

Lessons Learned About Providing Laptops for All Students

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INTRODUCTION

A growing number of states are supporting one-to-one student-to-computer ratios by purchasing laptop computers for all students and teachers in particular schools or at particular grades. Maine has been a pioneer in the ubiquitous computing movement, providing computers and wireless Internet access to all students in grades 7 and 8. About one-third of Maine's high schools will also be providing laptops to their students in the 2004–2005 school year. Indiana supported one of the earliest one-to-one initiatives. Michigan, New Hampshire, New Mexico, Texas, and Vermont are also experimenting with state-supported laptop initiatives, as are many individual school districts throughout the United States, including Henrico County, Virginia, the largest district-funded laptop program.

Ubiquitous or one-to-one computing environments are different from what one traditionally finds in most school settings because they offer all students and teachers continuous access to a wide range of software, electronic documents, the Internet, and other digital resources for teaching and learning. Policymakers' goals for laptop initiatives include increasing economic competitiveness, reducing inequities in access to computers and information between students from wealthy and poor families, and raising student achievement through specific interventions, such as improving students' understanding of algebra through the use of education software. Other reasons cited for supporting laptop initiatives include improving classroom culture, increasing students' engagement, making it easier to differentiate instruction according to students' needs, and solidifying home-school connections. For example, the

former Governor of Maine, Angus King, said about the laptop initiative he initiated:

“For more than 100 years, Maine has always been in the bottom third of states—in prosperity, income, education, and opportunity for our kids. In my 30 years of working on Maine economic issues, no idea has had as much potential for leapfrogging the other states and putting Maine in a position of national leadership as this one—giving our students portable, Internet-ready computers as a basic tool for learning” (Curtis, 2004a).

Bette Manchester, director of special projects for the Maine Department of Education, including the Maine Learning Technology Initiative, adds that, “if people are really serious about school reform and leveling the playing field, raising the bar for all kids, these are tools that can really support change” (Curtis, 2004b).

Although one-to-one programs vary from one another, they have each demonstrated that a comprehensive, systemic approach is needed if the initiative is to achieve the desired goals. No one component is sufficient for a successful initiative, as represented in the illustration on the cover page. “If it's not going well,” says Bette Manchester, “it's usually about the leadership. There needs to be a leadership team that looks at things through three different lenses: the lens of curriculum and content; the lens of the culture of the building; and the lens of technical needs.”

As a way of helping states and districts interested in laptop initiatives, NEIRTEC has reviewed lessons learned to date from many laptop initiatives around the country



and has prepared this guide. Drawn from articles and reports about current and past programs (see references at the end of the paper), as well as conversations with policymakers, this guide can be of practical help to emerging initiatives. But it is important that this information not be perceived as a “recipe.” What is necessary or appropriate for a particular laptop initiative will depend on its specific goals, circumstances, and needs. Nonetheless, these lessons are intended to increase information sharing across laptop programs and help leaders and stakeholders build on existing knowledge. Because large-scale laptop initiatives are so new (Maine’s 7th graders received their laptops in 2002, for example), there is still much to be learned.

The lessons are presented in five main categories: *Planning, Training & Professional Development, Managing Change, and Monitoring & Evaluation.*

PLANNING

Align the laptop initiative with your goals

As noted above, policymakers support laptop programs for different reasons, including: increasing the equity of students’ access to technology and information, increasing economic competitiveness (one of the reasons that former Governor Angus King supported Maine’s laptop initiative), creating a more active learning environment for students, and increasing student achievement. The question is, what are *your* primary goals and what will be needed to achieve them? Bette Manchester’s role, for instance, is to “make sure that we’re focusing all of the technology effort on the work of the Maine schools as they attempt to meet the Maine Learning Results [the state’s education standards] and our Maine

guiding principles” (Manchester, 2004).

