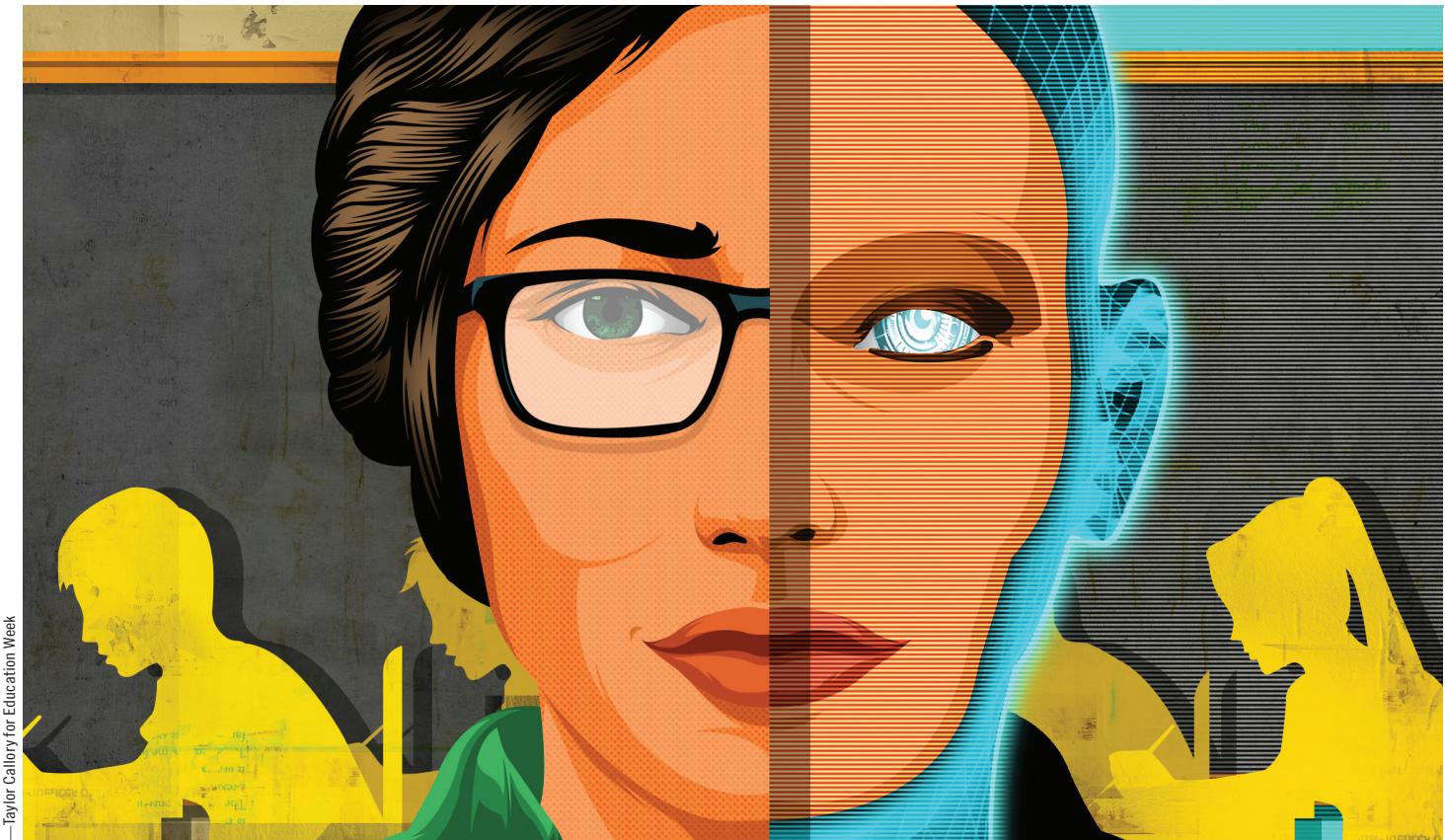


EDUCATION WEEK

2020

# SPOTLIGHT



—Taylor Callery for Education Week

## TRANSFORMATIVE LEARNING IN ED-TECH

### EDITOR'S NOTE

Technology and digital learning are transforming the education system. In this Spotlight, discover how teachers are using adaptive learning in the classroom, how technology is assisting English-Language Learners, and how educators are using digital games to assess knowledge.

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# Teachers, the Robots Are Coming. But That's Not a Bad Thing

By Kevin Bushweller

**B**ring up the idea of even the possibility of artificially intelligent robots replacing some of what teachers do, and you are likely to spark a tornado of anger among many educators. Intelligent machines could never match human interactions, they argue. Such moves would be a giant step toward a digital dystopia in education.

That kind of reaction to the role of AI robots in education clearly played out in our recent Big Ideas survey of K-12 teachers, which featured questions about robotics. The vast majority of teachers, 84 percent, disagreed with the suggestion that student learning would likely improve if more K-12 teachers had AI-powered robots working with them as classroom assistants. More than 90 percent did not think that student learning would improve in classrooms where chronically low-performing human teachers were replaced by artificially intelligent robots.

It makes sense that teachers might think that machines would be even worse than bad human educators. And just the idea of a human teacher being replaced by a robot is likely too much for many of us, and especially educators, to believe at this point.

But consider the case of a computer science professor at Georgia Tech. According to the Global Education & Skills Forum, this professor had a mix of online teaching assistants, and all of them were human except for one. The teaching assistants were available via email to answer questions. Only one student in the class thought one of the teaching assistants was not a human being, because that assistant tended to answer questions much faster than the others. That student was right.

The forum—part of the London-based Varkey Foundation, which brings together leaders from public, private, and social sectors from around the world to show how improving education can help solve global problems—posed a provocative question on its site that caught my attention: “Robots replacing teachers is

a good thing—yes or no?”

The better question might have been: Can robots help teachers improve classroom learning?

In China, they are testing that question. Hundreds of kindergarten classes in the country are now using a small robot named KeeKo, which tells stories, poses logic problems, and reacts with facial expressions when students master content. The robots are part of a big push in the country to be the world leader in the use of AI-powered technologies.



—Taylor Callery for Education Week

## 30%

of teachers cited “grading” as a task that robots could do to help improve their teaching.

SOURCE: EdWeek Research Center

“Technology is a wonderful tool, and it can help with many individual tasks,” said Darrell Billington, a 25-year veteran social studies teacher at Fairview High School in Boulder, Colo., who responded to our national survey of teachers. “But in education, there needs to be some sort of relationship. I don’t think artificial intelligence is there yet.”

But researchers are trying to get there.

Consider the work of Cynthia Breazeal, an associate professor of Media Arts and Sciences at the MIT Media Lab, who leads the Personal Robots group.

The group is conducting randomized control trials of the use of an AI-pow-

ered, teddy bear-sized and -looking robot named Tega in Boston-area schools that have large English-language-learner populations. The goal of the robots is to improve the language and literacy skills of 5- and 6-year-olds. Researchers are tracking gains in the youngsters’ vocabulary and oral language development to determine how the use of human teachers and artificially intelligent robots together in classrooms compares with instruction without robots.

“We’re starting to see some exciting and significant learning gains,” Breazeal said. “I am very encouraged.” But she conceded that a longer, bigger study is the next step.

What is particularly interesting is the research Breazeal and her colleagues are doing around social robots. In their study “Growing Growth Mindset With a Social Robot Peer,” young children played a puzzle-solving game with a peer-like robot. The social robots were fully autonomous and programmed to either exhibit a “growth mindset” (modeled after the work of Carol Dweck and Angela Duckworth) or a “neutral” mindset. Breazeal found that children who played with the growth-mindset robot were more persistent when trying to solve the puzzles compared with the kids working with the neutral robot.

And Breazeal points out that it is not just young children who respond positively to social robots. The team has used social robots with MIT undergraduates and older adults. “We see a social-emotional benefit across age groups,” she said.

