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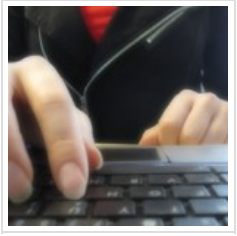
Technology News for Today's K-20 Educator

One-to-one computing programs only as effective as their teachers

Experts say 1-to-1 computing research needs to focus more on classroom practices—and less on equipment
By Meris Stansbury, Associate Editor

New Options in One-to-One Computing,One-to-one,One-to-one computing,Research,Top News,eClassroom News



Studies show that 1:1 success depends more on teachers than on the equipment itself.

A compilation of four new studies of one-to-one computing projects in K-12 schools identifies several factors that are key to the projects' success, including adequate planning, stakeholder buy-in, and strong school or district leadership. Not surprisingly, the researchers say the most important factor of all is the teaching practices of instructors—suggesting school laptop programs are only as effective as the teachers who apply them.

The studies were published in January by the *Journal of Technology, Learning, and Assessment [1]*, a peer-reviewed online journal from Boston College's Lynch School of Education.

Despite growing interest in school 1-to-1 computing programs, "little published research has focused on teaching and learning in these intensive computing environments," say editors Damian Bebell, an assistant research professor at BC's education school, and Laura O'Dwyer, an assistant professor of education.

According to Bebell and O'Dwyer, a big mistake that both researchers and educators make in talking about 1-to-1 computing programs is assuming that by adding computers to the classroom, nothing else has to change.

One-to-one computing "refers to the level at which access to technology is available to students and teachers; by definition, it says nothing about actual educational practices," say the editors.

The studies they present are intended to shed more light on how 1-to-1 programs influence, and integrate with, teaching practices.

The studies found improvements in student engagement [2] and modest increases in student achievement among classes using laptops effectively. But results varied widely among the various programs.

For example, in a study of laptop programs in five public and private middle schools in western Massachusetts, Bebell and Rachel Kay, a doctoral candidate in the Educational Research, Measurement, and Evaluation program at BC's Lynch School of Education, found that teaching and learning practices changed when students and teachers were given laptops, wireless learning environments, and other ed-tech resources.

Bebell and Kay found that while the implementation and outcomes varied across all five schools and across the three program years, access to 1-to-1 computing led to measurable changes in teacher practices, student engagement and achievement, and students' research skills. Specifically, seventh graders in the second year of the program showed statistically significant gains on state test scores in English and language arts after controlling for prior achievement.

But one school struggled with laptop implementation so much that students weren't using technology any more frequently by the third year of the program than were students in non-laptop classes.

It's "impossible to overstate the power of individual teachers in the success or failure of 1-to-1 computing," Bebell and Kay write. "Teachers nearly always control how and when students access and use [the] technology during the school day. In addition, teachers must make massive investments in time and effort to adapt their teaching materials and practices to make the 1-to-1 environment effective and relevant."

Similarly, a study of laptop use in 21 high-need Texas middle schools noted that "teacher buy-in … is critically important, because students' school experiences with [the] technology are largely dictated by their teachers."

The authors of the Texas study conclude: "Respondents at higher implementing schools reported that committed leaders, thorough planning, teacher buy-in, preliminary professional development for teachers, and a commitment to the transformation of student learning were keys to their successful implementation" of the state's Technology Immersion Project.

Researchers and educators who weren't part of the BC-published studies agreed with their findings.

Torsten Otto, an educator from Hamburg, Germany, said at his school (Wichern-Schule), the 1-to-1 computing model is only as successful as the teachers' 21st-century classroom practices.

"In our 1-to-1 program … we put a big emphasis on project-based learning; otherwise, the laptop is no more than an expensive notepad. … Research needs to show the effects of this different style of teaching in terms of student engagement, motivation, and so-called 21st-century skills. The subject matters themselves don't have as much room for improvement," Otto said.

Where it all needs to start

Though the journal's editors and researchers agree that teaching practices are key in making any 1-to-1 computing program successful, it takes a lot of steps to support innovative teaching.

A fifth journal article, not so much a study as a theoretical paper on 1-to-1 computing, argues that school district stakeholders should agree on a clear set of program goals.

