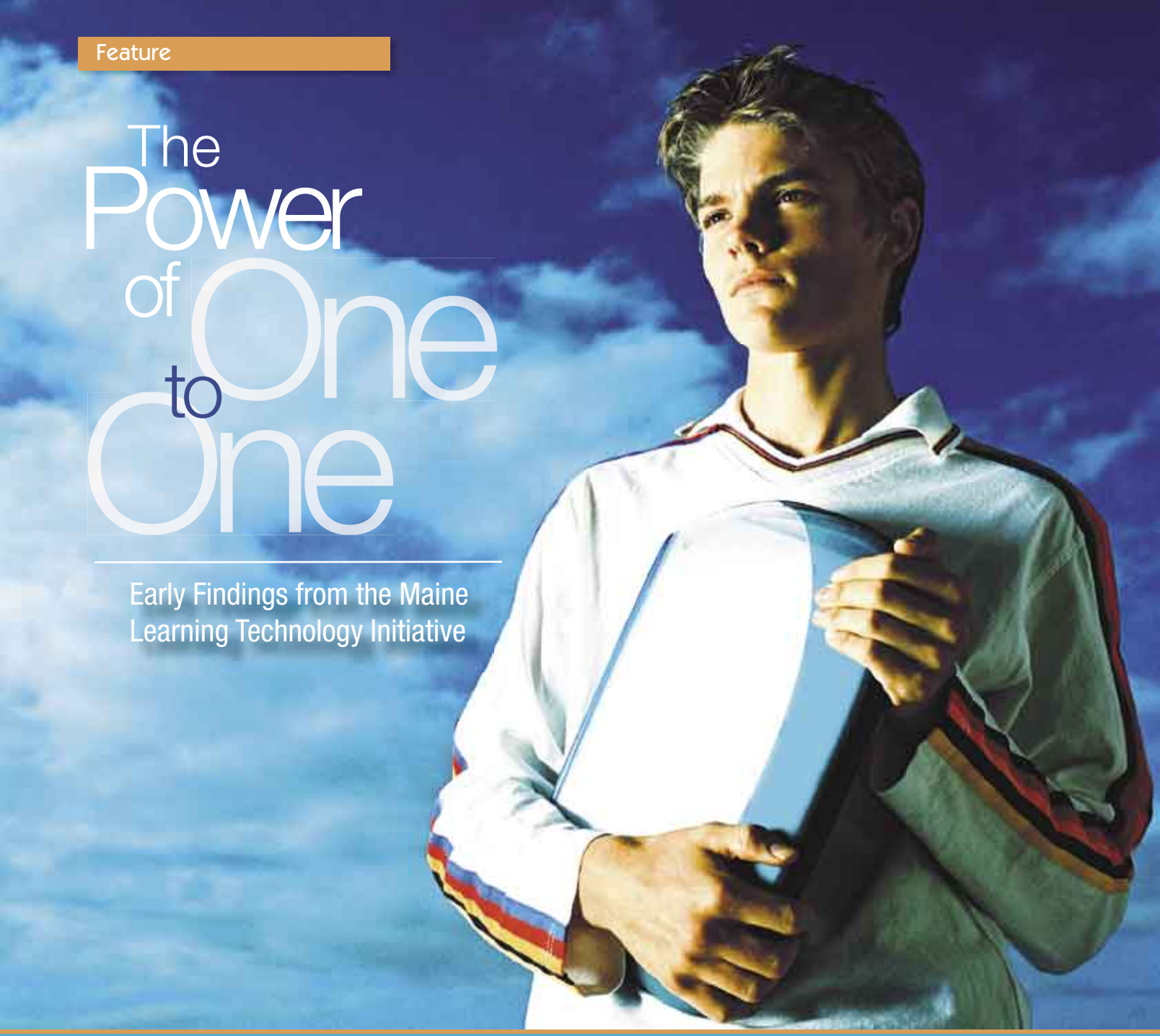
Feature

The Power of One to One

Early Findings from the Maine Learning Technology Initiative



By Mike Muir, Gerald Knezek, and Rhonda Christensen

Subject: Ubiquitous computing

Grades: 7–8 (Ages 12–13)

Technology: Laptops

Standards: *NETS•A* II (http://www.iste.org/standards/)

Maine Learns

"This is a lot like learning to drive a standard. At first, the car jumps around a lot. But later, you look back and think 'boy, I can't believe I had so much trouble.'"

