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1:1 COMPUTING PROVIDES BENEFITS FOR MANY

Programs that put a laptop or tablet on every desk boost achievement

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Programs that provide K–12 students with 1:1 computing—a laptop, tablet, smartphone, or some combination at every desk—have grown significantly during the past few years, and researchers have begun to document positive effects.

These 1:1 initiatives require that districts have the right curriculum and teacher training to go along with their new hardware. For example, districts that belong to the BLEgroup Thought Leadership Consortium began by focusing on instructional outcomes and realized that this process might take three to five years. Adequate bandwidth is also essential, since no matter how much districts spend on devices, they need to be able to access the Internet without any buffering required.

As 1:1 comes online, schools and districts have realized that when empowered to tailor their assignments as learning becomes more individualized, students take greater pride and ownership over their work. This ties into the Common Core State Standards, which direct educators to become facilitators of student knowledge gathering rather than lecturing from the front of the room.

1:1 programs also boost college and career readiness, since the skills they impart are increasingly expected both on campus and in the office, from a comfort level with online postsecondary courses, to the ability to work in the online “cloud” with professional colleagues who might be physically distant but are nonetheless a part of an employee’s day-to-day interactions.

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THE RESEARCH

The Sunnyside district in Tucson, Arizona, has seen its graduation rates climb from 67 percent to 87 percent in the more than five years it's used 1:1 computing, according to the authors of a paper from the BLEgroup Thought Leadership Consortium, which is comprised of several school districts and knowledgeable companies.

“Implementing 1:1 computing is like cooking the perfect meal,” the authors wrote. “For spectacular results, you must conduct the process slowly and patiently, using the right ingredients at the right time . . . all the while visualizing the outcome.”¹

Mark Warschauer, an education professor and associate dean at the University of California, Irvine, analyzed more than 50 studies of school laptop programs and found they have resulted in measurable student achievement in the areas of English/language arts and writing.²

Halfway around the world, the government of Queensland, Australia, has cited a study in *The Journal of Technology, Learning and Assessment*, titled “Educational Outcomes and Research from 1:1 Computing Settings,” which has shown increased student and teacher technology use, higher student engagement, and “modest increases” in student achievement as being associated with 1:1 programs.³

The teaser for a *District Administration* magazine Webinar on the topic lays out the ultimate purpose of 1:1. “An effective digital transformation is not just about technology, it is about utilizing technology to empower students to learn in new, more authentic ways. This authentic learning will occur when educators are focused on designing interactive, collaborative, real-world learning experiences for their students. The goal should not be to ‘go digital’ or to ‘go 1:1,’ but should instead be to become ‘student-centered.’”⁴

NOT A SILVER BULLET

The BLEgroup Thought Leadership Consortium paper notes that 1:1 computing means more than just having a ratio of one laptop, tablet, or phone per child. “Often, this concept is considered a silver bullet: ‘If the computer is present, education will occur,’” the paper says. “But in reality, 1:1 computing is a complex system grounded in a vision of educational accomplishment.”

That complex system can include cloud-based applications with customized resources to deliver measurable, individualized instruction, provide teachers with ongoing professional development, and connect stakeholders like teachers, students, administrators, and parents toward achieving educational outcomes.⁵

BLE Thought Leadership districts collectively decided they should pilot all new activities, building an infrastructure that is “robust, redundant and practically bullet-proof.” Teachers will need ongoing professional development, the technology director or CIO should be part of the superintendent's team, and the superintendent or someone close to him or her must “champion” 1:1.

To ensure sustainability of 1:1, districts must include technology as part of their ongoing budget, continuously search for new materials and approaches, develop metrics to study their progress, and create policies that require teachers to master technology skills and embrace a digital curriculum, the consortium says.⁶

OWNERSHIP OF KNOWLEDGE

The government of Queensland, Australia, sees 1:1 as tied in to an international movement toward individualizing learning, which boosts both self-initiated learning and students' sense of independence.