The study, titled "The End of Techno-Critique: The Naked Truth about 1-to-1 Laptop Initiatives and Educational Change," written by Mark Weston, adjoint professor in the Graduate School of Public Affairs and the Graduate School of Education and Human Development at the University of Colorado, Denver, and Alan Bain, associate professor in the School of Teacher Education at Charles Stuart University, says that the first step in creating a successful 1-to-1 program is to have a "set of simple rules" created by a community of students, teachers, school leaders, and parents, that defines "what the community believes about teaching and learning."

Schools and districts must outline their goals in implementing a 1-to-1 program, and how they think teaching and learning should change under this model, and then base their decisions on this plan.

In addition, the community must understand what technology infrastructure is needed for a sustainable program, and must be willing to make the necessary investment.

"Programs that have worked have started with a plan that was well thought-out and formulated by a vision committee that involved stakeholders," agreed Pamela Livingston, author of *1-to-1 Learning: Laptop Programs That Work* (published by the International Society for Technology in Education [3]). She is also an education technology analyst for EdisonLearning and adjunct professor at Chestnut Hill College in Philadelphia and the University of Massachusetts-Boston.

"They have nearly all given laptops to teachers first, sometimes a full year ahead, so teachers can use the laptops and begin developing curricular possibilities," Livingston said. "They have done a serious look at issues of infrastructure (network, electricity, wireless plan) and considered logistical issues (carrying cases, insurance) and formulated good policies and procedures."

One common problem, said David Peterson, chief technology officer for ed-tech firm Fiddlehead and a project manager of ubiquitous computing initiatives for two decades, is that technology moves on and schools get stuck in a "technology refresh strategy financial quagmire. It costs money to keep PCs up to date, it takes technicians to keep them up to date, and those resources must be allocated year after year, requiring school board resolve. That resolve is tough to come by when it becomes a choice of teachers, buses, or new PCs."

If a school or district can't maintain a continuous 1-to-1 program, teachers will not have an adequate chance of improving student achievement and engagement through classroom practices.

Peterson recommends that during the planning stage, schools consider sustainable PC implementation strategies. For example, schools could use a mainframe delivery model.

"Instead of planning to replace 500 laptops every three years, schools could get by with replacing the CPU in the mainframe, or system board, or both," he said. "But the end result is that all students have equitable technology and the upgrades are applied at one spot, the computational technology is applied at one spot, and when complete, everyone still has equitable [access to] technology. When the school has more students, or wants to go from a 4-to-1 to a 3-to-1 ratio, they simply add the 'dumb' terminals."

Supporting teachers

Given the importance of teachers in the success of school laptop initiatives, it's no surprise that "teacher preparation through [ongoing professional development] was important for successful implementation," write Bebell and O'Dwyer. "As 1-to-1 programs become more popular, the quality and depth of preparation that teachers receive for implementation will become a central predictor of program success."

Professional development that is "tied to curriculum support and development is most successful," said Livingston. "PD works best when it is not a one-shot undertaking, but is varied and continues yearly. Studies again and again show that with any major school-wide initiative, the most important factor for success is what happens in the classroom."

Otto agrees, saying his school gives teachers advance preparation: One and a half years before the laptops arrived, teachers sat down to plan their technology-based lessons. "Teacher training is critical," he said, "because we need to know what works to be able to use it productively in class."

John Orban, system administrator for The Country School in Easton, Md., said that whenever possible, schools should have faculty conduct these training workshops, "as it seems their peers pay more attention to them than [to] the 'technology folks.'"

Orban said his school requires teachers to submit a written technology plan each month indicating how they plan to use technology in their classroom.

"The biggest fault with 1-to-1 initiatives is not looking at the entire process," said John Thompson, associate professor in the education technology program at New York's Buffalo State College.

"Buying laptops is the easiest part of the process, but too often school districts neglect such fundamental items as providing initial and ongoing professional development for the teachers and providing sufficient tech support," Thompson said. "Taking a true TCO [total cost of ownership] approach would avoid many of the mistakes, as schools often do not have a good grasp of the real costs of starting and continuing a 1-to-1 program. And part of the TCO approach should be setting measurable program objectives and then doing formative and summative program evaluations, whose results are made known to everyone to provide a feedback loop in the continuous planning and re-planning that characterizes successful programs."

Student involvement

But it's not just teachers who experts say must be involved in the 1-to-1 planning process—students should be, too.

"Perhaps a backwards way of thinking by some accounts, we believe a 'bottom-up' approach is better than a 'top-down,'" said Katie Morrow, technology integration specialist at O'Neill Public Schools in O'Neill, Neb.

