The New York Times

GRADING THE DIGITAL SCHOOL

In Classroom of Future, Stagnant Scores

Students using an interactive whiteboard, part of an ambitious technology plan in the Kyrene School District in Arizona.

By MATT RICHTEL

Published: September 3, 2011

http://www.nytimes.com/2011/09/04/technology/technology-in-schools-faces-questions-on-value.html

CHANDLER, Ariz. — Amy Furman, a seventh-grade English teacher here, roams among 31 students sitting at their desks or in clumps on the floor. They're studying Shakespeare's "As You Like It" — but not in any traditional way.

In this technology-centric classroom, students are bent over laptops, some blogging or building Facebook pages from the perspective of Shakespeare's characters. One student compiles a song list from the Internet, picking a tune by the rapper Kanye West to express the emotions of Shakespeare's lovelorn Silvius.

The class, and the Kyrene School District as a whole, offer what some see as a utopian vision of education's future. Classrooms are decked out with laptops, big interactive screens and software that drills students on every basic subject. Under a ballot initiative approved in 2005, the district has invested roughly $33 million in such technologies.

The digital push here aims to go far beyond gadgets to transform the very nature of the classroom, turning the teacher into a guide instead of a lecturer, wandering among students who learn at their own pace on Internet-connected devices.

"This is such a dynamic class," Ms. Furman says of her 21st-century classroom. "I really hope it works."

Hope and enthusiasm are soaring here. But not test scores.

Since 2005, scores in reading and math have stagnated in Kyrene, even as statewide scores have risen.

Jim Wilson/The New York Times

Molly Siegel and Christian Dedman, both 7, worked together with a laptop during a class in the Kyrene School District in Arizona.

To be sure, test scores can go up or down for many reasons. But to many education experts, something is not adding up — here and across the country. In a nutshell: schools are spending billions on technology, even as they cut budgets and lay off teachers, with little proof that this approach is improving basic learning.

This conundrum calls into question one of the most significant contemporary educational movements. Advocates for giving schools a major technological upgrade — which include powerful educators, Silicon Valley titans and White House appointees — say digital devices let students learn at their own pace, teach skills needed in a modern economy and hold the attention of a generation weaned on gadgets.

Some backers of this idea say standardized tests, the most widely used measure of student performance, don't capture the breadth of skills that computers can help develop. But they also concede that for now there is no better way to gauge the educational value of expensive technology investments.

"The data is pretty weak. It's very difficult when we're pressed to come up with convincing data," said Tom Vander Ark, the former executive director for education at the Bill and Melinda Gates Foundation and an investor in educational technology companies. When it comes to showing results, he said, "We better put up or shut up."

And yet, in virtually the same breath, he said change of a historic magnitude is inevitably coming to classrooms this decade: "It's one of the three or four biggest things happening in the world today."

Critics counter that, absent clear proof, schools are being motivated by a blind faith in technology and an overemphasis on digital skills — like using PowerPoint and multimedia tools — at the expense of math, reading and writing fundamentals. They say the technology advocates have it backward when they press to upgrade first and ask questions later.

The spending push comes as schools face tough financial choices. In Kyrene, for example, even as technology spending has grown, the rest of the district's budget has shrunk, leading to bigger classes and fewer periods of music, art and physical education.

At the same time, the district's use of technology has earned it widespread praise. It is upheld as a model of success by the National School Boards Association, which in 2008 organized a visit by 100 educators from 17 states who came to see how the district was innovating.

And the district has banked its future and reputation on technology. Kyrene, which serves 18,000 kindergarten to eighth-grade students, mostly from the cities of Tempe, Phoenix and Chandler, uses its computer-centric classes as a way to attract children from around the region, shoring up enrollment as its local student population shrinks. More students mean more state dollars.

The issue of tech investment will reach a critical point in November. The district plans to go back to local voters for approval of $46.3 million more in taxes over seven years to allow it to keep investing in technology. That represents around 3.5 percent of the district's annual spending, five times what it spends on textbooks.

Jim Wilson/The New York Times

At Kyrene Aprende Middle School, students took their final exam last May. The district has invested roughly $33 million in technology.