“Students who have their own laptop computers have been found to take greater pride and ownership over the knowledge they create,” the education ministry believes. “1-to-1 programs can extend formal learning communities to include parents, siblings and other people important in students’ lives.”

The Queensland education agency believes that successfully implementing 1:1 requires a widely supported vision, strong and supportive culture, effective technical infrastructure and support, and the use of student-centered pedagogies and professional development for staff.⁷

The Journal of Technology, Learning and Assessment paper, which the Queensland government has cited, is a meta-analysis of four individual studies that the JTLA synthesizes. Their analysis leads to the aforementioned conclusions about increased student and teacher technology use, higher student engagement and interest level, and modest increases in student achievement.

Overall, the JTLA paper notes, there has been relatively little empirical research on the subject. But their review of four studies—which respectively cover a statewide Massachusetts middle-school pilot program, three high school science classes, 21 high-need middle schools, and fourth-grade literacy—provide early indicators.

The authors take pains to note that while all four programs use 1:1 technology, “each 1:1 setting had its own unique ‘1:1 program’ that comprises a set of expectations, funding mechanisms, and individual implementation models including variation in hardware, software, networking, teacher training, and professional development, as well as program support.”⁸

TIES TO COMMON CORE

Senior technology consultant John Kuglin, a former associate dean at the University of Montana and chief information officer for the Eagle County School District in Vail, Colorado, says teacher websites are a critical component of 1:1.

“It’s your portal; it’s your window; it’s your digital address,” he says. “This is where students’ parents are coming to get your assets. What’s different today is that a site isn’t just a website that’s disjointed from what you’re doing; it becomes a critical component of the 1:1. It’s as critical as having the device itself.”

Indeed, pairing the device with the right content is essential, Kuglin says, and free cloud-based applications can be a good place to start before moving on to more comprehensive resources. For example, Kuglin, who trains teachers in 1:1, uses an app called

Socratic through which he can send a 10-question quiz about, say, the U.S. National Park Service to a room full of his teacher-students. They respond with answers, and he gets a spreadsheet with everyone's answers corrected for him.

"We're using technology, but it isn't changing the way we're directing instruction," he says. "Technology allows for the creation of new tasks previously inconceivable; we could not do that before. Common Core is going to want you to use inconceivable ideas."

The implementation of 1:1 in the classroom will enable teachers to meet the challenges of the Common Core State Standards, Kuglin believes. "A lot of them are feeling nervous; feeling overworked," he says. "They're looking for ways to address this: How do we work smarter, and not harder? If we're not going to transform ourselves, we're not going to keep up with expectations."

Rick Kiker, principal with ed tech consulting firm Kiker Learning, sees 1:1 as preparation for becoming independent learners and discoverers of knowledge. "Teachers become facilitators and not dictators," says Kiker, who also serves part-time as director of online learning at Palisades School District in Bucks County, Pennsylvania. "It puts students in a space where they're connected and engaged at their level. It leads to inquiry, student engagement and ultimately, when managed correctly, it leads to achievement."

The Classrooms for the Future state grant initiative in Pennsylvania, for which Kiker served as coach in his former capacity as teacher and media technology chair at Palisades, put high schools in the position to place a device on every student's desk while providing the teacher training. While that grant program ended in 2010, Kiker says it created a network that endures; for example 300 teachers in 12 districts attended a free ed tech summit this summer. "Districts that participated in 1:1 are having that kind of culture right now," he says.

Districts with 1:1 initiatives in place will be better equipped to handle the statewide testing that will come in 2014–15 under the Common Core, Kiker says. "From a management standpoint, it's almost becoming required," he says. "State departments of education are probably happy about that. I'm more interested in 1:1 based on student achievement that's focused on the full spectrum of human knowledge, not just the small sliver we're focusing on" in standardized tests.

COLLEGE AND CAREER READINESS

Students with 1:1 experience will certainly be better equipped for college, given that roughly 95 percent of college courses are either fully online or blended with Blackboard or Moodle, Kiker says. "If they're not giving students this opportunity, districts should take 'college and career-readiness' off of their mission statement because they're not doing it," he says.