- Focus on key goals for students’ learning: Which goals for students are most important—increased motivation, better writing skills, test preparation, technology proficiency, broader access to Advanced Placement courses, helping students succeed in algebra, or any of many others? To meet the goals you establish, you may need to license appropriate software or websites, provide focused teacher professional development, select new curricula, implement new policies for technology use, create new resources, develop new assessments, or engage the community in supporting your goals (Jeroski, 2003). For example, Maine, in response to needs identified by the state department of education, chose to implement a professional development program to help rural middle schools improve the teaching of mathematics using the laptops.

- Align your technology policies and supports with your goals: Is bridging the “digital divide” between wealthier and poorer families an important goal? If so, home use is important. Home use is also important if teachers are expected to give homework assignments that require the use of the laptops. (Note that if the laptops do go home, insurance needs to be considered.) Similarly, if students are expected to do homework using the Internet, or enroll in online courses outside normal school hours, then it may be important to help some families access the Internet from home. Henrico County, Virginia, for example, offers families the option of signing up with an Internet Service Provider at low cost. In some initiatives, parents are trained and are also beneficiaries of the initiative.



Build a strong leadership team at all levels

Strong leadership is needed at all levels, from the classroom and the school to the district and the state. For example, Indiana's experience shows that strong and visionary leadership that encourages collaboration and risk-taking is needed from teachers, as well as from administrators. According to preliminary results of an evaluation, "the ongoing success of one-to-one in Indiana is dependent upon the support and involvement of building-level leaders" (Lemke & Martin, 2004). Similarly, Bette Manchester believes that, "You really need to spread the leadership for a project. And giving teachers a lot of say and responsibility for how this project is played out is really critical" (Manchester, 2004).

- Meet on a regular basis: In Maine, school leadership teams (including the principal, a teacher leader, the technology coordinator, and the librarian) meet on a regular basis to assure that all aspects of the laptop program are moving at a similar pace, including the technical infrastructure, professional development, software needs, etc. Technical needs alone ought not drive the initiative; instead, "the educators in the building need to own the technology work" (Manchester, 2004).

Think about funding for the long term

Ongoing training and technical support are costly and require a long term commitment from the operating budget. Most of the initiatives reviewed for this document faced unexpected costs due to technical difficulties (such as inadequate network bandwidth), and personnel often requiring more training than was planned.

Successful programs use multiple sources of funding, including appropriate state and federal programs.

- Use outside funds, when possible: Maine uses a variety of federal, state, and local funds to support the laptop program. Maine also used a grant from the Gates Foundation to provide professional development to principals and superintendents involved in the laptop initiative, as well as a U.S. Department of Education award to support a rigorous evaluation study.

Develop solid partnerships both inside and outside the school system

Developing partners establishes a foundation for the project.

- Take into account stakeholders' level of interest in the one-to-one initiative and demonstrate success early: Stakeholders' initial perceptions of technology influence their predisposition to carry out an initiative like one-to-one computing, and they can either facilitate or hinder the implementation process. Therefore, in large systems it may be best to begin with volunteer districts or schools, as many states are doing, rather than the entire system. Maine, for example, began its initiative in a small number of pilot schools. Speaking of the first of the laptop schools in Maine, former Governor King said, "[it] was critical because it gave us a test site that we could point to" (Curtis, 2004a).

- Develop business partnerships: Business partners, including hardware and software vendors, can help reduce costs and build a more effective team. In addition, this type of partnership may help increase



technical and training capabilities as well as decrease skepticism from some stakeholder groups (Edwards, 2004).

- Develop partnerships with evaluators: Maine began at an early stage to use university-based teams of evaluators who could quickly provide the legislature with information it wanted about implementation of the laptop program.

Plan logistical details carefully

Laptop initiatives are often delayed or disrupted by small, logistical details rather than by major problems. The director of the Buddy project in Indiana, Nancy Miller, provides the following advice to other educators, “Think long-term. Ensure impact by ensuring that the mundane aspects of the project (maintenance, upgrades, insurance, replacement of equipment) are planned and supported” (Lemke & Martin, 2004).

- Help protect the computers: Once laptops arrive, they need to be stored in a secure place that is accessible on a daily basis, especially in case students are not allowed or choose not to take their laptops home. To transport the computers safely, a well-cushioned carrying case will help prevent damage. Similarly, to reduce students’ intentional or unintentional misuse of laptops, it is important to develop and establish a code of conduct that specifies the rights and responsibilities of students with regard to the care and use of laptops (Apple, Profiles in Success: Henrico).