The district leaders' position is that technology has inspired students and helped them grow, but that there is no good way to quantify those achievements — putting them in a tough spot with voters deciding whether to bankroll this approach again.

"My gut is telling me we've had growth," said David K. Schauer, the superintendent here. "But we have to have some measure that is valid, and we don't have that."

It gives him pause.

"We've jumped on bandwagons for different eras without knowing fully what we're doing. This might just be the new bandwagon," he said. "I hope not."

A Dearth of Proof

The pressure to push technology into the classroom without proof of its value has deep roots.

In 1997, a science and technology committee assembled by President Clinton issued an urgent call about the need to equip schools with technology.

If such spending was not increased by billions of dollars, American competitiveness could suffer, according to the committee, whose members included educators like Charles M. Vest, then president of the Massachusetts Institute of Technology, and business executives like John A. Young, the former chief executive of Hewlett-Packard.

To support its conclusion, the committee's report cited the successes of individual schools that embraced computers and saw test scores rise or dropout rates fall. But while acknowledging that the research on technology's impact was inadequate, the committee urged schools to adopt it anyhow.

The report's final sentence read: "The panel does not, however, recommend that the deployment of technology within America's schools be deferred pending the completion of such research."

Since then, the ambitions of those who champion educational technology have grown — from merely equipping schools with computers and instructional software, to putting technology at the center of the classroom and building the teaching around it.

Kyrene had the same sense of urgency as President Clinton's committee when, in November 2005, it asked voters for an initial $46.3 million for laptops, classroom projectors, networking gear and other technology for teachers and administrators.

Before that, the district had given 300 elementary school teachers five laptops each. Students and teachers used them with great enthusiasm, said Mark Share, the district's 64-year-old

director of technology, a white-bearded former teacher from the Bronx with an iPhone clipped to his belt.

“If we know something works, why wait?” Mr. Share told The Arizona Republic the month before the vote. The district’s pitch was based not on the idea that test scores would rise, but that technology represented the future.

The measure, which faced no organized opposition, passed overwhelmingly. It means that property owners in the dry, sprawling flatlands here, who live in apartment complexes, cookie-cutter suburban homes and salmon-hued mini-mansions, pay on average $75 more a year in taxes, depending on the assessed value of their homes, according to the district.

But the proof sought by President Clinton’s committee remains elusive even today, though researchers have been seeking answers.

Many studies have found that technology has helped individual classrooms, schools or districts. For instance, researchers found that writing scores improved for eighth-graders in Maine after they were all issued laptops in 2002. The same researchers, from the University of Southern Maine, found that math performance picked up among seventh- and eighth-graders after teachers in the state were trained in using the laptops to teach.

Jim Wilson/The New York Times

At the start of the school year, Amy Furman tries to inspire her students at Aprende Middle School to write. “I start with pens and pencils,” she says, but computers help the students edit their thoughts and work.

A question plaguing many education researchers is how to draw broader inferences from such case studies, which can have serious limitations. For instance, in the Maine math study, it is hard to separate the effect of the laptops from the effect of the teacher training.

Educators would like to see major trials years in length that clearly demonstrate technology’s effect. But such trials are extraordinarily difficult to conduct when classes and schools can be so different, and technology is changing so quickly.

And often the smaller studies produce conflicting results. Some classroom studies show that math scores rise among students using instructional software, while others show that scores actually fall. The high-level analyses that sum up these various studies, not surprisingly, give researchers pause about whether big investments in technology make sense.

One broad analysis of laptop programs like the one in Maine, for example, found that such programs are not a major factor in student performance.

“Rather than being a cure-all or silver bullet, one-to-one laptop programs may simply amplify what’s already occurring — for better or worse,” wrote Bryan Goodwin, spokesman for Mid-continent Research for Education and Learning, a nonpartisan group that did the study, in an essay. Good teachers, he said, can make good use of computers, while bad teachers won’t, and they and their students could wind up becoming distracted by the technology.

A review by the Education Department in 2009 of research on online courses — which more than one million K-12 students are taking — found that few rigorous studies had been done and that policy makers “lack scientific evidence” of their effectiveness.. A division of the Education

Department that rates classroom curriculums has found that much educational software is not an improvement over textbooks.