That social connection also seems to be much stronger with physical robots rather than intelligent tutors or agents students view on computer screens. Jamy Li, an assistant professor in the Human Media Interaction group at the University of Twente in the Netherlands, conducted a review of 33 studies that examined how adults and children interact with physical versus virtual robots. The analysis, published in 2015 in the *International Journal of Human-Computer Studies*, found that adults and children tend to have more positive interactions with physical robots and find them more believable than virtual robots.

# Looking for a literacy program that checks all the boxes?



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Now, of course, there are all kinds of red flags that go up when you start talking about artificially intelligent robots playing a bigger role in teaching. Data privacy is a big one, with huge fears that kids would share personal information with an artificially intelligent robot they trust, and that information could get in the hands of people who should not see it. Plus, if the information that is input into the robots to allow them to learn is biased or skewed, that would make the judgments of the robot flawed.

And there is the value of human connections. If students started feeling much more comfortable interacting with robots rather than human beings, and preferred the machines, they might jeopardize their willingness and ability to have meaningful conversations or relationships with other people. In some ways, you already see those troubling signs in how many young people (and even some older folks!) prefer to text back and forth to each other rather than have a face-to-face conversation.

Breazeal recognizes those downsides. For starters, the AI field right now is not diverse or inclusive and that could affect

the kinds of technologies being developed and fuel potential biases in the software. And, “we need to be thinking more deeply around ethics,” she said, “particularly with AI with children.”

But that’s exactly why educators should not be putting their heads in the sand and hoping they never get replaced by an AI-powered robot. They need to play a big role in the development of these technologies so that whatever is produced is ethical and unbiased, improves student learning, and helps teachers spend more time inspiring students, building strong relationships with them, and focusing on the priorities that matter most. If designed with educator input, these technologies could free up teachers to do what they do best: inspire students to learn and coach them along the way.

And what the developers of these technologies might need to consider is what matters most is often in the eye of the beholder.

In our survey of teachers, we also asked them to rank duties they think AI robots could replace to help them do a better job teaching. The top-ranked response (44 percent of teachers) said

“taking attendance, making copies, and other administrative tasks,” 30 percent said “grading,” and 30 percent said “translating/communicating with emerging bilinguals.”

But Billington, the Colorado teacher, takes exception to turning attendance over to robots. That is often the one time in which he has a face-to-face interaction with some students. “Do they look happy? Are they sad? What is their mood? I would be sad if I had to give that one up.”

On the other hand, when we spoke, Billington began to calculate aloud the time it takes to grade essays: “If I take three minutes per student, and there are 120 students, that’s six hours of work. And most assignments take longer than that to grade.”

He paused, adding: “If AI could help us figure out a way to help us grade faster, that would be amazing.”

As it is, Billington remains heavily skeptical of AI-powered robots becoming a regular feature in U.S. classrooms in the foreseeable future. But he also cautions educators to never say never. It would be “stupid,” he said, “to think it can’t happen.” ■

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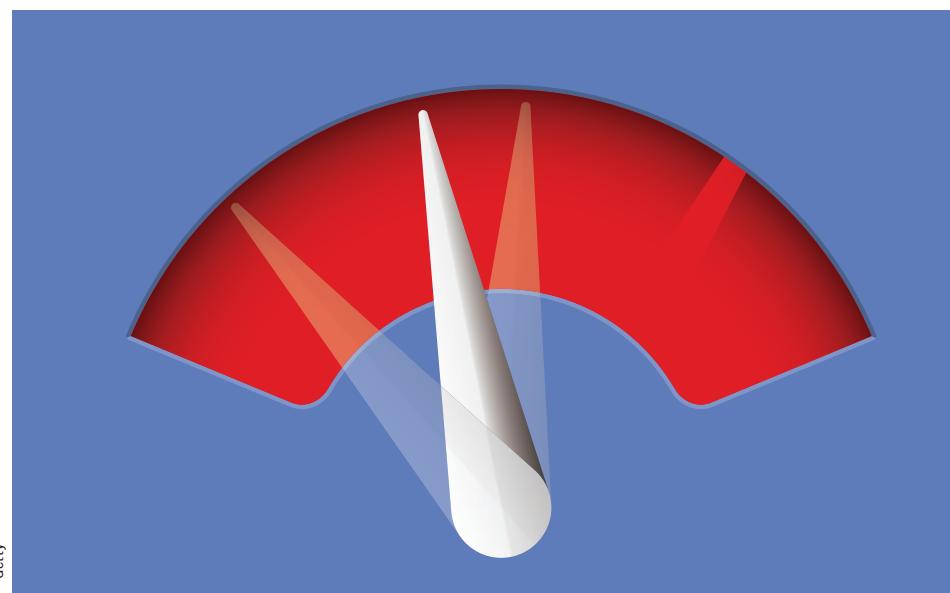
## Digital Learning Tools Are Everywhere, But Gauging Effectiveness Remains Elusive, Survey Shows

By Alyson Klein

**E**ducators are using digital tools to boost student learning more than ever. But few believe there's good information available about which resources are going to be effective in the classroom.

That's the takeaway from a survey released last week by the NewSchools Venture Fund, a nonprofit venture-philanthropy firm that works with K-12 schools, and by Gallup, a polling organization.

The survey found that about two-thirds of teachers—65 percent—use digital tools every day and about 53 percent say they would like to use technology more often. (Those findings present something of a contrast with an *Educa-*



tion Week survey conducted earlier this year, which found that only 29 percent of teachers felt strongly that ed tech supports innovation in their own classrooms.)

Despite the enthusiasm for technology found in the NewSchools-Gallup survey, teachers and administrators also reported that they don't have as much information as they'd like about which digital tools actually help students master content.

In fact, only about a quarter of teachers—27 percent—said they had a lot of information about the effectiveness of the digital tools they used. And only about 25 percent of principals and 18 percent of administrators say there's a lot of evidence-based information available about the effectiveness of digital-learning tools used in their districts.

## A Healthy Dynamic'

More than a third of teachers cited a tool's ability to provide "actionable data on students' progress" at the top of their list of criteria in selecting digital resources for the classroom.

And nearly two-thirds of the educators who took the survey—65 percent—said they've jettisoned a digital tool that they had initially piloted or adopted. Forty-one percent cited lack of improvement in student learning outcomes as a primary reason for ditching a digital resource. And 27 percent mentioned cost.

That's not necessarily all bad, said Stacey Childress, the chief executive officer of the NewSchools Venture Fund.

"You could be of two minds about this," Childress said. "In many ways, [it's] a good sign that folks aren't locked in to things that aren't working well. That's a healthy dynamic."

On the flip side, though, 65 percent is "pretty high," she added. "We need to ensure that by the time the tool gets to the classroom, the product-development process and small-scale evaluation process have made sure the product works for the situation in which it's being implemented—so that more of these are likely to work by the time they get to classrooms."

And she said teachers and administrators need more specifics about what context a digital tool might be suited for.

"There are big gaps between teachers' optimism about what technology can bring to the classroom and their desire to use it even more—and the information that is available to them," Childress said.

In the absence of clear evidence, though, educators say they are testing out digital tools largely through trial and error.

"We end up just kind of trying them out to see if they are going to be a great tool," said Jamie Richardson, the principal of LaCreole Middle School in Dallas, Ore. "You have to get in there and try it out and see how easy or functional it is."

He asks his teachers to regularly share resources that have worked for them. And he speaks often to other administrators to get their advice on the best tools available.

## Lack of Training Is a Problem

In fact, 94 percent of teachers say they are most likely to get information on digital-learning tools from other teachers. Eighty-five percent get the information from their school or district. Nearly half choose from a list provided by their district. And 58 percent say they get input on new tools by looking at social media.

"I fall down that rabbit hole of Twitter way too often," said Kristina MacBury, the principal of Sarah Pyle Academy, a public school in Wilmington, Del., that offers a nontraditional dropout-prevention program and is part of the Christina school district. Seeing how other schools are using new technology "build[s] a snowball of excitement."

