Learning with a personal tutor is one of the oldest and best ways to learn. Hiring a tutor for every student was never a realistic option. Now, new computer programs can customize education for each child. But adding computers to classrooms isn't likely to help unless teachers are willing to change their approach to teaching.

Imagine you're at a dinner party. Someone mentions Crazy Horse and you think, "Who was Crazy Horse again?"

So you whip out your Smartphone and you look it up. (Crazy Horse was the Lakota leader who took up arms against the United States government and won the Battle of Little Big Horn in 1876.)

If you're a student at an American public school, you probably don't have the option of looking up the answer on a Smartphone or a computer. To answer the question you'd probably use a textbook, ask your teacher -- or wait until you got home to use the computer there. While the Internet has profoundly changed the way most people get information and learn new things, most students in the United States do not have regular access to the Internet at school.
"There are [schools] that have one computer for 30 kids or a computer lab that they have access to three times a month," says Sara Schapiro, director of the League of Innovative Schools, a national coalition of school districts that are making heavy use of technology in classrooms.

The League's mission is to demonstrate how schools can use technology to help students learn better. The first step is getting more computers into classrooms and making sure schools have reliable, high-speed Internet.

In June of 2013, President Barack Obama announced a federal initiative to do just that. It's called ConnectED. The goal is to connect 99 percent of America's students to the Internet through high-speed broadband and high-speed wireless within five years.

"In a country where we expect free Wi-Fi with our coffee, why shouldn't we have it in our schools?" Obama asked in a speech announcing the initiative. "Why wouldn't we have it available for our children's education?"

The president's speech was met with thunderous applause. He was at Mooresville Middle School in Mooresville, North Carolina, a small town about 30 miles north of Charlotte.

Mooresville has become something of a poster child for computers in the classroom. Every student in grades three through 12 gets a MacBook Air laptop. Teachers say the laptops have changed the way they teach: less lecturing, fewer worksheets; more student projects, more lessons customized to the learning needs of each student.

But in many schools where computers are introduced, nothing changes about how teachers teach or how students learn.

"Far too often, school leaders fail to consider how technology might dramatically improve teaching and learning," writes Ulrich Boser, the author of a Center for American Progress report on the use of digital technology in public schools. "Schools and districts often see technology as something to add to their current approach rather than something that might change their current approach," he writes. "Schools are not using technology to do things differently."

It's not worth it to spend money on laptops and software if all they do is replace textbooks, says Karen Cator, a former director of the Office of Educational Technology at the U.S. Department of Education and now president of Digital Promise, an organization authorized by Congress to spur digital innovation in America's public schools.

But Cator says it's hard to get schools -- and particularly teachers - to change the way they do things. Teachers tend to teach the way they were taught. "Teachers have something like 15,000 hours of 'muscle memory' about what it feels like to be" a student, she says. Cator thinks it's
harder for schools to change than it is for businesses or other institutions because everyone --
teachers, principals, parents, policymakers -- has an idea, based on their own experience, about
what school should be like.

Some teachers aren't interested in giving up their role as lecturer, says Sara Schapiro, director of
the League of Innovative Schools, which is part of Digital Promise. "If you've taught for 30 years
at the front of the class and all of a sudden your kids are researching things on Google and
coming up with projects where they are the expert on a certain topic, you are sort of ceding
control of your classroom in a way that's uncomfortable for some teachers," says Schapiro. "It's a
new role, to be in a digital classroom. You're not standing in front of the room anymore and
delivering a lecture. You are more of a roving conductor."

Or at least that's the way it should be, but so far technology hasn't
done much to change teaching and learning in most schools, says
Adam Frankel, former executive director of Digital Promise.
"People have been talking about the potential of technology to
transform education for a very long time," says Frankel. Thomas
Edison once famously predicted that movies would make books obsolete in public schools.

Experts also predicted calculators, television, overhead projectors
and electronic whiteboards would change education. "But they
sustained rather than transformed the conventional structure,"
writes Heather Staker, a researcher at the Clayton Christensen
Institute, an organization trying to improve education through
innovation. When it comes to changing schools, what's to say
computers and the Internet are any different?

Karen Cator of Digital Promise says this time is different, because
of the way computers and the Internet have already transformed
business and everyday life. Calculators and whiteboards did not
instigate the same kind of broad cultural change. "If you look at every profession, whether it's car
mechanic or biologist, technology has fundamentally changed" the way they do their work, she
says. "The Internet is not going away."

"It is possible to
teach every branch
of human knowledge
with the motion
picture. Our school
system will be
completely changed
inside of 10 years."

- Thomas Edison, 1913
But Kevin Welner, director of the National Education Policy Center, advises caution when it comes to computers in schools. "We're still talking about what's essentially an experiment," he says.

There's not a lot of research on the impact or effectiveness of digital learning at the K-12 level. Some studies show that when students learn online for part of the school day they learn better than students who are in traditional classrooms with no computers. But other studies show no difference. Welner says computer learning may even be harmful. "We don't know yet."

Welner is particularly concerned because, while most students do not have regular access to computers and the Internet in school now, things are changing quickly. Online learning used to be a novelty; now it's a movement. And he fears the movement is being driven by "excitement about technology, rather than by evidence or by sound learning science."

But Adam Frankel says schools can't wait for the research to show exactly what works and what doesn't. That could take decades, and schools need to embrace the 21st century now, he says. Frankel acknowledges that there's not enough research and that what exists is "uneven and very new." It's precisely because of that, he says, that educators and policymakers need to make sure that schools aren't "diving in whole hog without really appreciating and understanding all of the challenges which need to be dealt with at every stage."

But he believes computers can help students learn better. Frankel says there are a number of schools and school districts that are getting good results -- including the Mooresville Schools in North Carolina. He says those schools have a lot to teach the nation about how to do digital learning right.
Tutoring is one of the oldest ways to learn -- and one of the best. But hiring a tutor for every student was never a realistic option -- until now.

How can schools get the best out of their students? It's one of the most pressing questions in education, and Benjamin Bloom spent much of his life thinking about it.