—MLTI Regional Leader Mike Shannon

In March 2000, Maine Governor Angus King surprised the rest of the United States when he announced that he wanted to provide every seventh grader in Maine with a portable wireless computing device. An unexpected state budget surplus had given him the opportunity to do something radical to improve education and the economy of Maine. King recognized that jobs and the economy were changing and that both the ability to use technology and the ability to learn would be key to Maine's being competitive. Perhaps most important, King recognized that Maine had to do something radically different if it were to get ahead.

The one-to-one computing idea came to him at a national governor's meeting. Everyone, every state, he said, was chasing the same things: jobs and opportunities for citizens. And they were all doing the same things: tax reform, international trade, economic development initiatives, and streamlining regular investments in R&D and in education. "We were seventh in per capita income," King explained in a November 25, 2003, address to Noble High School in Berwick, Maine. "We can't get ahead doing the same things as everyone else. The old saying in business says, you don't get ahead of the competition by keeping up." (***Editor's note:*** Find a link to this presentation and other resources on p. 11.)

A conversation with Logo developer Seymour Papert, who now calls Maine home, convinced the governor that simply increasing the student-to-computer ratio wouldn't be enough. At the time the ratio was approximately 5 to 1. The governor asked Papert, who had a hand in founding MIT's Media Lab, what if he could make the ratio 3 to 1. "It wouldn't matter," Papert corrected, "It is only when you implement one-to-one computing that the power happens!"

And so the idea of the Maine Learning Technology Initiative (MLTI) was born. Maine has had two years to study the initiative's effects on learning. Others want to know, too. States such as Michigan and New Hampshire have announced their own large-scale technology initiatives, and others are planning theirs. They want to be able to learn from Maine in support of their own work.

We are involved in an exploratory study of this initiative. We'll begin by describing the project from the planning stages to plans for its future. We'll also share the results of our research on the project.

The Planning Process

Maine released a Request for Proposal and conducted a rigorous bid process that Apple Computer eventually won. Apple agreed to provide 37,000 high-quality laptops over two years (12" iBooks with CD-ROM drives), with a full complement of software (office applications; Web browsers; and encyclopedia, e-mail, presentation, desktop video, and photo album software), wireless networks, initial training for teachers, and technical support. That was enough technology for every seventh and eighth grade student and teacher in the state of Maine. There were other large-scale laptop initiatives in the United States, but this would be the first statewide initiative.

The Design Team for Curriculum and Professional Development convened in August 2001 to help shape the design and implementation of MLTI. They did a great deal of planning and organizing that fall as well as communicating with schools about what to expect. One of the team's major decisions was to keep MLTI clearly focused on teaching and learning. The technology would be secondary to educational objectives. This has been realized by involving teachers in project leadership and through ongoing professional development that focuses on sharing resources and best practices, group problem solving of classroom challenges, and technology

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skills taught within the context of how they can be used to teach academic content.

MLTI began with nine Exploration Schools in spring 2002. These schools piloted the learning with laptop solution, not simply to work out the details for widespread implementation, but also to provide educators, state legislators, and the public a place to see what education supported by wireless computing could look like. By fall 2002, every middle level school in Maine had wireless networks and enough laptops for every seventh grade teacher and student. Roughly 1,800 teachers and 16,000 students in 239 schools had just moved education into the 21st century. In fall 2003, additional laptops were added to ensure that every seventh and eighth grade student and teacher in Maine was involved in the project.