Larry Cuban, an education professor emeritus at Stanford University, said the research did not justify big investments by districts.

“There is insufficient evidence to spend that kind of money. Period, period, period,” he said. “There is no body of evidence that shows a trend line.”

Some advocates for technology disagree.

Karen Cator, director of the office of educational technology in the United States Department of Education, said standardized test scores were an inadequate measure of the value of technology in schools. Ms. Cator, a former executive at Apple Computer, said that better measurement tools were needed but, in the meantime, schools knew what students needed.

“In places where we’ve had a large implementing of technology and scores are flat, I see that as great,” she said. “Test scores are the same, but look at all the other things students are doing: learning to use the Internet to research, learning to organize their work, learning to use professional writing tools, learning to collaborate with others.”

For its part, Kyrene has become a model to many by training teachers to use technology and getting their ideas on what inspires them. As Mr. Share says in the signature file at the bottom of every e-mail he sends: “It’s not the stuff that counts — it’s what you do with it that matters.”

So people here are not sure what to make of the stagnant test scores. Many of the district’s schools, particularly those in more affluent areas, already had relatively high scores, making it a challenge to push them significantly higher. A jump in students qualifying for free or reduced-price lunches was largely a result of the recession, not a shift in the population the district serves, said Nancy Dundenhoefer, its community relations manager.

Mr. Share, whose heavy influence on more than $7 million a year in technology spending has made him a power broker, said he did not think demographic changes were a good explanation.

“You could argue that test scores would be lower without the technology, but that’s a copout,” he said, adding that the district should be able to deliver some measure of what he considers its obvious success with technology. “It’s a conundrum.”

Results aside, it’s easy to see why technology is such an easy sell here, given the enthusiasm surrounding it in some classrooms.

Engaging With Paper

“I start with pens and pencils,” says Ms. Furman, 41, who is short and bubbly and devours young-adult novels to stay in touch with students. Her husband teaches eighth grade in the district, and their son and daughter are both students.

At the beginning of the school year, Ms. Furman tries to inspire her students at Aprende Middle School to write, a task she says becomes increasingly difficult when students reach the patently insecure middle-school years.

In one class in 2009 she had them draw a heart on a piece of paper. Inside the heart, she asked them to write the names of things and people dear to them. One girl started to cry, then another, as the class shared their stories.

It was something Ms. Furman doubted would have happened if the students had been using computers. “There is a connection between the physical hand on the paper and the words on the page,” she said. “It’s intimate.”

But, she said, computers play an important role in helping students get their ideas down more easily, edit their work so they can see instant improvement, and share it with the class. She uses a document camera to display a student’s paper at the front of the room for others to dissect.

Ms. Furman said the creative and editing tools, by inspiring students to make quick improvements to their writing, pay dividends in the form of higher-quality work. Last year, 14 of her students were chosen as finalists in a statewide essay contest that asked them how literature had affected their lives. “I was running down the hall, weeping, saying, ‘Get these students together. We need to tell them they’ve won!’ ”

Other teachers say the technology is the only way to make this generation learn.

“They’re inundated with 24/7 media, so they expect it,” said Sharon Smith, 44, a gregarious seventh-grade social studies teacher whose classroom is down the hall from Ms. Furman’s.

Minutes earlier, Ms. Smith had taught a Civil War lesson in a way unimaginable even 10 years ago. With the lights off, a screen at the front of the room posed a question: “Jefferson Davis was Commander of the Union Army: True or False?”

The 30 students in the classroom held wireless clickers into which they punched their answers. Seconds later, a pie chart appeared on the screen: 23 percent answered “True,” 70 percent “False,” and 6 percent didn’t know.

The students hooted and hollered, reacting to the instant poll. Ms. Smith then drew the students into a conversation about the answers.

The enthusiasm underscores a key argument for investing in classroom technology: student engagement.

That idea is central to the National Education Technology Plan released by the White House last year, which calls for the “revolutionary transformation” of schools. The plan endorses bringing “state-of-the art technology into learning to enable, motivate and inspire all students.”

But the research, what little there is of it, does not establish a clear link between computer-inspired engagement and learning, said Randy Yerrick, associate dean of educational technology at the University of Buffalo.

