Can AI Really Personalize Learning?

"Personalized learning" has been an edtech business buzzword for decades. The introduction of apps enabled with generative AI has only added new fuel to the fire, with companies describing their products with such phrases as "personal tutors," "personalized curriculum," and "student centered." Beyond the bells and whistles and the slick marketing, it can be difficult to determine what's real—and what's realistic to expect from an app.

In this Q&A, NEPC Fellow Michael Barbour of Touro University California offers a guided tour of this world. He starts by defining personalized learning, tracing its origins back to medieval apprenticeships and to behavioral psychologist B.F. Skinner's Cold War-era "teaching machine." He also explains how generative AI has—and has not—improved the ability of computers to provide education that is truly custom tailored to the needs of individual students. In doing so, he lists the pros, cons, and limits of these types of tools. He ends by offering advice on the types of questions users should consider before adopting AI-enabled edtech tools that purport to personalize learning.

Dr. Barbour is an Assistant Dean for Academic Integration and Innovation at Touro. He has been involved with K-12 distance, online, and blended learning for almost three decades as a researcher, evaluator, teacher, course designer, and administrator. His research examines the design, delivery, and support of K-12 distance, online, and blended learning, with a focus on how regulation, governance, and policy can impact these environments.

Q: What is personalized learning?

A: At its core, personalized learning is the idea that instruction should be tailored to individual students—their pace, their interests, their strengths, and their struggles. It's not a new concept. Good teachers have always done some version of this, whether it's pulling a small group aside for extra help or giving an advanced reader a more challenging book. The truth is that the general idea of personalized learning has been around for centuries in the form of apprenticeships in which students learned trades by working under people who had mastered them. As students became increasingly proficient at blacksmithing or bread-baking or laying brick, they required decreasing levels of support—until they were finally ready to do the work on their own.

The formal idea of personalized learning has roots going back decades. This concept, which is often described as "individualized instruction," draws upon research about differentiated teaching, learner-centered design, and the simple observation that a one-size-fits-all approach leaves too many kids behind. Under this model, students typically have the option of choosing how they learn and at what pace, as well as ways in which their mastery is assessed.

Skinner's teaching machine of the early Cold War period exemplifies early efforts to standardize and digitize this approach. The machine was essentially a box that would spit out questions. If students answered correctly, they would get a new question. If they were wrong, the machine would provide a set of learning instructions delivered in bite-sized pieces that could be absorbed at the learner's preferred pace. A key objective was freeing up the teachers so they could provide personal or individual attention to each learner.

From an academic perspective, there have been many definitions of personalized learning. One of the more comprehensive definitions can be found in a recent article in the peer-reviewed journal *Smart Learning Environments*, where the authors suggest that personalized learning needs to adapt to individual knowledge, experience, and interests in order to be effective and efficient in supporting and promoting desired outcomes. One interesting aspect of this definition is that it implies that learning outcomes have already been defined—as opposed to generated by the students themselves—which speaks to the modern trend of states defining specific, discrete standards that students must learn. So in a modern sense, the term "personalized learning" has been stretched to cover just about anything from thoughtful differentiation planned and executed by a teacher to glorified digital worksheets that simply rearrange question difficulty. Interestingly, most modern definitions of personalized learning retain many of these features from the past (such as students choosing how they learn, the pace they learn, and how they demonstrate they have learned—sometimes with the assistance of a device that provides immediate and individual feedback).

Q: How do edtech products currently interpret and incorporate personalized learning?

A: Unfortunately, the way that most edtech products operationalize personal learning is very much like Skinner's teaching machine. Students engage with the edtech product by first responding to a series of multiple-choice questions. The product then focuses instruction on the topics of the questions students answered incorrectly. Upon completion of this instruction, students take another multiple-choice test. Once they have achieved mastery (often defined as scoring at least 80%), they move onto the next sequence and repeat the same process.