- Set up filters and other control mechanisms for laptops: In Maine, the iTunes software (a “digital jukebox”) was not provided on students’ computers, although it is usually provided with

Apple iBooks, because using iTunes was a potential distraction. Similarly, one of the lessons learned from Henrico County is the importance of having a certain level of “control over the type of information students use in the classroom and at home” (Edwards, 2002). Henrico staff added controls to limit what students could access at school and reconfigured the laptops to limit file sharing and downloading of inappropriate materials (Edwards, 2003).

- Design systems for distribution and for daily management: Prior to distributing the laptops, inform students and parents about the code of conduct through a seminar, workshop, or in other ways. Require students and teachers to sign the acceptable use policy for proper use and care of laptops. Create an inventory; Henrico for example, scans barcodes to ensure an accurate and efficient inventory. Collect insurance payments and forms. Establish a Help Desk (telephone-based, or other) for troubleshooting and technical questions, so students know where to turn if they experience problems (Edwards, 2003). It is also essential to have a system in place to manage the daily use and distribution of the laptops. If the laptops do not go home, who will collect and distribute them daily, and when? If they do go home, what is the process used to check them in and out? If a student does not bring his or her laptop to school, what happens? Laptops need to be charged, and often re-charged, prior to and during the school day. Where will this occur? Is there adequate power and/or space available? Will the laptops be collected and then redistributed during recess, lunch, gym, and extra-curricular activities?



TRAINING & PROFESSIONAL DEVELOPMENT

Training and professional development of staff at different levels are fundamental components of a successful laptop program and should be part of the initiative from the start.

Provide training and professional development for teachers and administrators mainly on curriculum integration, not only on technical skills

Teachers participating in one-to-one projects agree that in order to make the transition to ubiquitous computing, they need assistance integrating technology into the curriculum, not only help developing new technical skills. One piece of advice from Gunderson High School (San Jose, California) to other schools considering one-to-one computing is, “the success of your laptop program depends on having teachers who feel confident in the use of technology” (Apple, Profiles in Success: Gunderson). Similarly, Bette Manchester told principals in Maine, “it was really critical that we set up staff development during the day and that we bring teachers together by content area” (Manchester, 2004). Maine provides staff development for technology integration in all subject areas, including training teachers to use project-based learning.

- Assess the technical and professional development needs of school staff: Effective training builds upon existing knowledge. Knowing at an early stage the different technical proficiencies that teachers and administrators have can help you develop a professional development plan that is sustained, rigorous, and

effective in addressing their needs (Lemke & Martin, 2004). Offer training for both curriculum-specific and cross-curricular applications. At the same time that teachers are learning about technology integration, technology coordinators need staff development about school change processes that support the key goals of the laptop program.

- Form a “Technology Leadership Team”: From the onset, administrators at Gillispie School in La Jolla recognized that “the laptop initiative would succeed only if all teachers received ongoing professional development” (Apple, Profiles in Success: Gillispie). They therefore formed a “Technology Leadership Team,” which trained teachers new to classroom technology integration and provided ongoing training and mentoring to teachers at all levels and specialties. Similarly, Dan Evans, former State Superintendent of Indiana advises new initiatives to “put together a team that brings together expertise in curriculum, learning, school change, and technology. Focus on getting teachers ready to use the tools in powerful ways for learning” (Lemke & Martin, 2004).

- Use a variety of training and professional development formats: Teachers value both formal professional development events, such as workshops during the school year or summer, and informal opportunities to learn from their colleagues. Team meetings, department meetings, and other ongoing events can become occasions to discuss technology integration. Co-teaching opportunities can be useful, as well as demonstration lessons taught by more expert teachers. Online professional development is a viable option, especially because all the teachers have laptops. Providing teachers with a “menu”



of training opportunities is a good idea.