Substantial barriers to using technology in the classroom still exist, the survey found. More than half of teachers—56 percent—cited lack of training as a "significant" or "extremely significant" problem. Nearly half say that some teachers believe nondigital tools are more effective. And 46 percent said the problem was that they weren't sure which tools to use.

"We do believe the survey results show, overall, a very positive view among educators about the current use of technology and optimism about using it in the future. It's higher than what was expected," Childress said. "The real story in the survey is a little deeper, in the way that teachers are using it in classrooms. There are things they wish digital tools were better supporting them on."

Still, educators are optimistic about the potential impact of education technology. Ninety percent of teachers say that it's helpful in doing research or searches for information. And 71 percent of teachers, and 78 percent of principals,

## WANTED: Proof of Effectiveness

A new survey shows the percentages of teachers in specific subject areas who report having a lot of information about the effectiveness of the digital learning tools they use.

Reading: **35%**

English-language learning: **31%**

History/Social Studies: **28%**

Math: **27%**

Special education: **27%**

English/Language arts: **25%**

Science: **21%**

SOURCE: The Education Technology Use in Schools report, NewSchools Venture Fund/Gallup

view it as a good tool to get students to work on projects with others.

"Technology helps kids collaborate and think more creatively," said Darren Ellwein, the principal of South Middle School in Harrisburg, S.D. "It really helps facilitate creativity and innovation."

Educators are ponying up their own money for digital resources, too. In fact, more than 4 in 10 teachers reported that they had used money out of their own pockets to cover the cost of classroom technology, according to the survey.

That's happened at Sarah Pyle Academy.

"I always say no, let me reimburse you," MacBury said. But sometimes teachers will "get excited [about something] and say, 'I want to try this out,' or they want to bring it to me with some solid evidence that it's working or why it's working." ■

*The NewSchools-Gallup survey was generated from a sample of 3,210 P-12 teachers, 1,163 principals, 1,219 district-level administrators, and 2,696 public school students. The surveys were conducted from Jan. 29 to March 25 of this year. The survey has a margin of error of 2.1 for teachers, 3.5 for principals, 3.2 for district administrators, and 2.3 for students.*

Published on November 5, 2019, in Education Week's Special Report: Personalized Learning: What Educators Really Think and Do

# Data: Here's What Educators Think About Personalized Learning

Exclusive national survey shows teachers view personalized learning as good in theory, but hard in practice

By Alyson Klein

**W**hen Hinton High School tested personalized learning in a big way two years ago, it did not go as planned.

Students at the Oklahoma school were given digital devices, with the idea that they would use them to work on individual lessons, all at the same time. And that's when educators and students started questioning the approach.

"Personalized [learning] wasn't working across the board," said Jarrod Hohmann, now the principal of the school but a math teacher when the rollout began.

Teachers felt there wasn't enough genuine class-discussion time. Students who fell behind were often reluctant to ask for help. Unmotivated students used the looser structure to slack off. The school, Hohmann said, had taken on too much, too fast by putting personalized learning, including flexible scheduling, in place in grades 6-12, all at once.

"Kids were frustrated, teachers were frustrated, the community was frustrated," he recalled.

Now the school has scaled back the approach.

Hinton still relies on technology to individualize instruction, including for remediation and acceleration. "We still have a digital component to our classes," he said. But "we are using a variety of strategies to teach concepts and objectives."

## Personal Interests, Learner Profiles

As more schools around the country not only embrace but also put in place personalized-learning approaches, educators such as Hohmann see a lot to be optimistic about. But most still view this approach with a critical eye, according to a nationally representative survey of nearly 600 teachers conducted by the Education Week Research Center.

"I think if done well, it could really

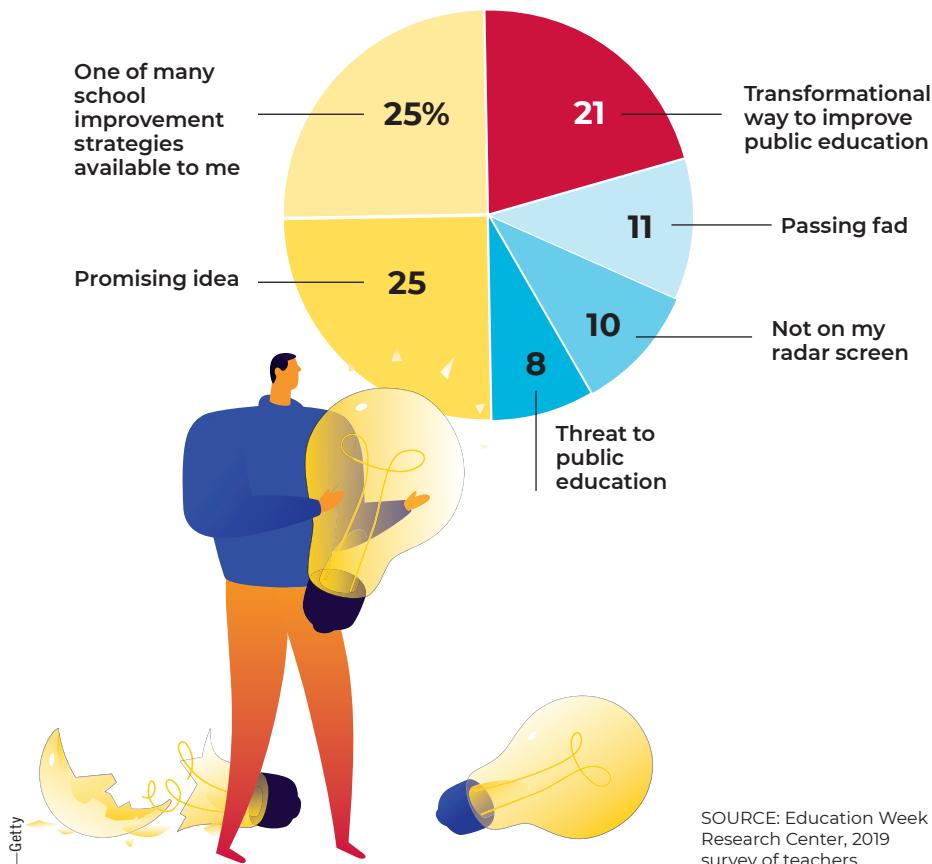
transform things," said Denice Hatch, who teaches kindergarten at Atwood Primary School in Oakland, Maine. But she added, "I've been in education many, many years and I know it's really hard to make systemic change."

There is genuine enthusiasm among teachers for allowing students to infuse their own personal interests into classroom learning. Still, educators find many of the oft-cited tenants of personalized learning—having students set their own

learning goals, letting them give input on how they'll be graded, or using data to construct "learner profiles" of students—difficult, or inappropriate, for the particular grade level they teach, the survey and follow-up conversations with survey participants show.

Half of educators describe personalized learning as one tool in the school improvement toolbox or as a "promising idea," according to the survey. And 21 percent view it as a "transformational

Which of the following best describes how you **perceive** the **personalized learning movement**?



SOURCE: Education Week Research Center, 2019 survey of teachers

way" to improve K-12 schools.

But 11 percent view it as a passing fad. Ten percent say it's not on their radar screen. And 8 percent see it as a "threat to public education." Professional development, in particular, is seen as a trouble spot.

And teachers' use of personalized-learning technologies—such as adaptive software—was not as common as many personalized-learning advocates might expect or hope for: A majority of educators surveyed, 60 percent, say they "never" or "rarely" use adaptive software to let students learn at their own pace.

### 'It Gets Tricky'

Even though a number of educators—and their schools—are supportive of personalized learning in theory, some of the techniques that are a hallmark of the approach aren't widely used. That's in part because they aren't easy to pull off, educators said in interviews. State-required standardized tests are seen as an especially big barrier for more student-centered approaches such as personalized learning.