The First Year

By fall 2002, Apple Computer had delivered laptops to the seventh grade teachers months ahead of schedule. As part of their contract, Apple offered two-day summer training institutes across the state. Schools received student laptops in the summer, and because Maine is a "local control" state, could decide when and how they would distribute them to seventh graders. Some schools turned them out on the first day of classes, while others waited. Some schools had students participate in "boot camps," laptop training sessions similar to what the teachers experienced in the summer. Others had teachers introduce laptop concepts individually as they fit with some curriculum-based technology project the teachers were implementing.

Some teachers dove in, working with the laptops from the very first days. Others were more cautious. By the end of September, it was estimated that between half and two-thirds of the schools had deployed their technology with students. Throughout the fall and winter of that first year, teachers of various levels of technical competence, comfort, and enthusiasm worked on teaching students with the use of these laptops. Teachers explored and pioneered, struggled and excelled, learned furiously and became overwhelmed. But they constantly persevered toward the goal of improved learning and engagement for each student. Mike Shannon, a MLTI regional leader, put it this way: "This is a lot like learning to drive a standard. At first, the car jumps around a lot. But later, you look back and think 'boy, I can't believe I had so much trouble.' At first, you have to think a lot about each step and later it comes without thinking."

The Maine Education Policy Research Institute (MEPRI) was charged with watching this first year of implementation. MEPRI, a project of the University of Maine System, is charged with reporting to the state legislature on any state-funded educational venture they wish to have evaluated. By the time they released their mid-year report (prepared by co-evaluators David L. Silvernail and Walter J. Harris) in 2003, MEPRI had interviewed and surveyed teachers, administrators, and students; visited the nine Exploration Schools and seven comparison schools; conducted classroom observations in 23 classrooms; and participated in 10 regional meetings.

Based on the first five months of the statewide implementation, MEPRI found that student engagement and attendance were up and behavior referrals were down. In addition to a dramatic increase in the use of technology within classrooms, they found teachers felt the laptops were "having positive impacts on their teaching. Teachers are finding that their lessons are more extensive, use more up-to-date resources, and provide more opportunities to explore knowledge and information in more depth." Furthermore, there was evidence that student interest in school and learning had increased and behavior issues had decreased. Students are working harder both in and out of school. The report notes, "The nature of student learning in classrooms may be changing because students have the tools to pursue, organize, analyze, and present information more readily at hand. Although some students continue to experience technical problems, most are excited about using the laptops in their classes."

A Middle School Case Study

MEPRI wasn't the only group looking at Maine's middle schools. The Maine Learning with Laptop Study, a collaborative project of the University

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of Maine at Farmington and the University of North Texas, is exploring the effects of MLTI on teaching and learning. For our exploratory study of the initiative, we have collected notes and documents from planning, informational, evaluation, and professional development meetings throughout the Initiative, archived e-mail discussions, conducted formal and informal interviews of teachers and administrators, and administered formal surveys of students and teachers.

A group of principals attending a regional MLTI meeting in October 2002 thought it was a rocky start for staff. Although many teachers approached the innovation with excitement, other staff members were unsure. They felt a huge sense of responsibility to make the initiative work but were fearful that they didn't have all the tools and support to make that happen. Everyone recognized that the two-day training wasn't sufficient (it was only intended to be an introduction to teaching with technology), and there hadn't been sufficient time yet for staff to participate in the other professional development opportunities that became available. Some schools saw MLTI as an add-on to the standards and local assessment work they were already doing, while other schools were trying to integrate their standards and assessment work with the laptops.

The same group of principals felt it was a good start for students. The principals were impressed with the change in the seventh graders: students were more focused in class, there had been fewer discipline referrals (zero for one principal), no problems with eligibility checks, and seldom were they in detention. Principals agreed that there was student enthusiasm. They were also surprised at how well students were caring for the machines.

