from the calculator journey, here is a three-step guideline for the integration of AI into education.

Step 1: Planning for Integration into Lesson Plans

The first step involves carefully planning how to integrate AI into the curriculum. Teachers should start by understanding the capabilities and limitations of AI technologies. This step includes identifying specific parts of the lesson plan where AI can be most beneficial, such as in personalizing learning experiences or automating routine tasks like grading. It is also important to consider any ethical issues and recognize potential biases in AI systems. Teachers need to identify AI tools that are relevant to their subjects and learning objectives, develop strategies to incorporate these tools into their lessons, and plan for an inclusive approach that supports diverse learning styles and abilities.

Step 2: Active Intervention and Observation

The second step focuses on active intervention and observation. In this phase, teachers play a crucial role as facilitators, closely monitoring the integration of AI in the classroom. They need to observe how students engage with AI tools and how these

tools affect their learning process. Teachers should be ready to provide support and clarification when students encounter challenges with AI. It is important to intervene and adjust the use of AI in response to student feedback or if it is observed that the AI implementation is not meeting the learning objectives effectively.

Step 3: Review and Adjustment

The final step is to review the effectiveness of AI in the educational process and make necessary adjustments. This involves conducting a reflective analysis to evaluate how AI tools have impacted teaching and learning outcomes. Teachers should gather feedback from students and other educators on the effectiveness of AI tools and analyze this data to understand patterns in student learning. Based on this feedback and analysis, teachers can then adjust their AI integration strategy, continually improving and optimizing the role of AI in education.

Throughout these steps, it is important to remember that AI should serve as a tool to enhance the educational experience and not replace the human elements of teaching and learning. The goal is to use AI to create more dynamic and personalized educational experiences, enhancing both teaching methods and student engagement.

Conclusion

This study closely examines how new technology, like calculators and AI, becomes part of education. We have seen that it usually starts with teachers not being sure about the latest technology but then slowly getting used to it and seeing its benefits. Also, this study provided guidelines to help with the integration into education from the support of calculator integration. Even though this research gives us some good ideas, it is important to acknowledge its limitations, primarily the reliance on



historical data for calculators and current perspectives that may evolve for AI. Future research could look deeper into longitudinal studies of AI's impact on education, examining the long-term effects on student learning and teacher strategy. As technology keeps changing how we live and learn, it is important to keep studying and understanding it. This way, we can ensure AI helps in education, adding to the teaching process instead of taking away from it.

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