- Partner with local universities, education organizations, and other institutions: Explore whether local universities and/or education organizations have the expertise and capacity to assist in training teachers, administrators, and others. The one-to-one program in Indiana, for example, formed collaborations with Indiana University, Purdue University Indianapolis and The Center for Interactive Learning and Collaboration for teacher training on curriculum integration (Lemke & Martin, 2004).

- Provide administrator professional development: Training is often planned for teachers while leaving administrators aside. However, administrators play a leading role during implementation and they also need guidance, advice, and training. Indiana, for instance, collaborated with Apple to organize seminars like “Problems Encountered with Teachers Integrating Technology” to help administrators improve their leadership skills (Lemke & Martin, 2004), and Maine has also provided school administrators with substantial professional development about the laptop program.

- Make professional development flexible: As teachers and administrators receive training, their needs change. Therefore, it is critical to keep updating professional development. “The key is to plan as best you can but to remain flexible,” the past superintendent of Henrico points out. “Technology changes at the speed of light and so do the training needs of teachers” (Edwards, 2003). Connect teachers’ professional development to other key initiatives in the state or district that affect them, as Maine is doing to try to increase achievement in middle school mathematics.

Train parents on basic technical skills and inform them about the code of conduct and rules involved

- Establish a training requirement for parents: From the outset, Maine has expected parents to attend a 90-minute training before the laptops are allowed to go home. Similarly, in Henrico County, parents of every middle school student are now required to attend a 90-minute training session before picking up the laptops. These sessions provide technical information about the machines as well as an explanation of the code of conduct established for the use and care of laptops. In order to establish such a requirement, however, training sessions should be easily accessible to parents. Henrico offered the training several times throughout the day, accommodating parents’ schedules (Apple, Profiles in Success: Henrico).

- Create parent resource centers: Recognizing that a one-to-one computing initiative can reach out to parents and families, Henrico used Parent Resource Centers to make training available for parents interested in acquiring basic technical skills and conducting Internet research. Former superintendent Edwards (2004) says, “We work with parents to increase their capabilities and comfort level with the laptops,” which contributes to the long-lasting impact of the one-to-one initiative.

HARDWARE & SOFTWARE

Provide the necessary digital content and tools

The effective use of laptops depends in part on the availability of digital resources.



- Purchase or license digital materials: In order for teachers to integrate technology in the curriculum, and for students to use technology, they need access to the necessary software, online databases, and proprietary websites. Schools and districts should not only take care of licensing procedures to make the necessary tools available to teachers but should also provide sufficient guidance or training on how to use the tools.

- Create e-learning curriculum writing teams: Many laptop initiatives provide opportunities for their teachers, often working in teams, to develop lesson plans, websites, online courses, electronic documents, and other curriculum resources. In Henrico County, teams consisting of district curriculum specialists, teachers, and technology trainers worked together to develop units that incorporate digitized content and activities. As one teacher said, “Since I helped develop electronic lessons, I understand them from the inside out, and I can provide insights for my colleagues back at school” (Edwards, 2003).

- Identify software needs and restrictions: Prior to purchasing laptops, determine the key productivity tools needed and establish a standard software package to be used for word processing, spreadsheets, presentations, and so on. Standardization will reduce compatibility and training issues as well as reduce costs. Determine whether email and chat features will be available to students and, if so, how they will be managed.

Build and maintain the necessary network infrastructure

According to Indiana’s experience, a critical factor for the effective

implementation of one-to-one computing is the existence and maintenance of a high-quality network infrastructure.

- Assess the infrastructure and wiring needs within the school: The school may require network infrastructure modifications, which are costly and take time. If these issues are addressed at the onset, significant time and trouble may be saved later. Lloyd Brown, assistant director of technology for Henrico County Public Schools, gives the following advice: “look at your buildings; look at where the wireless connections will be set up; look at where and how the kids will use the computers; and then model what they will and will not do with them. Then, do your homework; talk to your technology suppliers; and figure out what it will take to bring that many people online at once” (Apple, Profiles in Success: Henrico).