The Maine Learning with Laptop Study also conducted a case study of a typical middle school, which they have posted on their Web site. They found that students at the school showed a significantly more positive attitude toward school ($p < .01$) than students at a technology-rich comparison school in Texas. The study was especially interested in comparing students who were allowed to take home the laptops with those who were not. Taking the technology home can have numerous benefits, not the least of which being students can continue on technology-based schoolwork at home and have the potential of as much as four times the access to technology-based resources than students who only have access at school. The study discovered that students who did not have a computer at home and were not allowed to take a MLTI laptop home scored lower ($p < .05$) on computer skills, on attitude toward school, and on self concept than other students at the same school.

The Exploration Sites and Achievement

It's not surprising that most of the initial findings about MLTI said little about achievement. Researchers recognize that broad, large-scale initiatives often take several years before there are discernable changes to achievement. But Maine got its opportunity with the 2003 eighth grade Maine Educational Assessment and the students of the Exploration Schools.

Teachers at the Exploration Schools received their laptops and the initial two-day training in March 2002, months ahead of the rest of the state. Before long, teachers and students were learning together how the laptops best fit into their teaching and learning. The students at one Exploration School were asked how their classes are different now. They responded that they were doing more reports and more typing. They weren't using them much in math (which surprisingly turned out to be fairly common and was addressed with focused professional development targeted to math teachers). Students said that they now get right to work. "We don't have to move to the library, and we don't have to move to the computer lab," one student said. Another added, "We do so much more on them with the laptops than we would have in the computer lab. We see things and notice how we can do better."

In fall 2002, the students at the Exploration Schools were allowed to take their laptops to the eighth grade. Maine does statewide standardized testing in Grades 4, 8, and 11, and in 2002–03 the only eighth graders who had been part of MLTI were from the Exploration Sites.

The Maine Learning with Laptop Study examined three years of MEA data in four areas (math, science, social studies, and visual and performing arts), comparing the school averages for the Exploration Schools to school averages for the other 214 middle schools for which there were data. In 2000–01, before MLTI got its start, the Exploration Schools were not unusual when compared to the

other Maine schools, except perhaps for being a bit lower in math. By the end of the 2002–03 school year, two years later, the Exploration Schools scored significantly higher in math, science, and visual/performing arts than the other schools. There were indications that students from the Exploration Schools had gained the equivalent of two extra months in these subjects.

The Future of the Project

Where will the project go from here? During spring 2004, Maine actively explored ways to continue the project into high schools. For now, the project will continue for seventh and eighth grade. A handful of high schools are moving ahead for the 2004–05 school year at their own expense but with the guidance and support of the state. But moving the statewide initiative into all high schools will require creative funding during challenging economic times.

But Maine has one school to which they can point to see what MLTI might look like at the high school level: Piscataquis Community High School (PCHS), located in Guilford. Guilford is a rural community in Central Maine. Many of its community members work for Guilford Industries, a textile manufacturer. Guilford has several distinctions: it is located in one of the poorest counties in the country, and despite this, Guilford Industries is considered one of the highest tech textile mills in the world.

In 2000, a year before the Exploration Schools were conceptualized, representatives of Guilford Industries heard King's plans to revolutionize education with technology. They realized that such a move would improve their future work force. They also knew that a small group of innovative teachers at Piscataquis Community Middle School (PCMS) had already received a small grant to buy laptops. Guilford Industries offered PCMS a significantly larger matching grant so that they could have one-to-one wireless computing for their entire eighth grade.

Guilford wasn't one of the "rich" districts in Maine, and they became a wonderful place to see how typical teachers with typical students and typical challenges could use a technology initiative to their advantage. Because there was no other statewide technology initiative, many of the arguments against King's idea were based on supposition, theory, and ideas, not on facts, research, or experience. King had the advantage of pointing to Guilford and saying, "If it works here (and it does), it can work throughout Maine."