"That's kind of where it gets tricky, personalized learning," said Paula Meitzler, a 4th and 5th grade resource teacher and behavioral specialist for Rodburn Elementary School in Morehead, Ky. "Yes, we want children to be able to show how they learned how they want to, but you've also got to think they have to be prepared for [state test] too."

Nearly two-thirds of survey respondents said they "rarely" or "never" allow students to set their own learning goals. Just 36 percent said they did so "often" or "always."

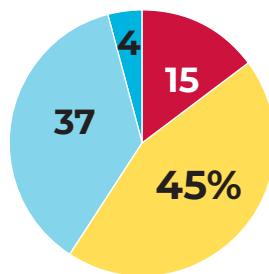
That does not surprise Fawn Jelinek, a teacher at Hunter Elementary School in Fairbanks, Alaska. She said setting "learning goals for 4th graders, that's a little bit ambitious." Jelinek has tried goal setting, but it is more around behavioral plans rather than academic ones, and it is with older kids in elementary school.

Similarly, nearly three-quarters of educators say they "never" or "rarely" use digital software to construct "learner profiles" of students. And 78 percent say they "never" or "rarely" allow students to pick the metrics that will determine whether they are making progress toward their learning goals. More than half say they "never" or "rarely" let students choose how they want to demonstrate what they have learned.

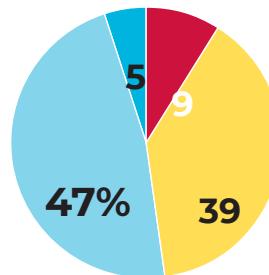


Never    Rarely    Often    Always

How often do you use **adaptive software** to let students **learn core material** at their own pace?



How often do you use **adaptive software** to provide **remediation/enrichment** to students at their own pace?



SOURCE: Education Week Research Center, 2019 survey of teachers

Although it may sound like good teaching practice, there's a downside to letting students determine how they'll be evaluated or graded, said Donna Cogan, a 6th grade teacher for Ocean Gate Elementary in New Jersey.

"Maturity level is an issue," she said. "The immature kids are going to look for the fastest way out. If they are not motivated learners, I think it would be hard to let them set the bar because they'll set the bar low for themselves."

Other personalized-learning techniques appear to be more widespread, even if they aren't used everywhere, according to the survey. Nearly 3 of every 4 teachers say they "often" or "always" integrate students' personal interests into specific classroom assignments and projects.

And more than half of educators, 54 percent, say they "often" or "always" use data from learning software to decide how to teach individual students.

"I like the customizing. I like the quick data that tech provides," said Tricia Proffitt, who teaches English/language arts for speakers of Spanish and English for Belvidere Central Middle School in Belvidere, Ill. "Yes, I could do the same thing with paper [and] pencil, but it would take longer, and I feel like kids would lose out."

But some schools, even those that embrace personalized learning in a big way, don't necessarily rely on technology to make it happen, especially early in elementary schools.

"We are still hands-on books, hands-on pencil-paper," said Jamie Fassett, who teaches 2nd grade for Cottonwood Valley Charter School near Albuquerque, N.M. Teachers at the middle school levels at her school use technology, but she says she often customizes 20 lessons for 20 different types of learners, without the use of digital tools. "It does take more time, but the results and the growth is worth the extra effort."

It's very clear that teachers have qualms about the reliance on technology tools in personalized-learning efforts. Nearly 3 of every 4 teachers worry "quite a lot" or a "great deal" that personalized learning can lead to students spending too much time on computer screens.

Beyond that worry, nearly half have significant concerns that the approach calls for students to work alone too often, almost half are anxious the technology industry is gaining too much say over public education, and more than a quarter worry that it could diminish the role

of the teacher.

"I have a feeling that teachers are going to be cut, cut, cut," Meitzler, the Kentucky teacher, said. "There will only be one teacher for every 60 kids and more online stuff, kind of like the college classes."

But other educators suggest personalized learning actually requires more of teachers.

"There's still a lot on me to plan and make sure that I'm aligning" [personalized learning] lessons with what students need, said Laura Finneman, who teaches special education students for Hickman Middle School in California's Central Valley. "I'm just not standing up there and talking as much." And, in her mind, the dividends on student achievement have been worth it. "I see more progress with them. The only time I've seen growth like this is when I switched from traditional to year-round school."

At least one teacher said he was told to back away from the personalized learning approach. John Davenport, who teaches 7th and 8th grade social studies for Corte Madera School in Portola Valley, Calif., had been allowing his students to write discussion

questions, offered them give-and-take conversations about grades, and allowed more advanced 8th graders to help 7th graders master the course material. Those were all strategies suggested by a former district administrator charged with innovation who recently left the district. But many parents found those approaches baffling, so his principal suggested changes.

Davenport, a veteran educator, spent years using more traditional teaching methods and is ready to reimplement them in his classroom. But he's disappointed by the change.

"I personally feel that it's a bit of a loss, but I totally understand where the district is coming from," he said.

### Not Enough Good PD

Most teachers, 61 percent, describe their principals as "supportive" of personalized learning, and 8 percent say it's a "top priority" for school leaders. But 42 percent of the teachers surveyed said the professional development they had gotten on personalized learning was "effective but inconsistent." And more

than a third reported it's "nonexistent" or "ineffective." Just 23 percent called it "effective" or "transformational."

There hasn't been as much PD "as is needed," Jelinek, the Alaska teacher, said. That's especially true when it comes to swapping resources for personalizing instruction. "Teachers may have found cool tools," she said, but that doesn't mean their colleagues have. "Teachers have so little time to share and talk and explore things that they've done."

Proffitt, however, gave her district's professional development a rave review. She and her colleagues have been able to observe teachers in other schools in the district and even went to out-of-state site visits. "I think everybody is really trying to make sure we're as comfortable as possible," she said.

As for Hohmann, the Hinton High School principal, he still considers himself "a big believer in personalized learning" despite his school's bumpy initial experience. "Schools are going to have to adapt and be willing to give up some control to reach some of these students that personalized learning really does benefit." ■

Published on February 5, 2019, in Education Week's Special Report: Projects, Portfolios, and Performance Assessments

## How Digital Games Take the Stress Out of Formative Tests

By Alyson Klein

NEWWAN, GA.

**S**econd grader Brooks Rudnik hunches over a screen, guiding a purple, sunglass-wearing character through an imaginary world called "Keenville." His mission: help save the planet's animals, in part by showing off his knowledge of phonics. As he answers questions correctly, virtual jelly beans pile up in a corner of his monitor.

Brooks doesn't realize it, but he's taking a test.

Brooks and his classmates here at Newnan Crossing Elementary School are early adopters of the state's newly developed game-based assessment system for 1st and 2nd graders, a group that tends to get antsy about pen-and-paper

tests. Georgia hopes the game—which is also known as Keenville—will eventually act as a formative assessment, giving teachers a real-time picture of how well their students understand math and reading skills like grouping, graphing, and reading comprehension.

Keenville, which was only available in many schools at the beginning of this school year, is still a work in progress. The Georgia education department has released only about a third of the games that will eventually be available. And although the games currently spit out some data for teachers on how their students performed, Newnan's teachers are anxious to get their hands on more-sophisticated student-data "dashboards" that will give more detailed information on student performance on a range of skills and standards.

All Brooks is interested in, though, are those jelly beans, the game's digital reward for correct answers. Students can exchange them for accessories for their avatar in the game—called a "Keen"—or to buy accessories for the Keen's house. Possibilities include a purple lava lamp, an electric guitar, or a fluffy couch.

Brooks' teacher, Brandi Cook, sees a lot of potential in Keenville.

"They love Keenville. They think decorating those houses and their [character] is so much fun and they have no idea that those problems they're solving are really assessing them at all. That's amazing, to have them actively engaged in taking a test and them not know it."

Brooks, she said, told her that he thought there would be "lots of girls around" if he did well in the game and created a snazzy house for his avatar.