- Support and maintain networks: Setting up the necessary infrastructure is not sufficient, it is also necessary to maintain it. The experience in Indiana showed that infrastructure needs to be “well supported by onsite technical support personnel” in order to keep network capabilities in good condition and up-to-date (Lemke & Martin, 2004).

- Consider purchasing display devices: Students and teachers will sometimes want to be able to look at a single screen as a group. In Henrico County, each classroom has a display device. Alternatively, classrooms may share display devices.

Make technology support available onsite as well as offsite

- Have onsite technical assistance available: Teachers across programs often



mention the lack of sufficient onsite technical support. “If teachers new to computers cannot get the help they need when problems arise in the middle of a lesson, they will become soured to future technology use” (Apple, Profiles in Success: Gillispie School, La Jolla, CA). Some schools contract a full-time onsite technical assistant, if not more than one. Maine uses student technology support teams (iTeams), which consist of technology-savvy students, who help teachers and classmates with troubleshooting and technical questions during the school day (Silvernail, 2004).

- Establish clear procedures to address major technical needs offsite: Some technical needs and repairs require specialized offsite services. Developing clear procedures for shipping and repairing laptops offsite as well as maintaining a strong partnership with offsite institutions can help reduce delays and make this process more efficient.

- Create a “student-run” help desk: Henrico was a pioneer in establishing a help desk composed of tech savvy students who, under the supervision of a faculty member, provide help to students and teachers who encounter technical problems during the school day. Students take turns working at the help desk and earn community service points for their efforts. According to Henrico County’s Director of Public Relations, this initiative proved to be very efficient for addressing minor technical problems (Apple, Profiles in Success: Henrico).

MANAGING CHANGE

Allow sufficient time for change and make it gradual

Stakeholders need time not only to

learn about and become comfortable with new technology, but also to understand the change process and its implications for their daily activities.

- Allow time for teachers to become comfortable with technology before expecting them to use it for instruction: In Maine, it proved essential to allow teachers sufficient time to become familiar with the laptops before expecting them to be used in classrooms. Similarly, after rapidly implementing the one-to-one program at the high school level, Henrico realized that allowing teachers, administrators, and other stakeholders sufficient time between the planning stage and the distribution of laptops to students is important for successful implementation. Thus, middle schools teachers received their laptops a full year before the students, and that time provided the teachers with a high degree of confidence in their ability to use the laptops (Edwards, 2004).

- Provide students with keyboarding skills: Technology integration may become “much more seamless” when students are given sufficient time pre-launch to become familiar with basic computer skills, like keyboarding, as highlighted by the experience at Gillispie School (Apple, Profiles in Success: Gillispie).

- Expect change to be gradual: In large laptop initiatives, like Maine’s, students at different grade levels usually receive laptops in different years. Over the long term, as computers are used more routinely, changes may take place not only in instruction but also in assessment systems (e.g., online testing), instructional materials (e.g., closer ties between textbooks and digital materials, including software), management systems (including data-driven decision-making), and communications



with parents (e.g., the use of password-protected websites, such as K12Planet, where parents can view their students' grades and assignments).

Foster and maintain stakeholder participation and ongoing communication

When all stakeholders (teachers, administrators, students, parents, technicians, etc.) are well-informed about the project and collaborate with one another, emerging problems are more easily identified and can be addressed at an early stage.

- Use various approaches to reach out to the broad community: All Maine schools held parent nights at an early stage of the laptop program, and most continue to hold annual parent nights. Henrico County created a “key communicator network” through which 400 stakeholders communicate via e-mail to learn about accomplishments and address challenges. Newsletters, community gatherings, formal/informal presentations, and consultations with community leaders can all be helpful (Apple, Profiles in Success: Henrico). The Manatee County, Florida school district advises other programs to foster ongoing communication with parents. They did so through continuous “parent night” gatherings and broadcasts of “Tech Time,” a TV show that gives information about the program and generates discussions via call-ins (Apple, Profiles in Success: Manatee). Meeting with PTA presidents and creating parent newsletters can also help.