Bloom was an educational psychologist at the University of Chicago. He's best known for the development of "Bloom's Taxonomy," a tool designed to help teachers promote higher forms of thinking in their students, such as analyzing and evaluating information, rather than just memorizing facts.

Bloom did education research for more than 50 years, until his death in 1999. One of his interests was personal tutoring. It's one of the oldest forms of education: Think of Socrates teaching Plato. Bloom believed tutoring might also be one of the best ways to learn.

In the early 1980s, he and a couple of graduate students conducted a study that compared how much students learned in a typical classroom to how much students learned when they got personal tutoring.
instead. They randomly assigned fourth-, fifth- and eighth-grade students to classrooms of about 30 students per teacher. Another group of students was assigned to work with tutors. The study found that the average student who got tutoring performed better than 98 percent of the students in the typical classroom. That's a dramatic result. Students who had been getting C's were doing as well as or better than the top students in the classroom.

What Bloom took away from the study is that most students had the potential to learn much more than they were learning in school. But a tutor for every student? Too expensive. The challenge was to come up with an affordable method of instruction that would mimic the effects of a good tutor. If teachers and researchers could figure that out, "it would be an educational contribution of the greatest magnitude," Bloom wrote. "It would change popular notions about human potential and would have significant effects on what the schools can and should do with the educational years each society requires of its young people."

Bloom's paper caught the attention of what might at first seem like an unlikely group: computer scientists. But from the earliest days of computers, scientists and engineers had been interested in developing machine-based tutoring systems. The concept can be traced back to the work of another famous psychologist, B.F. Skinner.

In the 1950s Skinner developed a "teaching machine." It was a boxlike mechanical device that fed questions to students and rewarded them for answering questions correctly. The teaching machines were controversial and never took off the way Skinner hoped, but his work got people thinking about the role machines might play in classrooms.

Benjamin Bloom's 1984 study on tutoring was another defining moment in the history of
machine learning. Computer scientists could see more clearly than they ever had before what the benefit of a good computer tutor might be. "That study was extremely influential in terms of developing what are called 'intelligent tutoring systems,'" says Kurt VanLehn, a professor of computer science at Arizona State University.

The technology has come a long way since 1984. VanLehn recently reviewed the research on some of the most sophisticated of these intelligent tutoring systems. He found that the best computer tutors aren't quite as effective as the best human tutors, but they're close. (Kurt VanLehn's review of the tutoring research also found that Bloom's 1984 study overestimated the positive effect of human tutoring. Human tutoring is significantly more effective than classroom learning; it's just not quite as good as Bloom had thought.)

So, why is tutoring so effective? And if students learn better with a tutor, what role should computer tutors play in schools?

Figuring out what makes tutoring effective is complicated. There's a lot going on when a tutor and a student are working together. In his review of the research on computer tutors, VanLehn tested a number of hypotheses about why tutoring works. It essentially comes down to this: A tutor gets you to practice, and practice is how people learn.

"You learn by experience, you learn by doing," says VanLehn. A tutor sits next to you, asks you questions, gives you hints, prods you when you're stuck. A computer can do that too. "A computer tutor just helps a person do," VanLehn says. "It helps them move forward. It helps them stop getting frustrated and stuck, gives them hints when they need it, gives them prompts, gives them encouragement."

It's impossible for a classroom teacher with 30 students -- as there were in Bloom's study -- to sit with each child individually, prodding that student along as he or she practices. Indeed, classroom time is not typically spent getting kids to practice; that's what students do at home, on their own, maybe with a parent or a sibling to help -- or a tutor if the family can afford it.

Classroom time is typically spent in some sort of whole-group instruction; teachers may lecture or run class discussions. Students may also break into small groups to work on assignments or projects. This is often when teachers can help students individually, but it's not the kind of sustained practice and assistance that a student can get working with a personal tutor.

VanLehn thinks the best computer tutors can do a lot to help students learn better in school. But they shouldn't be seen as a replacement for teachers. Rather, VanLehn suggests, computer tutors should be seen as classroom assistants; they can get students to practice, give them hints when they get stuck, monitor their progress, and provide teachers with detailed reports about

The best computer tutors can do a lot to help students learn better. But they shouldn't be seen as a replacement for
what students have learned and what they're struggling with.

VanLehn says even if schools could afford human tutors for every student, he wouldn't suggest tutoring as a replacement for classroom learning. School is not just about understanding the causes of World War II or learning how to do math problems. It's also about the experience of being in a classroom, learning how to communicate and work in groups, how to behave and interact with peers and teachers. Working with a tutor - whether it's a human tutor or a computer tutor -- can't provide that experience, and that experience is important, says VanLehn.

Still, VanLehn thinks figuring out how to use computer tutors well in classrooms could indeed change popular notions about human potential, as Benjamin Bloom had hoped.

People like learning -- but only when the problem they're working on is easy enough to be solved yet difficult enough to take some mental effort. Most schools are not set up to get students to this "sweet spot of difficulty."

Cognitive scientist Daniel Willingham wrote a book called *Why Don't Students Like School?* The book is complex and fascinating - and 228 pages - but you can basically boil the answer down to this: Students don't like school because school isn't set up to help them learn very well.
The first thing to know is that everyone likes to learn.

“There is a sense of satisfaction, of fulfillment, in successful thinking,” writes Willingham.

But it's not fun to try to learn something that's too hard.

“Working on a problem with no sense that you're making progress is not pleasurable,” writes Willingham. "In fact, it's frustrating."

Working on a problem that's too easy is no fun either. It's boring.

What people enjoy is working on problems that are the right level of difficulty.

"The problem must be easy enough to be solved yet difficult enough to take some mental effort," Willingham writes. He calls this the "sweet spot" of difficulty.

The problem with most schools is that kids don't get to their sweet spot enough. There are 20 other kids in the class - or maybe 30 or even 40. Everyone is in a slightly different place. Some kids get it and want to move ahead. Others are struggling to catch up and need more explanation. It's a challenge for teachers. The best teachers try to meet each student's needs. But a lot of teachers end up teaching to the middle. That leaves a lot of kids bored, or frustrated, or both.