For him, the best educational uses of computers are those that have no good digital equivalent. As examples, he suggests using digital sensors in a science class to help students observe chemical or physical changes, or using multimedia tools to reach disabled children.

But he says engagement is a “fluffy term” that can slide past critical analysis. And Professor Cuban at Stanford argues that keeping children engaged requires an environment of constant novelty, which cannot be sustained.

“There is very little valid and reliable research that shows the engagement causes or leads to higher academic achievement,” he said.

Instruct or Distract?

There are times in Kyrene when the technology seems to allow students to disengage from learning: They are left at computers to perform a task but wind up playing around, suggesting, as some researchers have found, that computers can distract and not instruct.

The 23 kindergartners in Christy Asta’s class at Kyrene de las Brisas are broken into small groups, a common approach in Kyrene. A handful stand at desks, others sit at computers, typing up reports.

Xavier Diaz, 6, sits quietly, chair pulled close to his Dell laptop, playing “Alien Addition.” In this math arcade game, Xavier controls a pod at the bottom of the screen that shoots at spaceships falling from the sky. Inside each ship is a pair of numbers. Xavier’s goal is to shoot only the spaceship with numbers that are the sum of the number inside his pod.

But Xavier is just shooting every target in sight. Over and over. Periodically, the game gives him a message: “Try again.” He tries again.

“Even if he doesn’t get it right, it’s getting him to think quicker,” says the teacher, Ms. Asta. She leans down next to him: “Six plus one is seven. Click here.” She helps him shoot the right target. “See, you shot him.”

Perhaps surprisingly given the way young people tend to gravitate toward gadgets, students here seem divided about whether they prefer learning on computers or through more traditional methods.

In a different class, Konray Yuan and Marisa Guisto, both 7, take turns touching letters on the interactive board on the wall. They are playing a spelling game, working together to spell the word “cool.” Each finds one of the letters in a jumbled grid, touching them in the proper order.

Marisa says there isn’t a difference between learning this way and learning on paper. Konray prefers paper, he says, because you get extra credit for good penmanship.

But others, particularly older students, say they enjoy using the technology tools. One of Ms. Furman’s students, Julia Schroder, loved building a blog to write about Shakespeare’s “As You Like It.”

In another class, she and several classmates used a video camera to film a skit about Woodrow Wilson’s 14-point speech during World War I — an approach she preferred to speaking directly to the class.

“I’d be pretty bummed if I had to do a live thing,” she said. “It’s nerve-racking.”

Teachers vs. Tech

Even as students are getting more access to computers here, they are getting less access to teachers.

Reflecting budget cuts, class sizes have crept up in Kyrene, as they have in many places. For example, seventh-grade classes like Ms. Furman's that had 29 to 31 students grew to more like 31 to 33.

"You can't continue to be effective if you keep adding one student, then one student, then one student," Ms. Furman said. "I'm surprised parents aren't going into the classrooms saying 'Whoa.' "

Advocates of high-tech classrooms say computers are not intended to replace teachers. But they do see a fundamental change in the teacher's role. Their often-cited mantra is that teachers should go from being "a sage on the stage to a guide on the side."

And they say that, technology issues aside, class sizes can in fact afford to grow without hurting student performance.

Professor Cuban at Stanford said research showed that student performance did not improve significantly until classes fell under roughly 15 students, and did not get much worse unless they rose above 30.

At the same time, he says bigger classes can frustrate teachers, making it hard to attract and retain talented ones.

In Kyrene, growing class sizes reflect spending cuts; the district's maintenance and operation budget fell to $95 million this year from $106 million in 2008. The district cannot use the money designated for technology to pay for other things. And the teachers, who make roughly $33,000 to $57,000 a year, have not had a raise since 2008.

Many teachers have second jobs, some in restaurants and retail, said Erin Kirchoff, president of the Kyrene Education Association, the teacher's association. Teachers talk of being exhausted from teaching all day, then selling shoes at the mall.

Ms. Furman works during the summer at the Kyrene district offices. But that job is being eliminated in 2014, and she is worried about the income loss.

"Without it, we don't go on vacation," she said.