- Involve students: Indiana organizes events where students act as mentors to parents, siblings, and the broader community. Through the “Tech Days”

program, students help local senior citizens increase their digital literacy (Lemke & Martin, 2004). They also organize annual presentations at which students use technology tools (PowerPoint and iMovie) to share their concerns and propose solutions to problems that they have identified (Lemke & Martin, 2004). Henrico involved students from the onset. They created “leadership teams,” which included students, teachers, and parents from the high schools, to discuss the laptop program prior to its implementation (Apple, Profiles in Success: Henrico).

MONITORING & EVALUATION

To meet the challenges of implementing a laptop initiative, to learn more about its impacts, and to inform ongoing debates about the value of these initiatives, ongoing monitoring and evaluation are called for.

Make monitoring ongoing

Some challenges may be foreseen and addressed during the planning stage but others emerge as implementation takes place. Ongoing monitoring helps identify obstacles at an early stage. For example, Henrico County found it helpful to use focus groups of teachers and students on a regular basis to identify and systematically address unforeseen problems that occurred during implementation of their one-to-one initiative (Edwards, 2002).

Conduct research or evaluation studies

Because laptop initiatives are new, and technologies are changing, there is still much to be learned. Some useful evaluative studies of laptop initiatives have been done (see <http://ubiqcomputing.org>



for references). However, there is still a paucity of information about cost issues, impacts on student learning in many subject areas, and other important topics. (Zucker [2004] provides an evaluation framework and an agenda for studying one-to-one programs.) Some needed studies are inexpensive and could be done in-house (for example, it would be valuable to have more descriptions of creative teachers' uses of laptops during a semester or a year). In other cases, external grants from federal, state, or private sources may be available for research. Maine, for example, is conducting a randomized experimental trial of its professional development intervention in middle school mathematics, using research funds from the U.S. Department of Education.

Authors of a new book about evaluating educational technology in schools (Means & Haertel, 2004) suggest that there are a small number of important evaluation principles that will help guide future work:

- Look for critical influences at multiple levels of the education system: There are many influences on teachers' and students' uses of technology. Study those influences that are most important in your context (state or district policies, school leadership, demographics of schools, teachers' training and expertise, etc.). Don't try to do it all.
- Figure out what you're especially trying to teach, and measure that: If you study student achievement, focus on areas that are high priorities in the laptop program. Even then, the evaluation field is likely to require the development of more good assessments of student learning—for example, to measure students' higher order thinking, problem solving, and technology

proficiency.

- Look for ways to evaluate the long-term costs and benefits of the technology infrastructure: Both costs and benefits are difficult to quantify, but understanding them is important. Little has been written about the costs of laptop programs, and about the relationship of those costs to the benefits.

- Let the research question drive the choice of method: There are too many interesting questions to ask about laptop programs for you to study them all. Depending on the research questions you choose, surveys, case studies, experiments, or other methods may be appropriate. No one methodology is best for answering all questions.

CONCLUSIONS

As computers and wireless networks become more capable and less expensive each year, more states and districts are providing all students with a computing device. These initiatives are complex and challenging. States and districts that are now beginning to implement one-to-one computing should try to benefit from the many lessons that others have learned through experience. Among the most important of those lessons is to focus on the desired goals. According to Bette Manchester, the laptop initiative in Maine “is not about the technology; it is about the students' learning and about capacity building in the schools” (Manchester, 2004).

NEIRTEC's review of lessons learned about laptop programs shows that they fall into five key areas. Policymakers must pay careful attention to planning, training and professional development, hardware and



software, managing change, and program monitoring and evaluation. Thinking about these issues from the outset will help you achieve the laptop program's goals while minimizing unexpected problems.

The Internet makes it easy to share information about implementing laptop computing initiatives. Using online discussion boards, your own website, or in other ways, please share your "lessons learned" so that others can benefit from your experiences.