The Keenville test grew out of recently passed legislation which called for Peach State districts to develop a system of formative assessments for K-5. After getting feedback from district leaders, Georgia's education department decided to create a game-based test to help districts meet that requirement for the early grades. The state collaborated with the Georgia Center for Assessment at the University of Georgia and FableVision Studios on the project. Districts that opt not to participate in Keenville must use another formative assessment with their 1st and 2nd graders.

So far, about 200 schools are using the games across 76 districts, roughly half the districts in the state. More districts and schools will likely jump on board as more games are released, said Jan Reyes, the director of assessment development for the state education department.

### 'Something That Would Be Ours'

Right now, there are 10 online assessment games that are part of the Keenville suite available to schools. The state's vision is to eventually have 31 games by next fall, including 16 for English/language arts and 15 for math.

There are plenty of off-the-shelf options for game-based assessments. Yet Georgia chose to build its own in part to avoid costly annual licensing fees, making the game more financially viable over the long term.

"We wanted to do something that would be ours and we would own it and we could sustain it over time," Reyes said. She hopes the game can also be more easily customizable and responsive to teachers' needs.

Eventually, Keenville will incorporate games set in make-believe regions that look like different parts of Georgia—mountains, a coastal area, a big metropolis, and even a swamp modeled on the state's signature Okefenokee. The idea is for students from all over the state to see their own community reflected in the game, Reyes said.

One Keenville game—based at a carnival—helps students tell time. Another takes place in a cave where students can unlock a "treasure chest" by reading non-fiction passages on subjects like "air" and then answering questions. Another, called "Peachling Cafe," asks students to figure out how much food the planet's animals need, in part by using a counting strategy.

"They're solving real-world problems," Cook, the teacher, said.

That's by design, said Scot Osterweil, the research director of Comparative Me-



Second grader Jace Willoughby plays the online game Keenville at Newnan Crossing Elementary School. The Newnan school is among dozens in Georgia using the game-based testing system with 1st and 2nd graders. The state plans to develop 31 such games by next fall for teachers to use as formative assessments.



Photos by Dustin Chambers for Education Week

Anna Johns, right, a 2nd grader at Newnan Crossing, plays the online game as her teacher, Brandi Cook, watches. Teachers at the school are hoping the game will eventually provide them with data "dashboards" that show them how individual students are doing on a range of reading and math skills.

dia Studies at the Massachusetts Institute of Technology, who is consulting with Georgia on the design of Keenville.

"What a good game does, in general, is give you an interesting challenge and give you fairly open-ended ways of solving that challenge," Osterweil said. "What we try to do with all these standards is come up with what are the interesting ways in which kids interact with these ideas and can you give the kid an interesting way of working through this stuff, not just here's a math ... question and did you get it right or wrong."

### 'All About Engagement'

Interest in game-based assessment is "definitely burgeoning," said Valerie Shute, an education professor at Florida

State University who has done extensive research on formative assessment. But she hasn't heard of another state attempting a game-based approach at this scale.

She said there are still "tons and tons of unanswered questions" about game-based tests like Keenville, but she's personally a believer. "It's all about engagement. Right now, when people take tests, it's so boring and tedious; it's a turnoff for a lot of people," Shute said.

But she said she would encourage Georgia to run checks to make sure the test can gauge students' skills accurately. "For any assessment to unfold on such a large scale, we need to ensure that validation studies are conducted to make sure that the assessments are measuring what they are intended to measure,"

she said. (The state plans to do validation studies, said Meghan Frick, a spokeswoman for Georgia's education department.)

To be most useful, the test should give teachers a clear picture of how their students perform on specific skills and an understanding of why they missed certain questions. That would be "something that teachers can grab and go with," Shute said.

For now, the state is in the early stages of implementation, still figuring out where the kinks in the program are and how to grapple with them. The state began piloting Keenville last spring and added additional schools this fall. Although teachers can already get some information about how many questions their students answered correctly, they don't yet have a detailed picture of their students' performance.

That will change later this school year, when Georgia is set to release more-detailed dashboards that will give teachers a better idea of how their students are mastering the math and literacy skills the game measures, Reyes, the

state director, said. The state also plans to roll out broader dashboards for school and district leaders.

Eventually, each student will receive both an overall measure of his or her reading comprehension that's used in part to help teachers find books that will be understandable but challenging for the child, and an overall rating of math content knowledge.

At this point, though, Newnan teachers haven't gotten much training on how to use Keenville as a formative assessment, in part because the state is waiting for the more-detailed dashboards to become available.

"Admittedly, it is very basic right now because we didn't want to hold up the release of the games until we had everything that we wanted in the dashboard," Reyes said. "We didn't do explicit dashboard training because we didn't have all the features, so we wanted to wait until we had more to train on."

Georgia's districts have broad leeway in incorporating the game into their classroom instruction. For now, Cook and Tonya Copeland, another 2nd grade

teacher at Newnan, said they have used Keenville to reinforce skills they teach in class and to adjust instruction a bit.

Down the road, they'd like to assign students a game instead of using a more traditional test to check their mastery of a skill.

"Instead of giving them the benchmark or a milestone test or something, I could be giving them a formative assessment that way, with whatever standard I assign them," Cook said. "You would know what to reteach and who to put in what group."

If Keenville is successful, the state may consider expanding the game-based assessments to other subjects and grade levels.

"We see it as a model for where we might want to go with some other things," said Allison Timberlake, the state's deputy superintendent for assessment and accountability. "We could eventually think of some really neat things we can do for upper grades and science. A traditional assessment model may not be able to fully measure what they are capable of." ■

Published on September 26, 2017, in Education Week's *Education Week's Special Report: Schools and the Future of Work*

## How 'Intelligent' Tutors Could Transform Teaching

Teachers' jobs aren't going away, but they could be different

By Sarah D. Sparks

**S**chools may be critiqued as "factories," but robots aren't going to replace human teachers any time soon. Still, that doesn't mean that artificially intelligent systems won't transform education just as they are changing a variety of fields and practices, from the way oncologists diagnose cancer to how lawyers analyze cases.

Intelligent-tutoring systems like ALEKS (for Assessment and LEarning in Knowledge Spaces), Cognitive Tutor, and a new program in development by IBM's Watson initiative are starting to expand in K-12 education, and experts argue that teachers need new training not only to use intelligent systems in the classroom but also to prepare students for careers in

increasingly technology-integrated fields.

"Any skill that a computer can teach is going to be done by a computer in the workplace, and that's something people don't think about enough," said Christopher Dede, an education and technology professor at the Harvard Graduate School of Education. For that reason, he said, teachers can use computer programs not simply to replace pieces of their instruction, but to model for students how to work with technology professionally. "It changes the skills people need to be employed. AI changes teaching, yes, but more important than that, AI changes the goals and purposes of teaching," Dede said.

Artificially intelligent tutoring systems, or ITS, are computer programs that model students' psychological states as well as their prior knowledge to personalize instruction for them. As students

interact with them, the programs collect data about how the students approach each problem, when they are likely to get frustrated, and so on. The system evolves in response to the people who use it, to improve the lessons and assessments it presents.

"In the tutorial, you have a conversation, and the tutor-machine knows an awful lot about your background in the course and can build on that in a way you can't in a regular classroom," said J.D. Fletcher, a researcher with the Institute of Defense Analyses and a primary developer of the U.S. Navy's Digital Tutor ITS, which is used to train Navy staff for technical jobs in the force, such as troubleshooting systems on a ship. "Some of your kids will take one day what it takes others four days to learn. In a traditional classroom, the fast students are left twiddling

their thumbs. ... If you have [an ITS] engaging in a conversation with you, the tutor can just keep piling on the questions to you that are progressively more difficult."

Such tutoring systems have had mixed effectiveness over the years, but more recent programs have shown significant promise. A 2014 meta-analysis of several different ITS found they were as effective in helping students learn as a person leading one-on-one or small-group instruction and more effective than full-sized teacher-led classes, workbooks or textbooks, or traditional computer-based instruction.