Money for other things in the district is short as well. Many teachers say they regularly bring in their own supplies, like construction paper.

"We have Smart Boards in every classroom but not enough money to buy copy paper, pencils and hand sanitizer," said Nicole Cates, a co-president of the Parent Teacher Organization at Kyrene de la Colina, an elementary school. "You don't go buy a new outfit when you don't have enough dinner to eat."

But she loves the fact that her two children, a fourth-grader and first-grader, are learning technology, including PowerPoint and educational games.

To some who favor high-tech classrooms, the resource squeeze presents an opportunity. Their thinking is that struggling schools will look for more efficient ways to get the job done, creating an impetus to rethink education entirely.

“Let’s hope the fiscal crisis doesn’t get better too soon. It’ll slow down reform,” said Tom Watkins, the former superintendent for the Michigan schools, and now a consultant to businesses in the education sector.

Clearly, the push for technology is to the benefit of one group: technology companies.

The Sellers

It is 4:30 a.m. on a Tuesday. Mr. Share, the director of technology at Kyrene and often an early riser, awakens to the hard sell. Awaiting him at his home computer are six pitches from technology companies.

It’s just another day for the man with the checkbook.

“I get one pitch an hour,” he said. He finds most of them useless and sometimes galling: “They’re mostly car salesmen. I think they believe in the product they’re selling, but they don’t have a leg to stand on as to why the product is good or bad.”

Mr. Share bases his buying decisions on two main factors: what his teachers tell him they need, and his experience. For instance, he said he resisted getting the interactive whiteboards sold as Smart Boards until, one day in 2008, he saw a teacher trying to mimic the product with a jury-rigged projector setup.

“It was an ‘Aha!’ moment,” he said, leading him to buy Smart Boards, made by a company called Smart Technologies.

He can make that kind of decision because he has money — and the vendors know it. Technology companies track which districts get federal funding and which have passed tax assessments for technology, like Kyrene.

This is big business. Sales of computer software to schools for classroom use were $1.89 billion in 2010. Spending on hardware is more difficult to measure, researchers say, but some put the figure at five times that amount.

The vendors relish their relationship with Kyrene.

“I joke I should have an office here, I’m here so often,” said Will Dunham, a salesman for CCS Presentation Systems, a leading reseller of Smart Boards in Arizona.

Last summer, the district paid $500,000 to CCS to replace ceiling-hung projectors in 400 classrooms. The alternative was to spend $100,000 to replace their aging bulbs, which Mr. Share said were growing dimmer, causing teachers to sometimes have to turn down the lights to see a crisp image.

Mr. Dunham said the purchase made sense because new was better. “I could take a used car down to the mechanic and get it all fixed up and still have a used car.”

But Ms. Kirchoff, the president of the teachers’ association, is furious. “My projector works just fine,” she said. “Give me Kleenex, Kleenex, Kleenex!”

The Parents

Last November, Kyrene went back to voters to ask them to pay for another seven years of technology spending in the district. The previous measure from 2005 will not expire for two years. But the district wanted to get ahead of the issue, and leave wiggle room just in case the new measure didn't pass.

It didn't. It lost by 96 votes out of nearly 50,000 cast. Mr. Share and others here said they attributed the failure to poor wording on the ballot that made it look like a new tax increase, rather than the continuation of one.

They say they will not make the same wording mistake this time. And they say the burden on taxpayers is modest.

"It's so much bang for the buck," said Jeremy Calles, Kyrene's interim chief financial officer. For a small investment, he said, "we get state-of-the-art technology."

Regardless, some taxpayers have already decided that they will not vote yes.

"When you look at the big picture, it's hard to say 'yes, spend more on technology' when class sizes increase," said Kameron Bybee, 34, who has two children in district schools. "The district has made up its mind to go forward with the technologically advanced path. Come hell or high water."

Other parents feel conflicted. Eduarda Schroder, 48, whose daughter Julia was in Ms. Furman's English class, worked on the political action committee last November to push through an extension of the technology tax. Computers, she says, can make learning more appealing. But she's also concerned that test scores haven't gone up.

She says she is starting to ask a basic question. "Do we really need technology to learn?" she said. "It's a very valid time to ask the question, right before this goes on the ballot."