In some products, personalization can mean simply adjusting the difficulty of problems based on whether a student gets answers right or wrong. Get three in a row correct? The system bumps you up. Miss a few? Questions get easier—or maybe you're rerouted to a review session. This is often called "adaptive learning." It's the most common flavor of personalization in today's market. Although it might be useful, it is not as personalized as it would be if a teacher were delivering the instruc-

tion. Tools may also try to personalize learning by presenting different types of instruction (videos, audio clips, texts, practice sets), depending on student performance. For example, a student who gets more multiple-choice questions correct after watching videos than after reading texts would increasingly encounter video-based instruction. Some tools go even further by attempting to build learner profiles, tracking skills over time, or recommending specific pathways through content. While these tools can support teachers by providing data they might not otherwise have time to collect, they also allow edtech companies to generate lots of student information that is then stored in their proprietary systems.

There's an important business reality to acknowledge. Edtech companies need products that are scalable. As a result, all of these "personalization" models rely upon designing edtech products for the masses rather than for individuals. Companies boil down learning into discrete pieces of knowledge or tasks, then convert them to instruction that is prepackaged, predictable, and standardized for all students.

True personalization, the kind that accounts for a student's home life, motivation, cultural background, and relationship with a teacher, is messy and expensive to build. What scales is standardized content with an adaptive algorithm on top, which is why the education standards movements over the past three or four decades has been so helpful for these companies.

Q: How is AI impacting the personalized learning provided by edtech products?

A: First, I think it's important that we point out that the concept of [artificial intelligence has been around for a long time](http://nepc.colorado.edu/publication/newsletter-barbour). For example, Skinner's teaching machine was based on a very basic form of AI in that it was essentially a series of if/then functions: For example, IF students scored poorly on questions that were tagged "causes of World War I," THEN they would be assigned to complete the instructional review items that were also tagged "causes of World War I."

When we discuss AI today, we are typically referring to generative AI

(e.g., ChatGPT, Gemini, Copilot, and Claude). This form of artificial intelligence is much more advanced than basic if/then situations. [Generative AI works](#) by analyzing vast libraries of existing content to identify underlying rules and structures. Once it recognizes these patterns, it uses statistics to predict and assemble new text that is based on underlying source material. Essentially, AI isn't intelligent in that it knows things. It simply uses the patterns to guess at the next logical piece of a puzzle based on everything it has seen before.

As you might imagine, generative AI has added rocket fuel to edtech companies' ability to "personalize learning" because their products can analyze student work more quickly, give more detailed feedback, and generate customized practice materials in mere seconds. Some AI tools can even adapt to a student's personal writing style or suggest learning paths that feel more individualized than the older, if-then, rules-based systems.

Q: What are the pros and cons of using AI-enabled edtech to provide personalized learning?

A: As I mentioned above, one of the pros of using AI-enabled edtech to provide personalized learning is the ability to generate then quickly analyze student data to determine patterns of behavior. Teachers generally don't have the time to engage in that level of analysis—especially when juggling the needs of 30 students at a time.

Another benefit is that students can engage on their own terms, moving through material at the time, pace, and sequence that best suits their needs. At its best, this type of learning can be like having access to a tutor who is always on call. A third advantage is that AI-enabled edtech can progress beyond the standardized instructional model that previous generations of technology relied upon. For instance, generative AI does not have to rely on multiple-choice questions. It can provide detailed feedback based on student essays and other types of open-ended input.

For students with disabilities, AI can provide read-alouds, visual alternatives to written texts, and other accommodations. Multilingual learners can get assistance from translations. Finally, generative AI-enabled

edtech can help teachers use their time more efficiently by creating practice tasks, analyzing patterns in student work, suggesting targeted supports, and formatting lesson plans. When used thoughtfully, AI can help students receive quicker feedback, explore different explanations of a concept, or move through material at their own pace without waiting for the whole class.