"I think teachers are acutely aware that this is an enormous problem," Willingham said in an interview. "I don't think it's easily solved."

You can trace the roots of the problem back to the Industrial Revolution. That's when American public schools as we know them today got started.

Prior to the rise of factories and cities, most people lived on farms and in small villages. Children were typically educated in one-room schoolhouses. "In such environments, education could be individualized," says Angeline Lillard, a professor at the University of Virginia who has written about the history of education.

Not everything was perfect in the one-room school. But if you were 10 and needed to learn addition, that's what the teacher taught you. If you were 5 and already knew how to write your name, you'd move on with the older kids.

Then in 1847 in Quincy, Massachusetts a new kind of school appeared on the scene. Instead of being together in one room, students were separated into classrooms based on how old they were. It was seen as a more efficient way to educate children.
"The whole country was so taken by this idea that we could improve through industrialization," says Lillard. "Mass production was going to be the wings through which we could fly into the future. And schools were no different."

By the early 20th century, some education experts were actually referring to schools as factories. Elwood Cubberley, dean of Stanford University's School of Education from 1917 to 1933, put it bluntly: Schools were "factories in which the raw products (children) are to be shaped and fashioned into products to meet the various demands of life."

"What we lost from the one-room schoolhouse days was individualization," says Lillard. "We replaced that with an expectation that all children be the same."

Today it's a big challenge to deal with the 10-year-olds who haven't learned addition; they're supposed to be doing fifth-grade math. There's not a good way to deal with the 5-year-olds who are ready to move ahead either.

The problem of how to meet students' individual needs is at the heart of today's education debates: the achievement gap, tracking, social promotion. These are among the thorniest and most important issues facing American schools, and they all have something to do with the fact that we expect students of a certain age to be in a certain place with their learning, rather than working with each child individually based on their unique learning needs.

"All students are supposed to accomplish exactly the same goals under exactly the same circumstances by exactly the same date and demonstrate their learning in exactly the same way," says Carol Ann Tomlinson, sounding a bit exasperated.

Tomlinson is an expert on a teaching technique called "differentiated instruction." It's a response to the challenge of working with a classroom full of kids who have different abilities and interests. Rather than teaching to the middle, the teacher offers a variety of lessons or assignments so that the students who are ahead get more challenging work and students who are behind get more practice on basic concepts.

Tomlinson's research shows differentiated instruction can be done. But even she admits it's not easy. It takes talented teachers and good training.

Keona Walker says she learned all about differentiated instruction during her teacher training. When asked how she pulled it off in the classroom, she laughs. She says differentiated
Walker was an English teacher at a high school in Indianapolis, Indiana. In any given class she would have some students who were ready for college-level work and others who couldn't "tell you what the verb of a sentence was." She felt constantly frustrated and unable to meet everyone's needs.

Then she heard about a new school with a different approach to learning. The school is called Carpe Diem-Meridian. It's a public charter school that opened in Indianapolis in August 2012. Students spend part of the day in traditional classes, and part of the day learning on computer. There's an online curriculum; students move through each course at their own pace. When they demonstrate they've mastered the material, they move on to the next level.

Walker is the English teacher at Carpe Diem. She says because students spend part of their day learning on computer, she has more time to work with students individually. And she thinks when students work on their own at their own pace they actually have a better understanding of what they need help with. "These are the things I've mastered. I don't need help with that," they'll say to her. "These are the things that I can read and understand on my own. [And] these are the things that I really need help with." That's what she focuses on with them. She says it's a more efficient way to teach -- and to learn.

Cognitive scientist Daniel Willingham is not familiar enough with Carpe Diem to comment specifically on the school's model. But he says technology is a possible solution to the "sweet spot" problem. He says learning on computers does not necessarily result in better learning, though.

"The technological solutions are more difficult to implement than would appear at first blush," he says. Teachers need lots of training. And he adds: "The software has got to be really good."

The software is getting better. So-called "adaptive learning" programs, which have been around for more than a decade, are designed to adjust to an individual's needs. A student answers questions or solves problems and the software adapts the level of difficulty depending on how the student is performing. Dozens of companies have developed this kind of software. The software varies in quality. Research suggests some adaptive learning programs do help students learn better, but the research is sparse and overall the results are mixed.

Willingham says technology may be a solution to the "sweet spot" problem for some students and some schools. When asked if he would send his own children to a school that uses computers to help teachers individualize instruction for students he says: "The answer would depend a lot on how old my child is." He's not sure...
putting young children on computers for large or even small parts of the school day is a good idea. He says his own kids, who are 6 and 8, don't use computers at all -- at school or at home. He doesn't see any reason his children need to use computers yet.

That's a personal choice, he says, not based on evidence that there's something categorically wrong with young children using technology.

Willingham does note, however, that research shows the emotional connection between a student and a teacher is enormously important when it comes to how much a student learns. He doesn't think students of any age should spend all of their time learning on a computer. The balance between time spent with computers and time spent with other human beings is important for schools to consider as they think about bringing technology into classrooms. Willingham says this may be the most important question -- even more important than how good the software is. Technology is only as good as the way it gets used.

Willingham says in a few years, when his children are in middle school or high school, he might be open to sending them to a school where they would spend part of their day learning on a computer. But he'd have to see the school first and make a decision based on what he thought of the school, and what the other options were for his children's education.

A charter school network is using computers to try to help students learn better.
Seizing the School Day with a New Way to Learn

Elijah didn't like school. It was "monotonous and tiring," he says. "I was kind of wavering away."

Elijah was attending a magnet high school in Indianapolis, Indiana. He says he spent more time during the school day writing songs and drawing than he spent doing schoolwork. Social studies and English were pretty easy; he was just "sliding through." Math and science were a different story. He needed help, but the teachers never seemed to have time.