A separate evaluation of the Navy's intelligent-tutoring system found those who used it outperformed those using standard technical training—not just on other tests, but also on practical troubleshooting exercises. Navy staff who had been trained using the tutoring program also attempted more challenging problems and tasks than students who had been trained in other ways.

"Whether the [ITS] is like a human or not doesn't matter if it works better in some ways," said Kenneth Koedinger, a professor of human-computer interaction and psychology at Carnegie Mellon University, who helped develop another artificial-intelligence teaching program, Cognitive Tutor. "In a system that big, you can replicate a strategy in a reliable way and try it against a separate strategy and see what works better, very quickly. You can't do that with a classroom teacher."

Yet across the board, researchers developing the programs argue that teachers are critical to making the systems work effectively. "These intelligent-tutoring systems, people always worry they are going to replace teachers," said Art Graesser of the University of Memphis, who developed the AutoTutor and ALEKS systems. "I would argue they don't, but they take over a lot of tasks teachers don't like to do: to grade papers, to cover the same skills over and over. ... In ideal systems, teachers will be creating the material, working with students on broader life goals."

Yet Graesser, Koedinger, and others all agree that teachers need more specific professional development in how to integrate intelligent systems into their classrooms.

"Teachers can say, 'Oh, the tutor teaches X, I teach Y.' That does not work," Dede said. "It's actually a very rich kind of sharing of responsibility between the teacher and the machine. The people who build the intelligent-tutoring systems often don't understand this very well and don't provide support

## Traditional Computer Programs

Preprogrammed lessons or exercises	Information structures, such as concept maps and 1-on-1 tutoring strategies
Student responds to specific computer prompts	Student or computer can ask a question to open a dialogue, pose problems, or provide explanations
Adapts questions based on student's performance on prior questions or on an achievement benchmark	Incorporates prior student data from inside or outside the system, as well as measures of engagement (keystroke speed, frequency of help requests, etc.)
Uses a limited script of questions and responses	May use natural language or demonstrations
System is set	System changes as more students use it

to teachers to implement them."

Chalapathy Neti, the vice president of IBM's Watson initiative, agreed. The Watson intelligent system has already been used to help accountants at H&R Block unravel tax law and to help oncologists at the Mayo Clinic diagnose cancers, but the system is just being launched this year in higher education and preschool. Neti said the group is piloting cautiously, while keeping teachers in the development process.

"The time a doctor has with a patient is very episodic and sporadic, but a teacher is with the student every day. We need to lay a foundation for the learner," Neti said. "We don't think of 'AI' as artificial intelligence, we think of it as 'augmented intelligence,' and we are thinking of how we improve this partnership" between teachers and computers.

Hazelwood East High School in St. Louis is a case in point: When it started using Graesser's ALEKS intelligent-tutoring system, teachers were making a virtue of necessity.

A majority of the 1,300 students there are poor and black, and the school was among the lowest performing in the state in 2010. It used a federal school improvement grant to join a pilot program to use the ALEKS tutoring system for Algebra 1, a subject in which only 6.5 percent of its students were considered proficient.

The school identified incoming freshmen who had previously performed poorly in math and required them to take a double block of algebra: One 90-minute section included traditional lecturing, while the other was a 90-minute lab with ALEKS that teachers facilitated.

"You cannot simply hand ALEKS over to your teachers and say, 'Here's a great intervention, run with this,'" said Mi-

## 'Intelligent' Systems

chael Peoples, then a math instructional coach at Hazelwood. "No. You need a very clear plan and you need to involve teachers in your plan."

It took nearly three years for teachers to really integrate the tutoring system into their instruction, Peoples said, in part because the school's low performance came with tight scrutiny and high teacher turnover. Hazelwood provided collaboration time for teachers, as well as a series of training sessions—first on just the technical aspects of how to use the system and later on how to monitor students' progression and use the results to plan instruction.

As the teachers adjusted to the new system, the school's algebra-proficiency rate climbed steadily, from 6.5 percent in 2010 to 44.8 percent scoring at "proficient" or "advanced" by 2015—even as the statewide algebra-proficiency rate dipped slightly. Last year, the district launched a 1-to-1 tablet initiative and integrated ALEKS into all algebra classes, not just remedial ones.

"Our school at the time was under a microscope," said Peoples, who is now the school's assistant principal, so implementing the intervention "was not presented as an option." As teachers learned more about the system, he said, "it has birthed a movement toward more cooperative learning. ... We began to push more for activities that required students to engage in discourse."

"You began to hear students taking the lead more in class, presenting more, critiquing each others' work and students defending their own work, and talking through their thinking more," Peoples said. "Ultimately, there was a movement from teachers as lecturers to more of facilitators." ■



# How Artificial Intelligence Helps Teachers Improve Literacy Outcomes



By Annelise Mitchell,  
Education Solutions Specialist



**C**losing the connectivity gap and improving access to digital resources in America's classrooms has been a national priority over the past few years. Digital learning is recognized as a necessity, and equitable access as critical for educational opportunity.

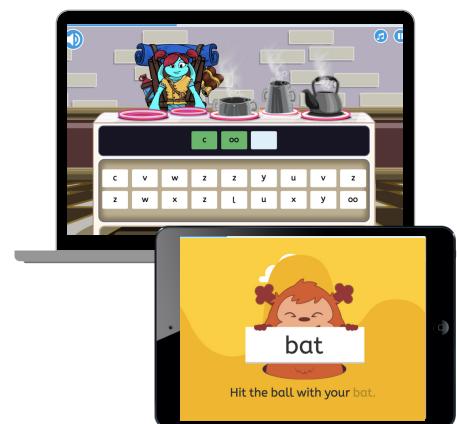
Today, more than 46 million students in 83,000 schools across the U.S. are connected; most teachers use digital resources on a weekly basis, and most educators believe they have a positive impact on instructor effectiveness and student outcomes 1,2.

We know however that access and use of digital resources doesn't in itself lead to proficiency or guarantee better outcomes, as shown by the International Association for the Evaluation of Educational Achievement's (IEA) International Computer and Information Literacy Study (ICILS) 3, and the OECD's Program for International Student Assessment (PISA) findings 4.

As with all teaching resources, it's about using the right ones, in the right way. As Bill Gates once famously said: "Technology is just a tool.

*In terms of getting the kids working together and motivating them, the teacher is most important".*

So, while digital learning can transform classrooms, how can teachers best utilize it to improve early literacy teaching?



The answer is an adaptive program that checks four important boxes: it is evidence-based, curriculum-aligned, comprehensive, and gamified. This offers teachers, and their students, the best of what digital learning can provide for subject teaching. It meets the diverse demands of today's classroom, in a way that only modern technology can.

“

An adaptive program that is evidence-based, curriculum-aligned, comprehensive, and gamified, meets the diverse demands of today's classroom, in a way that only modern technology can.

”

## Personalized learning

In his 2014 book *Digital Leadership*, educator and author Eric Sheninger wrote "...one of the most important shifts needed in schools is to provide individualized and personalized learning experiences ...".

The benefits of personalized learning are many, and well documented. Delivering it in a grade-level English class, made up of different learner types, varying abilities, and needs for support, extension, and everything in between, used to be a challenge.

The shift has now happened, facilitated by developments in software technology, that are making it easy. Artificial intelligence has made its way into the classroom, and drives adaptive software programs, designed to personalize instruction, for optimal individual learning outcomes.

An adaptive program can take best-practice and evidence-based pedagogical approaches, and tailor them for every student in the class.