And in terms of career-readiness, 1:1 brings students into an age when companies are becoming immersed in the mobile and cloud evolution and moving to bring your-own-device policies, Kiker says.

"For 30 years we've done local computing," he says. "Now, when you talk about the world of e-learning and e-training, whether you're a welder or an accountant . . . it's ubiquitous. This is what we have to work with and adjust accordingly, and quite frankly, adjust rapidly. It's about as big of a no-brainer as you can get."

INCLUDING EVERYONE'S VOICES

A social studies teacher at William Fremd High School in suburban Palatine, Illinois, Shawn McCusker remembers the days when teachers simply stood in the front of the classroom and dispensed knowledge, serving as essentially the sole source of information and analysis of that information.

No longer, says McCusker, who's in the second year of a 1:1 iPad pilot after piecing together smartphones, tablets, and whatever else he could for a few years before that. "The teacher is no longer the sole source of knowledge when you have access to every single document and every single source online," he says. "Should students be checking my facts while I'm teaching? My answer is yes. Let them find out where I'm wrong."

Teachers have less of a role as distributors of information in an age when "we live in a sea of information," McCusker explains. Instead, students must learn how to choose the most relevant and reliable information, and then, "How do I express the meaning behind so many sources and distill it into something meaningful?"

In a social studies class, this means instead of one answer to a question, "you have 30 individuals seeking out sources . . . and coming to individual conclusions," he says. "They start debating and discussing and analyzing. . . . I find myself stumbling into these

moments of incredibly deep and analytical thinking. Because they're trying to express themselves, we do a lot more writing, a lot more organization of ideas."

Perhaps the single most transformational aspect of 1:1 has been the ability of quieter students to find their voice—by making a video, for example, to break the ice before they make a presentation to classmates, McCusker says. "That starts to get them comfortable with expressing themselves," he says. "If I were to lose devices, the thing I would miss the most would be the voices of all the kids who are a part of what I'm doing now. You used to have the most confident person—who may or may not be the most intelligent—dominating conversations."

Bottom line, McCusker says, "If the types of activities and amount of writing and student creation and expression is any measure, I'm satisfied with what's going on in my class. There's no question in my mind

that what we're doing in these classes is better for students and more like the real world. Test scores, I would hope they will follow suit. I'm pretty confident they will."

PROFESSIONAL DEVELOPMENT ESSENTIAL

Other districts provide similar testimony. In Natick, Massachusetts, the school board purchased 1,500 MacBook laptops for 8th through 12th graders for a cool \$1.8 million. "So many kids were going home and doing their homework on their laptops," yet the in-school technology hadn't kept up, says Peter Sanchioni, superintendent of the district of 5,000 students. "We had to change that."

But Sanchioni knew that just handing out the devices wasn't enough. He issued the \$900 MacBooks to teachers and administrators first, and then provided them with adequate professional development before rolling them out to students.

FIVE STEPS TO SUCCESSFUL 1:1 IMPLEMENTATION

The online publication *Edutopia* offers a five-step guide to successfully transforming your district, school or classroom to a 1:1 environment:⁹

1. **Define Your Goals.** These ultimately are going to be more about access to the "most current, scholarly information available" than about devices, per se.
2. **Define the Device's Role.** Teachers should view laptops and tablets as the latest in a succession of devices that's included the chalkboard, calculator, and CD-ROM. "They must understand that this device will give their students a better opportunity to share, connect, and seek out information," *Edutopia* says.
3. **Harness the Device's Power.** Either model this for students yourself, if you're comfortable enough, or find a colleague, instructional technology coach, or very skilled student to do so. "Demand good professional development that not only presents the device's functionality, but displays examples of it in use," the guide says.
4. **Don't Become Too Attached.** Your classroom should not always have the device on display, and students shouldn't become too tethered to it. "Administrators should not demand that the device always be used," *Edutopia* says. "Allow your teachers some learning and growing time as they begin to integrate the device."
5. **Model Information Technology.** Devices cannot replace students' own critical thinking and questioning skills. They will provide much more in the way of information and potential answers than definitive direction.