BIBLIOGRAPHY

Apple. *Profiles in Success: Gunderson High School – Beating the Odds*. Retrieved August 25th, 2004, from <http://www.apple.com/education/profiles/gunderson/index3.html>

Apple. *Profiles in Success: Henrico County Public Schools – Continuous Learning*. Retrieved August 8th, 2004, from <http://www.apple.com/education/profiles/henrico1/index.html>, <http://www.apple.com/education/profiles/henrico1/index2.html>, <http://www.apple.com/education/profiles/henrico1/index3.html>, and <http://www.apple.com/education/profiles/henrico1/index4.html>

Apple. *Profiles in Success: Manatee County Schools – Starting Small, Thinking Big*. Retrieved August 24, 2004 from <http://www.apple.com/education/profiles/manatee/index3.html>

Apple. *Profiles in Success: The Gillispie School – Ahead of the Wave*. Retrieved August 25th, 2004 from <http://www.apple.com/education/profiles/gillispie/index4.html>, <http://www.apple.com/education/profiles/gillispie/index2.html>

<http://www.apple.com/education/profiles/gillispie>, and <http://www.apple.com/education/profiles/gillispie/index2.html>

Bartels, F. (2002). *Reflections on the RCDS [Rye County Day School] Laptop Program After Three Years*. Rye, NY. Retrieved October 21st, 2004 from <http://www.learningwithlaptops.org/files/3rd%20Year%20Laptop%20Prog.pdf>

Bartels, F. (2000). *Reflections on the RCDS [Rye County Day School] Laptop Program After One Year*. Rye, NY. Retrieved October 21st, 2004 from <http://www.learningwithlaptops.org/files/Laptop%20Program%20Reflections.pdf>

Curtis, D. (2004a). A computer for every lap. *Edutopia Online*. Retrieved October 8, 2004 from http://glef.org/php/article.php?id=Art_1032

Curtis, D. (2004b). The Maine event. *Edutopia Online*. Retrieved October 8, 2004 from http://glef.org/php/article.php?id=Art_1119

Edwards, M. (2002, July). Lessons Learned. *District Administration*. Retrieved Aug, 25th, 2004 from <http://www.districtadministration.com/page.cfm?id=188>

Edwards, M. (2003, April). The Lap of Learning. *The School Administrator*. American Association of School Administrators. Retrieved August 25th, 2004 from http://www.aasa.org/publications/sa/2003_04/edwards.htm

Edwards, M. (2004, February). Fulfilling the promise of ed tech: Laptops spur learning. *eSchool News Online*. Retrieved February 2nd, 2004 from <http://www.eschoolnews.com>



Jeroski, S. (2003, July). *Wireless Writing Project Research Report: Phase II*. Horizon Research and Evaluation, Inc. Retrieved, from the World Wide Web: http://www.prn.bc.ca/FSJ_WWP_Report03.pdf

Kerr, K. A.; Pane, J. F.; Barney H. (2003). *Quaker Valley Digital School District – Early Effects and Plans for Future Evaluation*. Santa Monica, CA: Rand Corporation. Retrieved October 21st, 2004 from <http://www.rand.org/publications/TR/TR107/>

Lemke C. & Martin C. (2004, March). *One-to-One Computing in Indiana – A State Profile (Preliminary Report)*. From <http://www.metiri.com/Solutions/Research.htm>

Manchester, B. (2004). Recorded interview with Bette Manchester about leading in educational technology, prepared for the SETDA Leading in Technology Program. Newton, MA: Education Development Center, Inc.

Means, B., & Haertel, G. D., eds. (2004). *Using technology evaluation to enhance student learning*. New York: Teachers College Press.

Rockman, S. *Learning from Laptops*. (2003, Fall). From <http://www.ciconline.org>

Silvernail, D. L. & Lane, D. M. (2004). *The Impact of Maine's One-to-One Laptop Program on Middle School Teachers and Students – Phase One Summary Evidence*. Maine Education Policy Research Institute, University of Southern Maine Office. Retrieved October 21st, 2004 from <http://www.usm.maine.edu/cepare/pdf/mlti/MLTI%20Phase%20One%20Evaluation%20Report%201.pdf>

Zucker, A. A. (2004). Developing a research agenda for ubiquitous computing in schools. *Journal of Educational Computing Research*, 30:4, 371-386. [An earlier version of this paper is available at http://ubiqcomputing.org/eval_materials.html.]