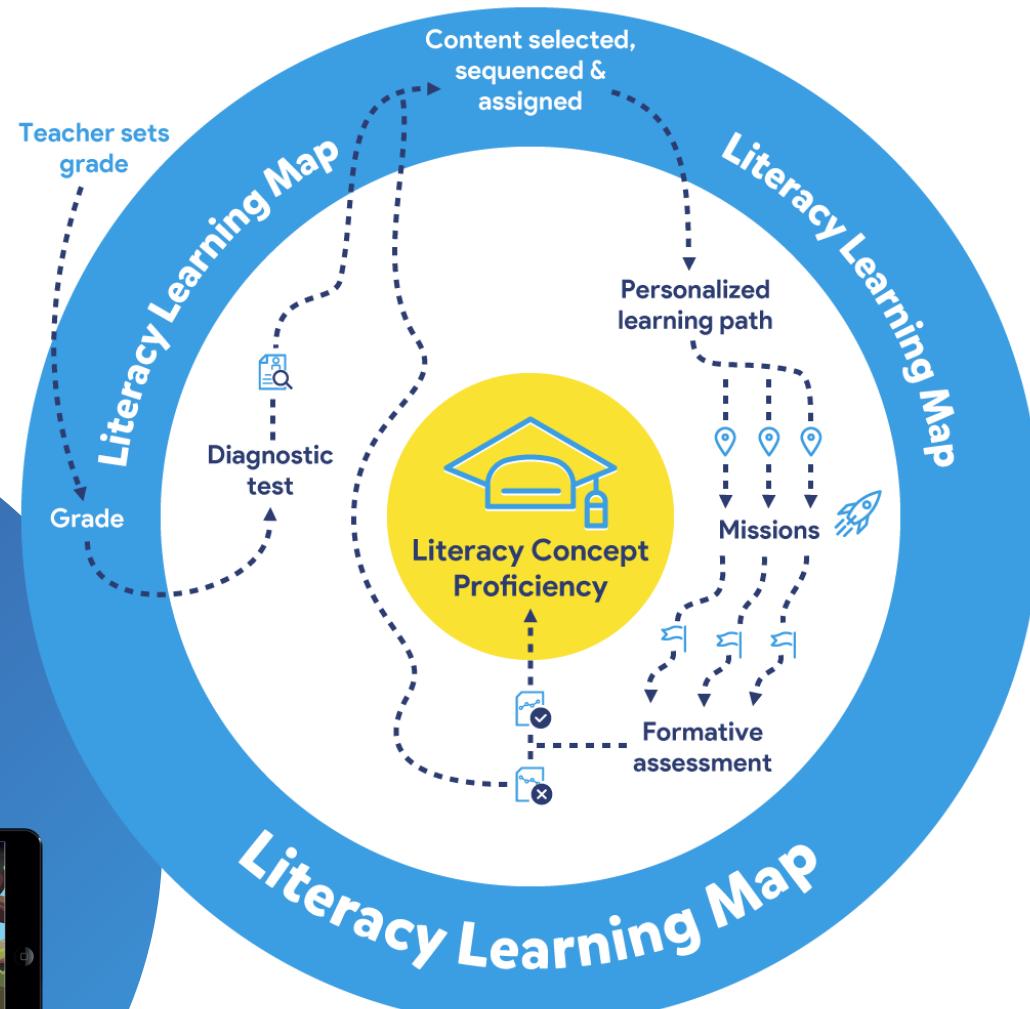
Well-built adaptive programs use advanced algorithms, iterative assessment, and predictive analytics to modify the delivery of content. They respond to individual student performance in real time, and differentiate and customize the learning experience to an individual's needs.

“

Possibly one of the most important shifts needed in schools is to provide individualized and personalized learning experiences to students.

”

Eric Sheninger,  
*Digital Leadership*



## Boosting efficacy

An adaptive program based on the latest advances in learning sciences, and evidence-based pedagogical approaches, provides a resource that teachers can trust, but other key factors will improve outcomes even more.

Content is critical. Every piece of content should be mapped to the curriculum, and the deeper and broader the content available for the program to draw from, to sequence a personalized learning path, the better.

As an example, a systematic approach that combines phonics, including both synthetic (explicit) and analytic (explicit) exercises, with sight words instruction is better for reading acquisition. Research also shows that

combining instruction from different literacy concepts and strands, such as phonics and sight words, with spelling and vocabulary, improves learning outcomes.

Gamification, the integration of game mechanics, also plays a specific role in engaging and motivating students, and has been shown to have various academic, psychological and behavioral benefits. An effective gamified platform improves student participation, enjoyment, and performance. It fosters an enthusiastic attitude to the subject, makes the learning experience more meaningful, and drives students to achieve their best.

Research into the impacts of digital programs with these features is yielding some exciting findings.

Independent clinical trials and in-school studies of LiteracyPlanet's program have found it has a "large and significant" treatment effect on reading outcomes, is effective in decreasing attainment gaps, and students using it achieve better results in a variety of literacy skill areas.

- ✓ **Adaptive**
- ✓ **Evidence-based**
- ✓ **Curriculum-aligned**
- ✓ **Comprehensive**
- ✓ **Gamified**

[Read how teachers across the U.S. and around the world use LiteracyPlanet's award-winning adaptive program.](#)



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## COMMENTARY

Published on June 28, 2018, in Education Week's Learning Deeply Blog

# How Education Technology Can Transform Learning for the Better

By Sarah Ward and Tom Beresford

Lots of people, including many educators, have great faith in the role that technology can play in transforming learning for the better. For decades the unstoppable march of technological progress has promised to unlock a radical shift in our education systems and create step changes in the performance of our schools.

When used at its best, education technology (ed tech) is designed and implemented to support the development of “softer skills” and dispositions that are required to thrive in today’s world (e.g., deeper learning, independent learning, teamwork, presentation skills, confidence, critical thinking, questioning, and digital literacy).

Yet with the potential of technology comes risk.

Researchers at the OECD have warned that the digital divide in education goes beyond the issue of access to technology. A second digital divide separates those with the competencies and skills to benefit from computer use from those without, therefore contributing to the widening of equity gaps. Access to technology can also expose children and young people to new risks that—left unmitigated—can do them serious harm.

### 'What Works' Agenda—Not Just the What, but the How

The evidence base about the impact of ed tech on learning outcomes is still emerging, with a loose global community of entrepreneurs, philanthropists, educators, and policy makers still learning in real time about what works (and what does not) and for whom.

Concerted efforts to grow the evidence base around “what works” are ramping up. The United Kingdom’s Department for International Development (DFID) has proposed investing £19.9 million (US\$26 million) over eight years to form a global “what works” evidence hub to answer key research questions such as



“what works to spread and scale ed tech interventions to deliver better learning outcomes for the poorest children in developing countries?” and “which edtech interventions present the greatest value for money?”

Meanwhile, the Global Partnership for Education has launched a new funding channel—KIX (Knowledge and Innovation Exchange)—and is looking to provide seed funding for promising innovations to leverage ed tech at scale in the developing world; a particular focus will be on classrooms and schools in some of the lowest-resourced countries.

While these initiatives will generate much needed learning about which technological solutions have a positive impact on learning outcomes, they focus on the what. If ed tech is to truly transform learning, we also need to understand the how.

How can designers, policy makers, system leaders, teachers, and other stakeholders come together to make technologies effective, drive innovation and generate new practices? How is the right ed tech integrated into existing teaching practices, school structures, and learning cultures? These are the types of questions Innovation Unit have been raising with organizations and networks who are serious about the sustained use of ed tech for learning. Our

collective knowledge of how to do this well (and how not to do it) exists in the stories of success and failure.

### The Importance of Purpose and Problem-Solving

If we’re serious about ed tech being a transformative force for education, we need to be clear about where we want to get to—what is the purpose of education in a changing world, and what role does ed tech have to play?

Over the last year, Innovation Unit has been working in partnership with Aga Khan Education Services, Aga Khan Foundation, and both UNICEF’s Eastern and Southern Africa, and West and Central Africa Regional Offices (ESARO and WCARO) to research and investigate education technology stories from diverse contexts to understand the complex relationships between purpose, use, context, and impact.

Our research showed that unlocking the value of ed tech is reliant on how teachers, schools, and systems implement it.

Any effective ed tech strategy must first and foremost ask how ed tech contributes to the overall purpose of education and how that should be communicated and owned.