PCMS became one of the nine Exploration Schools, but they didn't stop there. In 2002–03, when the rest of the state had one-to-one wireless computing in all their seventh grade classrooms, Guilford had one-to-one wireless computing in Grades 6–12. Theirs was the first high school in Maine to have fingertip access to technology for all their students and teachers. The high school was already active in educational restructuring work. Years before, they had had a Nabisco school restructuring grant, and they are currently part of the Gates Foundation–funded Great Maine High Schools Project, an initiative working with 10 high schools across Maine on their individual plans to better meet the needs of their students and communities (not necessarily through the use of technology).

The Mitchell Institute is helping to facilitate the Great Maine Schools Project and has released *One-to-One Laptops in a High School Environment,* an interim report on PCHS's learning with laptop program. They surveyed students, teachers, and parents. The findings from this high school strongly parallel findings from the state's middle schools to date. Students' and teachers' technology skills and access to resources have improved. Student motivation and interest has increased. Teachers believe that the quality of students' work has improved and that they are achieving to a higher degree. Interaction between students and among students and teachers has improved. Although the laptop program has benefited all students, it has resulted in the greatest improvements for at-risk or low-achieving students. Further, their survey results did not point out any perceived disadvantages to or complaints about the laptop program at PCHS.

Conclusion

One-to-One Laptops clearly points out that the results for PCHS are valid for Guilford and can't necessarily predict

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the results of a statewide high school learning with laptop initiative. The findings, however, certainly provide evidence that a high school initiative could work and optimism that such an initiative would have positive benefits for high school students and teachers. Likewise, studies of Maine's current seventh and eighth grade initiative, while valid for Maine, will not necessarily predict how similar programs will work in other states or countries. But the findings discussed here are compelling evidence that MLTI is positively affecting the achievement of Maine's students and provide sufficient evidence that other technology leaders in other states could anticipate encouraging results. Perhaps wireless portable one-to-one computing environments are simply a long overdue upgrade to public education.

Resources

Institute for the Integration of Technology into Teaching and Learning: http://www.iittl.unt.edu/

King, A. (2003, November 25). *Can I have my laptop so I can email my lawyer?* Presentation at Noble High School, Berwick, Maine. Available: http://www.sad60.k12.me.us/king/.

Maine Learning with Laptop Study: http://www.mcmel.org/MLLS/

Maine Learns! (the MLTI educators' site): http://www.mainelearns.org/

MLTI Historical Documents: http://www.state.me.us/mlte/history/

Muir, M., Knezek, G., Christensen, R. (2004). *The Maine Learning Technology Initiative: An exploratory study of the impact of ubiquitous technology on student achievement. Maine Learning with Laptop Study.* Farmington: Maine Center for Meaningful Engaged Learning. Available: http://www.mcmel.org/MLLS/MLLS0401.pdf.

One-to-one laptops in a high school environment: Piscataquis Community High School study interim report. (2004). Portland, ME: Senator George J. Mitchell Scholarship Research Institute. Available: http://www.mitchellinstitute.org/Gates/.

Piscataquis Community Schools: http://www.sad4.org

Silvernail, D. L., & Harris W. J. (2003). *The Maine Learning Technology Initiative: Teacher, Student, and School Perspectives Mid-Year Evaluation Report.* Gorham, ME: Center for Education Policy, Applied Research, and Evaluation. Available: http://www.usm.maine.edu/cepare/pdf/mlti/MLTI%20Mid%20Year%20Evaluation%20Report.pdf.

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Dr. Gerald Knezek is a professor of technology & cognition at the University of North Texas. He currently serves as Chairman of the Society for Information Technology and Teacher Education Research Committee and as a member of the Executive Committee for American Educational Research Association Special Interest Group on Technology as an Agent for Change in Teaching & Learning.

Dr. Rhonda Christensen is a research scientist and adjunct professor in the Computer Education and Cognitive Systems Program at the University of North Texas. She serves on the SITE Research Committee and is on the Executive Committee for the AERA Special Interest Group on Technology as an Agent for Change in Teaching and Learning.