Unfortunately, these pros come with significant cons that are often obscured by glossy marketing. As has been the case with earlier forms of edtech, AI-enabled edtech can reduce opportunities for rich, meaningful learning. For example, some products may push students into endless cycles of learning, practice, and assessments. While this approach may help create useful data for teachers, administrators, and edtech companies, it does not necessarily stimulate student curiosity or encourage deeper learning. Another con is that AI-enabled edtech can narrow the definition of learning. If an AI system only measures what's easily quantifiable (correct answers, time on task, click patterns), it may prioritize shallow performance rather than deep understanding. Additionally, AI systems can misinterpret student needs, reinforce existing biases, or nudge learners toward narrow pathways based on incomplete data. Furthermore, AI can hallucinate or simply make up information and present it as fact. Finally, overreliance on AI-enabled edtech risks diminishing the role of the teacher. This is problematic because decades of research tell us that the teacher-student relationship is one of the most powerful factors in learning. Also troubling is the very real possibility that social emotional growth may be stunted if students spend more time interacting with bots than with teachers or peers.

Teachers may also feel pressured to use the generative AI tools that their district purchases—often at considerable expense. When districts or schools buy these products, they may be locked into professional development provided by seller. Because all of these functions are proprietary, once a contract expires, educators may lose access to everything related to the product, including student data. This can make it challenging for districts to switch vendors in order to identify products that are more affordable and/or better meet their students' needs.

Data privacy remains a serious concern. Because AI models require a

lot of data, there's always the risk that personalization becomes less about supporting students and more about harvesting information from them. As AI is used more and more, there is a corresponding need for increased, and better refined, training of the models through a more aggressive collection of student data. While the AI gets smarter, we have to wonder if the price of that personalization is a loss of student privacy. Additionally, not all companies are transparent about how that data is stored, shared, or monetized. And the track record for many of these tech companies has not been good, as several National Education Policy Center briefs have outlined in great detail.

It is also important to remember that edtech is a multibillion-dollar industry. When a company's primary duty is to its shareholders, personalization becomes a product feature designed to increase platform engagement and drive subscription renewals. The best interests of the student can quickly take a back seat to the bottom line. In using these tools, we risk turning classrooms into data-mining hubs where the student is the product, not the customer. In the end, the edtech industry has a long track record of overpromising and underdelivering.

Finally, I'd be remiss if I didn't mention the environmental impact of generative AI. The amount of electricity and water required to operate supercomputers is on par with the usage of the entire mid-sized cities. Furthermore, the frequent advances in technology mean that there is a need to upgrade the actual computers much more frequently than before, creating a massive increase in electronic waste (as well as added expenses for districts and schools). The carbon cost is equally striking, as a single data center can produce the same carbon footprint as 33,000 gas-powered passenger cars on the road for an entire year.

Q: What should consumers be on the lookout for when considering edtech products that are marketed as using AI to provide personalized learning?

A: When an edtech rep starts talking about "proprietary AI-driven personalized learning," it's time to ask a few friendly-but-pointed questions. What exactly does the AI do? How does the tool support teachers rather than replace them? Can you explain why the AI made this recommen-

dation for this student? Does the tool enhance deeper learning, or does it mainly focus on drill-and-practice? Does it adapt content difficulty? Does it generate original responses to student input? Does it analyze learning patterns over time? What student data does the product collect? Who has access to that data? Can that data be sold or shared with third parties? Does the company acknowledge the limits of AI?

Simply put, be wary of "silver bullet" solutions. Any product that claims to "solve" learning gaps or "guarantee" results through AI is likely prioritizing sales over reality. Authentic learning is messy, social, and human. The best edtech doesn't try to replace the teacher. It is an assistant to educators and students alike in that it helps them dig deeper into learning patterns and needs. If the product seems more focused on keeping kids glued to screens than on helping them maximize the benefits of their technology time so they can move on to deeper learning experiences, it's probably designed for the company's bottom line, not the student's mind.

NEPC Resources on Digital Technologies and Artificial Intelligence in Education

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