Elijah's mother was worried. "I could see that I was losing him," she says. But she didn't know what to do.

Then, sophomore year, Elijah heard about a new charter school opening the following fall. His math teacher was helping to start it. The school is called Carpe Diem -- that's Latin for "seize the day." The math teacher told Elijah about Carpe Diem and it sounded like no school he'd ever heard of before.

Students would spend about half of their day in traditional classes. The rest of the day they'd learn on computers. Students would move through the online classes at their own pace. Once they finished a class and demonstrated they knew the material, they'd move on to another class. Tutors would be available to help students when they were stuck, and teachers would have office hours so students could get more one-on-one help.

Elijah thought the school sounded great. He told his mom about it. She liked the sound of it too. "I wish I had had a school like that," she says. "Some of my subjects were so boring. I don't think I retained as much as I should have."

So Elijah transferred to Carpe Diem.

A Prayer Answered

Carpe Diem is a public charter school system. The Indianapolis campus is the first step in what's meant to be a national expansion. A school opened in Cincinnati, Ohio in August 2013. A school is on track to open soon in San Antonio, Texas and there are plans underway to start Carpe Diem schools in Detroit, Baton Rouge, and Washington, D.C.

The Indianapolis campus is called Carpe Diem-Meridian. It's located on North Meridian Street, about two miles north of downtown, in a brand new two-story building across from a Wendy's and a liquor store. The school opened in August of 2012. It's designed for 300 students in grades six through 12; the first year there were about 90 students.

The school's founder, Rick Ogston, was a Christian pastor before getting into education. The idea for a school where students would spend part of their day learning on computer came to him after a prayer.

It was 2003. Ogston was running a charter school in Yuma, Arizona. He describes it as
a "traditional" school with "traditional teachers, in traditional classrooms, doing traditional things." The school had been open for a few years and things were going pretty well. Test scores were fine. But Ogston felt something wasn't right.

One day he was walking the halls of the school, peering into classrooms. He saw students sitting quietly at their desks, listening to teachers lecture. Everyone looked kind of bored -- the teachers and the kids.

He went back to his office, put his head on his desk, and prayed for guidance.

When Ogston opened his eyes, the first thing he noticed was the cell phone clipped to his waist. Then he lifted his head, "and I looked on my desk and saw the computer." He scanned his office and noticed other forms of technology -- a copier, a fax machine. These were devices he rarely thought about, but now, looking around his office, he realized how much technology had changed the way he worked and lived his life.

Technology had not changed school, though. "We had some of it in classrooms," he says, "but it wasn't nearly being leveraged or used like it could be."

Ogston began to imagine a new kind of school, where students would use computers for their work as much as he did for his. Teachers could stop lecturing if students watched lectures on a computer instead. Teachers could then use class time to answer questions. Some teachers and professors around the country were already experimenting with this approach; it's known as "flipping the classroom." But Ogston didn't know about that. He was following his instincts.

Transforming his school from "traditional" to something new wasn't going to be an easy feat. He predicted teachers and parents would resist.

But then, as Ogston sees it, God intervened. The school lost its lease and the only space available in Yuma was a huge, open room in a University of Phoenix building. There was no way to turn the space into traditional classrooms. To keep operating, his school would have to do things differently. Ogston seized the opportunity to make his vision a reality. All of the students were going to be in one room, working independently on computers. It would be like a one-room schoolhouse for the 21st century.

**A New Kind of One-Room School**

Elijah is now a junior at Carpe Diem-Meridian in Indianapolis. He's sitting at his cubicle in the "learning center." That's what Carpe Diem calls the big, open space where students work on their online classes. It's the one-room schoolhouse Rick Ogston imagined in 2003.

The learning center looks more like a call center or an insurance agency than a school. Students decorate their cubicles with family photos, knick-knacks, pictures of movie stars.
and paraphernalia from their favorite sports teams. Everyone has made a sign with their name and what they intend to be when they grow up. They post these signs prominently in their cubicles. School leaders expect and even encourage students to change their intentions; the point is to always have a goal, some larger purpose for getting through school.

Elijah's sign says he wants to be a psychologist and a musician. His friend Aaron, sitting one row away, wants to be an audio engineer.

Aaron is 17, a junior like Elijah. They went to the same magnet school last year. Aaron is wearing red high tops and a black hoodie with white stripes. He's got a shadow of a mustache, dark brown eyes and an intense expression. He was working on an English paper earlier in the day but he was feeling kind of stuck. "Writer's block," he says. So now he's focusing on pre-calculus, watching a teacher he calls "the math wizard" deliver a video lecture. "He really is a wizard," Aaron says. "This makes no sense, but he knows exactly what he's talking about." He laughs.

Aaron took pre-calculus last year at the magnet school he went to with Elijah. Aaron thought the class was boring. He skipped a lot, and he didn't do well on the tests. But the teacher - who knew Aaron was generally a good student -- said to him, "I know you know this." And he gave him an A.
It bothered him to get an A when he hadn't done the work and didn't understand the material. Aaron says being able to really learn something is "a powerful thing."

After Aaron watches the pre-calculus lecture and does some review problems, he decides he’s ready to take the unit test. He gets out his iPod, loads up some hip-hop, and gets down to work. An hour later, he's done. He presses submit and gets his score back in seconds. Ninety-two percent.

Tutors to Help Kids Learn

Students at Carpe Diem use an online curriculum called Edgenuity. The company offers more than 125 courses for grades six through 12. Students watch videos, complete assignments, and then take quizzes. If they score at least 80 percent on a quiz, Carpe Diem allows them to move on to the next lesson. If not, they go back and watch the video lectures again. There are tutors in the learning center, available to answer questions. Carpe Diem calls them "coaches." They carry tablet computers that provide real-time information about what each student is working on and how each student is doing.

Josh McKinney, a bear of a man with a bushy beard, is one of the learning center coaches. He calls himself an "academic trouble shooter." McKinney is working on his master's degree in special education and plans to be a teacher. He likes being a coach; his job is about developing good relationships with students and understanding what they need.