"Filtering information and knowing the most efficient route to a solution is an invaluable skill," the publication says. "While students have access to more information than any generation, their ability to filter is much more challenging. Once your students understand that it is time to access the device, they must begin to filter through a vast field of weeds. . . . A 1:1 environment should not be intimidating. It should be our ally in the daily task to provide our students with the best access to information and promote learning."



Although it is early to definitely measure success, the number of honor roll students has grown and “qualitatively, teachers are reporting their students are more engaged and excited about being in school, with attendance up and discipline problems down,” according to *Education Week*.¹⁰

WRITING WITH A PURPOSE

Mark Pullen, a third-grade teacher in East Grand Rapids Public Schools in Michigan who has taught elementary school for 15 years, has taught in a 1:1 environment since his classroom was selected as a pilot for a laptop initiative in 2010.

Among other curricular changes, this has meant that each student has an individual blog on which to publish his or her writing; and they’re encouraged to post book reviews on Amazon, send opinion pieces to their local newspaper and include short stories in a self-published anthology on lulu.com.

“No matter what the genre is that we’re studying, 1:1 technology allows there to always be a real purpose and audience for my students’ writing,” Pullen says. “Writing for the teacher or to earn a grade on a report card is fake; writing for actual audiences as described above is real.”¹¹

In addition to providing inspiration, 1:1 has given Pullen the ability to assess students’ strengths and weaknesses more quickly and offer individual instruction more readily, which he says particularly benefits math. Plus, he has found that it is more natural to blend subjects and skills when students are given the ability to pick a topic, read about it in depth, and write collaboratively and publish online.

“Rather than using computers as virtual worksheets, when done well, 1:1 technology can be used to give students access to nothing less than the entire base of knowledge acquired throughout human history,” Pullen says.¹²

DEVICES FORCE CONVERSATIONS

Others caution that without changes in instructional strategies, devices alone won’t accomplish much. “Can you show me the report that shows the pencil or the overhead projector increased test scores?” asks Jill Hobson, director of instructional technology for Forsyth County schools in Georgia, which instituted a “bring your own technology” program for its 39,000 students three years ago.

More than 11,000 student-owned laptops, tablets, and smartphones access the district’s wireless network each day, and Hobson says the differentiation of

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devices brings a benefit. “The exciting thing about BYOT is that it’s pretty near impossible to teach the way you have always been teaching,” she says. “It forces conversations about differentiation and the personalization of teaching.”¹³

But some experiments have shown that devices alone can make an impact. Damian Bebell, assistant research professor at Boston College’s Lynch School of Education, has studied the outcomes of school technology investments since the late 1990s. During the 2011–12 school year, he worked with the 3,600-student Auburn, Maine school system to measure the impact of a 1:1 iPad program on the literacy of kindergarteners.

The end result: students who received iPads outperformed their peers on all 12 literacy measurements taken, despite the instructional strategies being similar. Mike Muir, multiple pathways leader for the district who approached Bebell, believes the immediate feedback and greater time for independent work given to the iPad-enabled students have made a difference.

The district has expanded the program to first grade in 2012–13 and second grade in the current school year. “The district was able to use that [research] information, making it a point of pride in the community,” Bebell says.¹⁴

PITFALLS OF 1:1

Kiker notes a couple pitfalls that districts implementing 1:1 should take care to avoid: lack of teacher preparation and inadequate investment in infrastructure. “When teachers are not adequately prepared or not given the right professional development, and not given the ability to get comfortable, not given the reassurance that if they fail at first, that’s OK,” the success of 1:1 is unlikely, he says.

In other cases, “you’ve spent \$1 million on devices but not \$50,000 to upgrade your wireless. Bandwidth is the currency that education trades with now. You can’t go too big because access is a critical conduit for digital literacy.”

McCusker says teachers need to think about classroom management in a somewhat different way because no longer is it prohibited to be on a screen during a lecture—but one still must monitor. “When you give students control over what they’re researching and choosing, you’re going to have to socialize what’s appropriate,” he says. “That takes redefining your sense of what ‘on task’ is. If someone’s on their iPad, you don’t know if they’re playing a video game or fact-checking what you’re saying.”