Ed tech must also be in service of problem solving. Systems, schools, and classrooms need to identify a specific teaching and learning problem or opportunity in their context and develop the right education technology strategy, as part of a broader purpose.

### System Story: Singapore's Technology Master Plan

Singapore boasts the world’s top performing education system. Yet it has not taken a backseat in the face of an innovation-driven economy. Currently on their fourth Technology Master Plan (2015 onwards), the Singapore government has pursued a systematic and systemic approach to the introduction of ed

tech into schools and continuing support for its effective adoption and deployment for teaching and learning. Master Plan 4 offers a vision for future-ready and responsible digital learners, where quality learning is in the hands of every learner, empowered with technology. In this vision teachers are designers of learning experiences and environments and school leaders are culture builders.

The country's eduLab—schools that are tasked with developing ICT innovations so that they can be adopted by schools across the system—has adopted better and more advanced data technology to help in science lessons. Instead of using traditional textbooks to understand the theory of gravity, schools have purchased accelerometers and light-gate sensors to allow students to see the results of gravity first-hand. This level of immersion allows students to retain the concepts learned in classes more easily and exemplifies the shift to skills-based learning, where students are not merely memorizing the concepts and laws governing physics, but applying them to everyday life to learn to solve problems.

This growth mentality has resulted in a top-down shift to skills-based learn-

ing and a bottom-up willingness to embrace change and adopt technology in learning to unlock a deeper understanding of the concepts taught.

### School Story: Summit Public Schools

Stateside, Summit Public Schools is a charter management organisation (CMO) operating 11 schools on the west coast of the United States that enroll approximately 2,000 students. Originating in Silicon Valley as a response to surprisingly poor local outcomes (fewer than half of students graduate eligible to attend a four-year college, and one in five drop out altogether), it was founded on the principle that all means all—a place intentionally designed to serve and embrace every individual child in a richly diverse community.

“Summit Learning” is a personalised, project-based learning (PBL) curriculum that puts Summit students “in charge” of their own learning through their Personalised Learning Platform (PLP)—an online tool to help students set and track goals, learn content at their own pace, and complete authentic, deep learning projects using a hands on

and inquiry-based approach. Summit teachers access data from the PLP on how their students are performing on a daily basis and use that to personalize instruction and provide additional support through mentoring and coaching.

Summit's impact has been impressive and is now considered by many as a “school of the future.” Graduates are on track to complete college in six years at double the national average; 43 percent of students met or exceeded math standards, compared to only one in three California students; and 63 percent of Summit students exceeded English language arts and literacy standards, compared to 43 percent of students in the state.

Technology should be interesting and effective for students or users. These stories tell us that this is dependent on particular students in a particular context. Furthermore, being clear about the purpose and specific contribution that ed tech can make is fundamental to both understanding and realising its potential to enrich and transform learning. ■

*This article is by Sarah Ward, researcher and project coordinator, and Tom Beresford, project lead, at the Innovation Unit.*

## COMMENTARY

Published on May 7, 2019, in Education Week's Global Learning Blog

# How Tech Tools Can Engage Foreign Language Students

By Adam Ross

**T**ech-savvy foreign-language educators and coaches are often surprised to hear how many colleagues are hesitant to use tech tools in their foreign-language teaching. Teachers lament that they don't have experience using these tools, worry that things may go wrong, or that they do not really know where to begin.

We are now nearly two full decades into the 21st century, and our students have grown up their entire lives with tech tools at their disposal. They are not all “digital natives,” and we cannot

assume they all have knowledge of how to use technology effectively. Instead, as 21st-century educators, we need to meet our students halfway to use tech for learning.

To assist with this goal, there is a model to help those feeling “tech unsavvy” to not only get started but also to be smart about it, or “SAMRT,” if you will. We will use the SAMR model, which was created by Dr. Ruben Puentedura to help teachers evaluate how well they are incorporating technology into students' learning activities. SAMR stands for “Substitution, Augmentation, Modification, and Redefinition,” and these four stages of using tech tools can be seen

as gradual steps moving toward more robust and transformative uses of tech.

To understand how to use the model, let's examine a simple example where a teacher asks a question in the target language and considers ways that technology can go beyond that basic task to more deeply engage the student by moving along the SAMR continuum.

### SAMR Example

In a novice-level class, a teacher asks students to partner and talk about a food that they like and why they like it. The teacher monitors students' performance by wandering around the class-

room, employing the SAMR approach.

### 1. Substitution

This is when technology can be used as a substitute for analog tools that already exist. For example, teachers might have a recorded set of questions that they play in their class. This use of audio technology substitutes for the teacher asking questions but does not significantly change the nature of the activity, as the students are simply responding to prompts using a recording device instead of engaging in pairs.

### 2. Augmentation

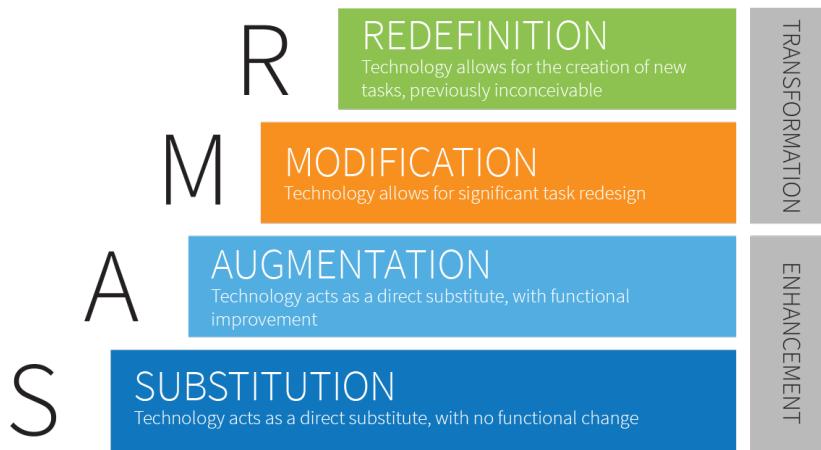
This is when the use of technology enhances the features of a pre-existing tool. In this example, the teacher could place the recorded questions online, allowing students to complete the activity at their own pace, in a location outside of the classroom, or at a different time. While there is an added level of flexibility, the basic task is still not significantly changed.

### 3. Modification

This is when a task is significantly redesigned using technology. For example, the Q&A task could be redesigned using an online tool like Flipgrid, where students could both see and hear their teacher ask the question via a recorded video and then record their own video answer to the Flipgrid page. This modification adds a deeper sense of interaction and the ability of the students to preview their answers and rerecord them if they are not satisfied with their work. Similarly, teachers can personalize feedback for each student.

### 4. Redefinition

This is when new tasks requiring technology can be used to engage students more deeply. Again, Flipgrid could be used for the example Q&A task, and students could also be asked to watch their classmates' video answers and provide their own text or video responses. In this way, students' work is extended, deepened, and even transformed by engaging not only with the instructor but also with classmates and engaging potentially with written interpersonal communication in addition to spoken communication. These are tasks that are more complex and more interactive and that could not have been done easily without the technology.



As you can see, each of these examples adds a level of enhancement to the original task, eventually transforming it into something new and richer. This is our challenge as foreign-language educators—to consider ways to use technology to deepen and enrich the learning experience of our students, especially for novice students.

Finally, a few pointers as you work with tech tools:

- **Start small.** Pick one tool, experiment with it, and try using it a few times in your classes.
- **Be willing to think outside the box.** Think about ways that you would ideally want your students to engage and consider ways where the tool you choose would support that deeper level of engagement.
- **Collaborate!** Find a colleague with whom to brainstorm and practice using one or more tech tools.
- **Get students to help.** Pick one or two students who are tech-savvy and have them assist a class activity using a given tool.
- **Expect things will go wrong.** Technology being what it is, not everything will always go as planned. Expect mistakes, learn from them, and keep refining your use of the tools with your classes. ■

*Adam Ross is a Chinese content and technology specialist at Chinese American International School in San Francisco.*

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