"There's one student I have to check up on every fifteen minutes to make sure he's still working," says McKinney. Some students need to be monitored; others get their work done without needing a push. If the ones who are diligent put their heads down on their desks for a quick nap or get up to walk around the learning center for a few minutes to stretch their legs, McKinney won't bother them. But he's like a hawk on some of the kids.

Out of the corner of his eye, McKinney notices the boy who needs to be checked in on every fifteen minutes. He's wandering around, distracting other students by poking them and giggling. McKinney strides up with his tablet computer tucked under his arm and a stern expression on his face.

"What are you doing?" McKinney asks.

The student, a redhead with freckles and a smirk on his face, says he's taking a break because he finished a biology test.

"I'm aware," says McKinney. "I looked at it this morning." He taps on his tablet, reminding the kid that
he knows exactly what the kid is supposed to be doing.

"Forty-four percent," McKinney says, lifting his eyebrows. That's how the student scored on the biology test.

"Yeah," says the kid, shrugging his shoulders and turning his smirk into a shy smile.

"Not so hot," says McKinney.

"No," says the kid, wincing a bit without shaking the smile.

"Do you need to go over the lessons again?" asks McKinney.

At first the kid says "probably not" but he makes a quick recalculation when he sees the expression on Coach McKinney's face.

"Yeah, I probably should," he says, nodding his head to punctuate his intention.

The kid strolls back to his desk and McKinney watches until he sits down and starts working.

Once students have successfully completed all the assignments, quizzes and unit tests for a course, they go to a testing room next to the learning center and take a final exam, monitored by a proctor. If they pass the exam with at least an 80 percent, they move on to the next class.

Some students are way ahead. One girl, a seventh-grader, started the year testing at a ninth-grade level in math. She ended the year at an 11th-grade level. The same student came in at a second-grade level in science. By the end of the year, she was testing at a sixth-grade level.

When you ask students what grade they're in, some of them will look at you funny. One student said: "Do you mean upstairs or downstairs?" Upstairs is the learning center where students work at their own pace on computers. There they don't really think of themselves as being in a particular grade. Downstairs is different. That's where students go for their classes, which are called workshops. There they are grouped together by the grade they would be in at a conventional school.

**Where the Critical Thinking Happens**

Aaron and Elijah are in 11th-grade social studies workshop together. The class begins with the teacher, Alyssa Starinsky, asking the students what music they want to listen to. Aaron suggests James Brown and Starinsky fires up "It's a Man's Man's Man's World" from her laptop.
As the music plays, the students get down to work. There are just six students in the class. Today's assignment is to gather data about a controversial topic and use that data to make opposing claims about the topic. The goal, according to Starinsky, is to get students to think critically about how data gets used. Aaron is researching ADHD. He's finding lots of articles and data online that says ADHD is a mental disorder.

"Look at some of these facts," he says to Elijah, who is sitting next to him looking a bit like a college professor in a V-neck sweater and thick black glasses. Aaron reads from a list of ADHD symptoms.

"Leaves seat when remaining in seat is expected." Aaron frowns and shakes his head. "That just shows a failure to meet expectations," he says, "and not so much a problem with the child themselves."

Aaron is skeptical that ADHD is a mental disorder. He tries to find facts that support his point of view but he's having a hard time. "I feel like I want to do a study on this," he says to Elijah.

This is exactly the kind of thing teacher Alyssa Starinsky wants to have happen in her social studies class. Upstairs in the learning center students learn facts and information; downstairs in workshop is where she says the "critical thinking" happens. And it's where, she hopes, students learn to love learning.

Starinsky used to teach in a traditional public school. "If there could have been a cartoon of what it looked like I always pictured opening a student's head and pouring in and jamming in as many names and dates as possible so when they took that standardized test, they would be prepared," she says.

Starinsky felt boxed in by all the material she was supposed to cover in class. There was never enough time for group discussions and projects. She was drawn to Carpe Diem because she felt like she could be a better teacher here.

Josh Woodward feels the same way. He's the math teacher who helped start the school and told Elijah about it. Woodward says teachers at Carpe Diem aren't bogged down by the need to lecture or solve problems at the board. They don't have to grade tests or quizzes either. The online system does all of that.

"I don't need to teach every student in this school how to calculate the slope of a line," he says. "If every student in this school needs me to teach them how to calculate the slope of a line, I'll be happy to. But I don't need to."

When Woodward says every student, he means it. He is the only math teacher at Carpe Diem. He's responsible for teaching all the students in grades six through 12. In total, there are just five teachers here: one for math, one for English, one for social studies, one for science, and one for physical education. (Carpe Diem has a weight room and cardio equipment. Students move through a physical fitness program at their own pace much like they do in their academic subjects.)

Since the school has just 90 students so far,
Some critics of Carpe Diem home in on the fact that its model uses fewer certified teachers. They say the school is replacing teachers with computers. Woodward responds by saying all schools are facing the challenge of how to do more with less, and this is a solution. He says the Carpe Diem model requires fewer teachers, but it requires better teachers -- the ones who are really good at encouraging their students to think deeply and critically. He thinks the nation might be better off with fewer teachers, but more excellent ones.

**It Doesn't Work for Everyone**

Elijah says Carpe Diem was exactly what he needed. "I didn't know how hands-on teachers could truly be with each student," he says. "I wouldn't trade it for the world."

It's working for Aaron too. What he likes best is the freedom. "The freedom to learn in a way that's comfortable for you," he says. "It's not comfortable for everybody."

By May of 2013, Carpe Diem had lost about 20 percent of the students who had started in August of 2012. It also gained some students during the school year. Ogston believes that when students leave Carpe Diem it's not because they can't be successful with the school's approach to learning. Rather, they don't want to be.

Most American students are "used to being told what to do and when to do it," he says. "So when they come to us there's a sense of, oh my God, what do I do?"

Ogston says you have to be independent and self-motivated to make it at Carpe Diem, but he insists those are skills students can learn. And he says students need to learn those skills to be successful in college and in life.