"Put the technology in kids' hands as early as possible and let them drive the initiative forward. Students should be involved on planning committees, tech support teams, and any visioning or research teams. Publish student projects early on, bring in visitors to see the possibilities in action rather than just talk about them, use students to share at community meetings, board meetings, and in any way possible. Students will push and promote the laptop's application in their various courses much more effectively than an administrator forcing it upon an unwilling teacher."

Morrow said that when the benefits are apparent beyond the school building, stakeholders are willing to support education—and students realize it's not just about the grade at the end of the unit.

"Collecting data is important, but more important is collecting stories," she explained. "Compile anecdotal evidence and interview students. Publish projects that evolve out of the students' opportunity to have 21st-century access 24/7—as opposed to purely test scores and teacher-driven assignments. This culture can cultivate in an initiative where the learning is the focus, rather than the instruction."

Advice and help

Stephan Sorger, instructor of advanced marketing analytics at UC Berkeley, said he follows a few simple principles for teaching with laptops.

For example, every computer project is done in groups; not only can team members help each other, but this also gives students the experience of working on complicated projects in groups. In addition, every computer project has a wrap-up discussion. The discussion ties the project to real-world situations and brings the subject alive for the students.

A new tool, released last month, can help schools and districts in planning their 1-to-1 computing initiatives.

Created by IT solutions provider CDW-G and Educational Collaborators, a national education consulting organization, the free resource—called the One-to-One Readiness Assessment Tool [4]—is based on a number of evaluations and planning matrices that the two firms have used with their education customers for many years.

The online tool helps school leaders assess the technical and cultural readiness of their school's environment for a 1-to-1 program, helps them identify critical success factors they might not have considered, and provides specific, next-step recommendations to reduce risk and time-to-launch.

The tool takes a three-phase approach, said Lance Busdecker, sales manager for CDW-G:

• Online survey: Schools gather key stakeholders, such as faculty, technology staff, and administrators, to complete the online survey.

• Survey review and discussion: Based on the survey results, an Educational Collaborators consultant, paired with the school or district based on demographics, goals, objectives, and other key factors, leads a one-hour review of the survey and discusses areas of concern or issues that require extra customer attention.

• Summary assessment and recommendations: CDW-G and Educational Collaborators deliver a final report, summarizing key discussion points and recommending next steps for the customer.

According to researchers Weston and Bain, indicators of success in a 1-to-1 computing program will appear in classrooms that are "differentiated in genuine ways for all students, with teachers who gather and mine just-in-time data. … Further, teachers, students, and parents use [technology] every day to collaborate about what to do next in their collective pursuit of learning. For them, waiting passively for the results of the big, once-a-year standardized test is not an option. That is why, if asked about the value of using a laptop computer in school, each would struggle to see the relevance of such a question, because computers have become integrated into what they do."

They continue by noting that "laptop computers [would not be] technological tools; rather, [they would be] cognitive tools that are holistically integrated into the teaching and learning processes of their school."

But even with the right tools, professional development, planning, and student input, the journal's editors and researchers, as well as other experts, agree that changing teaching practices through 1-to-1 computing programs will take time.

Tammy Stephens, CEO of the Stephens Group LLC, a private investment firm, is working on a dissertation that focuses on the evolution of transformational communication patterns in 1-to-1 computing environments. She has been evaluating a 1-to-1 program in the Milwaukee Public Schools for the past three years.

According to Stephens, changing teaching practices to incorporate 21st-century skills with laptops "is definitely an evolution, and it takes time for teacher practices to evolve."

Links:

JTLA: Volume 9: Special Edition [1]

CDW-G [5]

Educational Collaborators [6]

The Stephens Group [7]

One-to-One Readiness Assessment Tool [4]

URLs in this post:

[1] Journal of Technology, Learning, and Assessment: **http://escholarship.bc.edu/jtla/**

[2] student engagement: **http://www.eschoolnews.com/?p=54746/?utm_source=website&utm_medium=shorturl&utm_campaign=UsingMultimediatoIncreaseStudentEngagement0111_0511**

[3] International Society for Technology in Education: **http://www.iste.org**

[4] One-to-One Readiness Assessment Tool: **http://www.cdwg.com/1to1readiness**

[5] CDW-G: **http://www.cdwg.com/default.aspx?Seg=10**

[6] Educational Collaborators: **http://www.educollaborators.com/**

[7] The Stephens Group: **http://www.thestephensgroup.com/index.php**