The BLEgroup Thought Leadership Consortium notes several common mistakes that districts will need to avoid. Most frequent, the consortium says, is that districts don’t have enough bandwidth to sustain 1:1. They also implement too much, too soon, creating resistance and inviting failure. Unclear goals at the outset can hamper efforts, as can failing to provide support at the school and curriculum level. Finally, schools sometimes “replicate the textbook model of instruction on a computer, and then don’t benefit from the feature of true 1:1 computing,” the paper says.

“The vision is rapidly being adopted by policymakers, decision makers and educators,” writes author Eliot Levinson in comments at the end. “The hard part is the implementation. To change [the] value chain of teaching and learning and effectively embed the necessary policies and support roles is a lengthy process. The force of gravity of a century of educating from books is very strong and old dogs can only learn new tricks slowly. The organization will change only if the new ways are more efficient, produce better results, or the inhabitants have no choice.”

Advocates of 1:1 at both the district level and the 30,000-foot level say they're already seeing greater evidence of student engagement in class that they believe will translate to more learning, creative thinking, higher test scores, and enhanced college- and career-readiness.

"We all crave control of our own destiny and our own choices," McCusker says. "My classroom is a rich environment for choosing what we're going to learn, and how you express yourself. Nobody ever says, 'Wow, that worksheet changed my life.'"

But the creation of blogs, videos, and other online projects sparks conversations and makes students realize that their work product matters to more than just the teacher, McCusker says. For example, one blog that a student created in answer to the age-old question of whether Athens or Sparta represents a greater advance in civilization, and why, received 20,000 hits in six weeks.

"If you have students thoughtfully processing things and taking a stand, they find people are listening, and what I say matters," he says. "If you get a reward for taking risks and finding your voice, people will act on it. Why would you formulate an opinion if it's just for your teacher? If you're going to put it out there for your peers and the world, you take the time for genuine reflection."

CITATIONS

1. "1:1 Computing: More Than Devices," Eliot Levinson, et al, BLEgroup Thought Leadership Consortium, edtechdigest.wordpress.com, January 14, 2013.
2. "Districts Place High Priority on 1-to-1 Computing," Amanda M. Fairbanks, *Education Week*, March 11, 2013.
3. "1-to-1 Learning," Queensland Government, <http://education.qld.gov.au/smartclassroomsworking/digitally/1-to-1-learning.html>
4. "Implementing a Student-Centered 1:1 Initiative," *District Administration* magazine Webinar, teaser text.
5. "1:1 Computing: More Than Devices," Eliot Levinson, et al, BLEgroup Thought Leadership Consortium, edtechdigest.wordpress.com, January 14, 2013.
6. "1:1 Computing: More Than Devices," Eliot Levinson, et al, BLEgroup Thought Leadership Consortium, edtechdigest.wordpress.com, January 14, 2013.
7. "1-to-1 Learning," Queensland Government, <http://education.qld.gov.au/smanclassroomsworking-digitally/1-to-1-learning.html>
8. "Educational Outcomes and Research from 1:1 Computing Settings," Damian Bebell and Laura M. O'Dwyer, *The Journal of Technology, Learning and Assessment*, January 2010.
9. "Five Steps for Implementing a Successful 1:1 Environment," *Edutopia*, April 11, 2011.
10. "Districts Place High Priority on 1-to-1 Computing," Amanda M. Fairbanks, *Education Week*, March 11, 2013.
11. "How 1:1 Technology Is Making School More Real," Mark Pullen, *Edudemic*, April 30, 2012.
12. "How 1:1 Technology Is Making School More Real," Mark Pullen, *Edudemic*, April 30, 2012.
13. "Districts Place High Priority on 1-to-1 Computing," Amanda M. Fairbanks, *Education Week*, March 11, 2013.
14. "Districts Place High Priority on 1-to-1 Computing," Amanda M. Fairbanks, *Education Week*, March 11, 2013.