Tom Gaunt agrees. His daughter Kristina is a ninth-grader at Carpe Diem. He found out about the school on a local news program. What caught his attention was the idea that she could work at her own pace.

Kristina was behind in several classes at the Indianapolis public school she went to last year. Gaunt says she was unmotivated. He had to constantly pester her to do the work. He was afraid
Now, he says, his daughter is a different student. Teachers at Carpe Diem helped her "fill in what she was missing." For example, Gaunt says Kristina started in sixth-grade science. By the end of the year, she was back on track. And the best change? He doesn't have to pester her about schoolwork anymore. "She was not self-motivated when she started and I'm not sure how it happened but she became motivated," he says. "She doesn't need to be pushed."

Kristina, who is shy and soft-spoken and wears a huge flower in her hair, says the difference between Carpe Diem and the school she attended last year is this: she feels in control at Carpe Diem. Every day she knows exactly how she's doing; it says so right on her computer screen. At her previous school she would take tests and hand in assignments and sometimes wait weeks to get grades back. By the time she knew she was failing, it felt like it was too late to do anything about it.

Kristina says Carpe Diem doesn't work for "kids who don't care about school." But she was one of those kids until she came to Carpe Diem.

**Results**

Students at Carpe Diem move through school at their own pace, but as in all Indiana public schools, students must complete the courses required by the state for high school graduation. And they must take the state standardized tests.

High school students take standardized exams in biology, English and algebra. Because Carpe Diem is so small, there were only 24 students eligible to take these tests in 2013. Six students took the English exam and they all passed. Eight students took biology; one student failed, but that student started at Carpe Diem more than halfway through the school year, so the score doesn't count. Ten students took algebra. All but one student passed. According to Carpe Diem, the student who failed the algebra exam started at a fourth-grade level in math and made several grade levels worth of progress, but not enough to pass a high school-level test.

It's not clear whether these kinds of results can be sustained. The original Carpe Diem charter school in Yuma, Arizona started using a digital learning model in 2005. At first test results were high there too. But test scores have gone down in recent years. It's not clear why. Ogston says the school leadership has been in disarray. He's left Indianapolis and gone back to Yuma to try to turn things around.

Carpe Diem has been attracting a significant amount of national attention in the last few years. Ogston appreciates the interest in digital learning but says he's a bit uncomfortable in the limelight. "It is much easier to innovate when nobody knows you," he says. "Now, if [we] screw up -- if one school doesn't have the right scores - people are going to go, 'See, I told you so.' Rather than go, 'I wonder what went on, it was working so well, I wonder what happened?'"
Ogston says there are lots of people who think digital learning is a bad idea. They point to the struggles the Yuma school has been having and see proof that they're right. Others are champions of digital learning and point to the Indianapolis school to say digital learning works.

"Everybody wants to use us as a proof point," says Ogston, his voice rising with emotion. "I don't want to be used." He insists he didn't create Carpe Diem to prove a point. "I just want to help kids."

As Carpe Diem continues to make plans for more schools across the country, Ogston will likely have a hard time escaping the limelight. But he warns: "We don't have the silver bullet."

Ogston urges educators who are interested in digital learning not to copy Carpe Diem's model. Rather, he says, "look at the spirit of what we're doing and see what could you do to personalize [education] and innovate in your own arena, wherever that is. And do that."

A public school system in North Carolina turns to computers to shake up teaching and help students learn better.

Lessons from the Mooresville Public Schools

When Mark Edwards was superintendent of the Henrico County Public Schools in Virginia, he did something that few school systems had ever done before. He started what's
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It was the year 2000 and Edwards could see that computers were rapidly changing the way people got information and learned new things. He and others in the school system were concerned that kids from families who couldn't afford computers were going to be left behind.

"We felt a real urgency around addressing a digital divide," he says. The school system believed laptops for all could be a "pathway for equity."

The growing gap between kids from poor families and everyone else was a big concern for school leaders in Mooresville, North Carolina too. As in most school districts, students from poor families were not doing as well as other students on standardized tests.

Mooresville is a working-class town about 30 miles north of Charlotte. The poverty rate was rising. The textile mills that had allowed generations of families to live a middle-class life had recently closed. Times were tough.

So when the Mooresville school board was looking for a new superintendent in 2007, they decided they wanted Mark Edwards. They told him they wanted a laptop program like the one he'd started in Virginia.

Edwards took the job. He laid out his laptop plan in a speech to staff and teachers.

"I was not clapping," says Mooresville Middle School math teacher Maureen Fitzsimmons.

It's not that she didn't want to help students from poor families, but the idea of every kid having a laptop in class kind of freaked her out.

"They know how to use computers a lot better" than adults do, she says. It made her uneasy to think students would know more than she did. She was used to being the authority figure in her class. Teachers were supposed to know more than their students – about everything. "We were almost like a dictator in our classroom," says Fitzsimmons. But not anymore.

Changing Teaching

Maureen Fitzsimmons teaches 8th grade math. It's a Wednesday morning and students in her pre-algebra class are divided into groups, working on a project that combines math, geography and learning about colleges. Two students -- Kassie and
D'Aja -- are bent over a large map of North Carolina. They're using a red ruler to measure the distance between Mooresville and Western Carolina University. But they don't know where Western Carolina University is. So they Google it on their MacBook Air laptop.

"It's in Culla... Cullo... wa hee," says Kassie, stumbling over the pronunciation of Cullowhee, where the university is located.

"Oh, I've seen that!" exclaims D'Aja. She scans the map. "I'm telling you I've seen that somewhere."

After searching in vain for a minute, D'Aja and Kassie turn back to their laptop to look up what county Cullowhee is in. Armed with that information, they locate Cullowhee on the map. They squeal with excitement when they find Western Carolina University.

Math class didn't used to be like this. Like a lot of math teachers, Maureen Fitzsimmons used to spend most of her time at the board, doing problems and taking questions. There were always some kids who were impatient because they understood the math and wanted to move on. But there were always other kids who were confused and needed her to do another example, and then another.

The laptops offered Fitzsimmons a way to solve this problem. Instead of lecturing during class, she now uses a document camera to record herself doing problems, and the students watch the videos at home.

"It helps the kids that struggle," she says. "They can pause and rewind and pause and rewind me." And the kids who get it can watch the video once and be done.

Fitzsimmons says the laptops have changed a lot of things about the way she teaches. Since she isn't spending class time doing problems at the board, there's more time for students to do projects and group work. It's challenged her and other teachers to come up with new lesson ideas.

Teachers are looking for things that will "hook" students now, says Fitzsimmons. "What will engage them? How will they learn the concepts I want them to learn by applying it to something that is relevant to them?"

It was difficult at first to come up with ways to do this. Fitzsimmons says she turned to her colleagues for help, something she wasn't used to doing.

English teacher Bethany Smith wasn't used to doing that either. Teachers would "go in their classrooms, shut their door, and you did your own thing," she says.

But there's more collaboration now. Teachers trade lesson ideas and share websites and other online education resources. They also assign more projects across disciplines than they used to.

The map project that Kassie and D'Aja were
working on is an example. Fitzsimmons came up with the idea for that lesson with the eighth-grade social studies teacher, who is teaching North Carolina geography and history. Fitzsimmons says laptops make interdisciplinary projects easier because students have the coursework and textbooks for all of their classes at their fingertips. A kid doesn't have to run to his locker to get his social studies textbook if a geography question comes up during math class. He can look at his textbook online, or just use the Internet.

Having laptops makes it easier for teachers to manage the paperwork of interdisciplinary projects too. Students submit all of their work online so every teacher can access it. There's no passing papers around or making copies. It saves lots of time -- and it even saves money that would otherwise be spent on paper and copiers.

Fitzsimmons has come to love the laptop program. "Looking back now, it was such a huge gift," she says. But it took a while for staff and teachers in the Mooresville Schools to figure out what the laptops could do for them -- and for their students.

**Personalized Learning**

It took superintendent Mark Edwards a while to figure out everything the laptops could do too.

When he introduced the one-to-one laptop program the goal was to even the playing field for kids from poor families. But Edwards soon realized that laptops could do more than that. Laptops could help teachers reach students in new ways by customizing lessons to each child's ability level and learning needs.

The epiphany came in a conversation with Karen Cator, then the director of Education Leadership and Advocacy for Apple Computer, who would go on to serve as director of the Office of Educational Technology at the U.S. Department of Education. It was a year or so into the laptop program. Apple was a fan of what Mooresville was doing -- perhaps in part because Mooresville was leasing lots of Apple laptops for their students. Cator came to visit. She told Edwards about computer programs that could "adapt" to a student's learning needs. The technology was relatively new, but Cator told Edwards she thought it had the potential to be a "game-changer" in education.

"I really didn't understand it," Edwards admits. "But I really do see it now."

The Mooresville Schools use a variety of programs that help teachers customize education for each student. One of them is called "Study Island."

English teacher Bethany Smith's eighth-graders are using it in class today. They've just finished a class discussion about the book *The Outsiders*. Now all the students
have their laptops open, looking at reports the Study Island program has generated based on a grammar test the students took.

Kassie got a 73. But the report tells her much more than her score. It tells her what she did well on, and where she struggled. Smith is walking around the class, looking at each student's report. She gets to Kassie, leans down, and takes a look.

"OK," Smith says, "your first assignment will be adjectives and adverbs."

That's the area where Kassie needs the most work.

"Your second will be subject-verb agreement."

Kassie nods and says, "OK."

"Your third will be interpreting figures of speech."

The teacher asks Kassie if she has any questions and she shakes her head no. Kassie knows the drill. She'll go online and complete a customized series of assignments to practice the skills where she's weak. The next test she takes will be customized based on how she does on those assignments.

Smith says Study Island is a useful tool, especially for students who are behind.

"It doesn't help a child to just keep saying, try harder, try harder, try harder," she says. "If they really don't know what they need to try harder on, or what they need to practice, then how is their overall score going to improve?"

She says Study Island helps students who are ahead too. It adjusts to their skill level and gives them the challenge they need. Students use a similar program in math.

Math teacher Maureen Fitzsimmons says her fear that students would know more than she does about how to use computers has given way to a new understanding of what it means to be a teacher.

"It's OK that they know more," she says. They teach her new things all the time. And they teach each other. She says school is no longer so much about what teachers teach; it's more about what everyone learns.

"It doesn't help a child to just keep saying, try harder, try harder, try harder. If they don't know what they need to try harder on, or what they need to practice, then how is their overall score going to improve?"

- Teacher Bethany Smith
School is more fun, says science teacher Mark Buda. "I don't hear as much anymore, 'Well why do I have to learn this?' or, 'How am I going to use this?'" he says.

"It's a better way to learn," says an 8th grader named Alisyn. She moved to Mooresville from California three years ago. She says it was "kind of weird at first" to use computers in school. But now she can't imagine going back to paper and pencil.

Math teacher Maureen Fitzsimmons says kids actually like to learn now. "The excitement and the engagement has just completely changed...." She trails off for a moment, searching for the right word. "...school." The laptops have completely changed school.

Results

Before the laptop program began in 2008, only 73 percent of students in Mooresville were scoring proficient on the state's standardized tests. In 2012, 89 percent of students scored proficient. Mooresville was the second highest performing school district in North Carolina.

The high school graduation rate went from 77 percent to 90 percent in that same time. Students from poor families are now graduating at nearly the same rate, on average, as other students: 86 percent. And African-American students are doing better than any other group. The black graduation rate went from 67 percent in 2007 to 95 percent in 2012.

It's impossible to say whether the district's success is because of the laptop program, and school leaders are up front about that.

"We did mess up the research," says Mooresville Middle School principal Carrie Tulbert, because other aspects of the school district changed, too. "We didn't do it on purpose, obviously. But it would not be accurate to say" that laptops are the only reason Mooresville Schools have improved.

When Superintendent Mark Edwards came to Mooresville, he made a number of changes, such as adjustments to the curriculum and a new program focused on building better relationships between teachers and students.

Any one of these things could have made a difference. And it could just be that people in Mooresville got behind something new and by all pulling in the same direction, they improved their schools.

Mooresville Middle School Assistant Principal Angelo DelliSanti says technology doesn't change education, people do. "If you take laptops and you put them in a school where there are low expectations and no instructional leadership, what you're going to have are students doing worksheets on the laptop," he says. "Now they're just using a text edit tool to fill in their answers."

DelliSanti watched this happen at a school where he used to work. The school got a grant to give everyone a laptop. But teachers didn't get much training. They weren't thinking about how technology could change teaching and learning. Computers were not
It's critical to have a sustainable financial plan, says Superintendent Mark Edwards. Mooresville has written the costs of the laptop program into its annual budget.

"It comes down to about $200 per year per student to buy the hardware, all the software, and all the maintenance," says Edwards. That's about $1.3 million a year -- and it's a stretch for Mooresville. When it comes to school funding, the district ranks 108 out of 115 districts in North Carolina.

The district is committed to continuing the laptop program even though its budget has been cut 9 percent since the recession. Teachers have been laid off and class sizes have gone up. Classes at Mooresville Middle School have gone from an average of 18 students per class to an average of 30 students per class. But Edwards says teachers can manage larger class sizes better when every student has a laptop because students can do more on their own, and teachers can still follow student progress closely with the help of computer programs that track their performance.

Education Tourism

The laptop program has created a bit of an education tourism industry in Mooresville. Principals, teachers and other educators come from around the world to see for themselves how the program works.

The school district hosts six tours a year; there's a waiting list to get in.

"I'm here because I'm interested in how you do better teaching with technology," says Ed Sharp, a science teacher from the Carlisle School, a private school in Martinsville, Virginia. He's one of about 70 people who visited Mooresville Schools in February 2013.

Sharp has some reservations about technology in the classroom. His chief concern is that students will sit in front of screens all day, working alone. He thinks successful schooling includes learning how to work with other people.

At Mooresville Middle School he walks into a seventh grade social studies class where the laptops are on, but no one is working alone.

"This is the Israeli side, this is the Palestinian side," teacher Justin Phillips explains to Sharp, speaking loudly to make himself heard over the din of student voices.

The students are divided into groups, each group huddled over maps they drew with paper and pencil. They're discussing how Middle East land and resources should be divided up.

"Once they get their borders together, they're going to come to an agreement," Phillips
Students at Mooresville Middle School in North Carolina work on their laptops. February 2013. Photo by Stephen Smith.

A teacher's job isn't to have all the answers. A teacher's job is to ask the right questions.

- Principal Carrie Tulbert

explains. "And then we're going to see if peace can be attained. Wish us luck!" he says smiling.

Visitor Ed Sharp approaches the group representing Palestinians. Sharp peers at the borders they've drawn. "So you're thinking about it from the Palestinian point of view," he says. "How are you avoiding saying, 'We want all of this, and too bad for you'?"

The kids look at him skeptically. One boy says, "That's why we split it in half."

Another boy chimes in. "They both have water, fresh water."

The students just spent several minutes debating how to draw borders so both Israelis and Palestinians got fresh water. They're proud of their solution. They've also decided that Israel gets the West Bank and Palestinians get the Gaza Strip.

"It's not, like, uneven," says a boy.

Sharp peppers the students with more questions. Gradually the kids realize that achieving Middle East peace is a little more complicated than they thought. One student lets out a big sigh and exclaims, "Social studies is hard."

Another kid chimes in, "School can be challenging at times but other times fun."

"Always fun," another kid corrects.

"Unless you're learning about the reproductive system," says the first boy.

"Shut up about that!" says his classmate, wincing and giving him a friendly shove.

Visitor Ed Sharp is impressed by the class. "The kids were very into this," he says. The level of debate was "more sophisticated than I would have expected." Sharp was especially happy to see how lively and interactive the class was, and how well the students worked together.

Nothing Works for Every Child

Mooresville Middle School Principal Carrie Tulbert is not willing to say the laptop program is the reason for Mooresville's success, but
she has no doubt the laptops are making a difference.

"A teacher's job isn't to have all the answers," says Tulbert. A teacher's job is to "ask the right questions."

Tulbert says before the laptops, many teachers didn't see it that way. They were the experts, dispensing knowledge to students who were supposed to absorb the information.

"It was a lot of, for lack of a better term, 'sit and git' type instruction," says Stephen Mauney, who started as a teacher in the Mooresville schools 20 years ago and is now the executive director of secondary instruction.

"You might stand in front of the room," Mauney says. "You might lecture for a significant portion of the class. Students took notes." Mooresville schools were very traditional, he says.

Now teachers know that long lectures are bad practice – not because someone like principal Tulbert told them that, but because they've tried teaching in new ways and experienced an improvement.

"The laptops were the catalyst for that change," says Tulbert.

But she says the laptop program isn't working for every child.

"Nothing works for every child," she says. Tulbert is especially concerned about kids with ADHD. "Their attention is all over the place and when you give them a computer it's like they can't control themselves," she says.

"But that's when you teach them the coping mechanisms. And that's our responsibility as teachers. We're not just teaching [students] content, we're teaching them skills that will help them in real life. I have to have coping mechanisms now when I sit at a meeting that I'm not on six different programs at one time," she adds with a chuckle. "I think a lot of people are figuring that out."

Indeed, school administrators and teachers return often to the idea of what it takes to prepare students for "real life" when they talk about the laptop program.

Students need to be learning on computers at school, says English teacher Bethany Smith. They've "been raised in this age where technology has been at their fingertips." It doesn't make any sense, she says, to "send them to school without any technology to prepare them for a world that's filled with technology. That just seems really backwards."

The audio version of this documentary is available as an MP3 download and as a transcript. More on digital learning can be found via these links.

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