

Education in the 21st Century: One-to-One Learning Environments

By Eva La Mar



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While the modern workplace has moved beyond typewriters, ditto machines, and other older technologies, most U.S. schools are lucky to have one computer lab to share among 400 or more students. The U.S. educational system must offer more than a weekly visit to a computer lab or daily access for only one class period. To produce students who are ready to communicate and collaborate with the multinational businesses that are developing in the 21st century, students need access 24 hours a day, 7 days a week. One-to-one (1-to-1) laptop programs are a profound step in the direction of the 21st century for U.S. education.

In a one-to-one environment, students learn to utilize worldwide resources, increase

the quantity and quality of their reading and writing, and collaborate with their peers more than most students in traditional classrooms. Instead of waiting for a scheduled library visit, students access online encyclopedias. And, they use software that differentiates curriculum to meet their diverse learning needs.

There are many logical reasons to establish a one-to-one program. The most important reason is to move education beyond the traditional learning environment. The children we are teaching today are fearless users of technology. Most of them are already familiar with the technologies being used in the “real” world. Many are already using these technologies outside school. One-to-one

computing initiatives give students 21st-century tools and teach them how to get the most from them in a collaborative environment.

Changing Pedagogies

A one-to-one learning environment is more than a ratio of one laptop per student; it is the anytime, anywhere accessibility of resources and tools. It is more than just issuing each student and teacher a technology device; it is a profound involvement and engagement in the educational process. Research has shown that students involved in one-to-one programs are more engaged and involved in their schoolwork, collaborate more, and show more interest in school than those who learn in traditional learning environments.

Teachers facilitate the learning process unhindered by a lack of encyclopedias, dictionaries, reference books, and other materials often in short supply, especially in poor and rural schools. The playing field is leveled and students from disadvantaged homes and school districts have access to resources previously available only to the more advantaged. When students begin to buy into the process of their own learning, they are on the road to becoming lifelong learners.

In Springfield, Oregon, where 78 percent of the students qualify for free or reduced-price lunch, many families struggle to get by and school frequently becomes just one more challenge that overwhelms them. We have initiated a one-to-one computing program at our middle school and we have already seen an enormous increase in student engagement in the learning process.

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We have seen an increase in attendance with certain at-risk students who struggled with attending school at all. We see students showing pride in their school and their work. And students who hated to write often clamor for the chance to create Web sites, or to produce videos and other types of digital presentations. Our students see the power and value of their own work and recognize it as a worthy product in the 21st century.

While at the One-to-One Conference at Penn State in April 2005, I participated in discussions with many school districts about the actual cost of such a program. A few of the dis-

tricts explained that over a four-year period, their laptop programs proved to be less expensive than the continuous purchase of new textbooks, updating of encyclopedias, and other text material that was often outdated before it got to the students. Districts can lease or purchase laptops; the options in both areas are innumerable.

What is certain is that each year countries in Europe and Asia are producing students better prepared for participating in a global workforce. It is more than basic math skills; it is also the ability to communicate, collaborate, and work with modern tools. Giving

each of our students a laptop is not going to suddenly make U.S. students better, but it will allow teachers to better monitor student progress, challenge students at their individual levels, encourage and require collaboration in the learning process, and make resources accessible 24/7. The one-to-one learning environment represents what adults must do for our children in the 21st century: make schools a training ground for the real world rather than a series of seemingly arbitrary lessons and random activities

Anatomy of a One-to-One Laptop Program

Throughout the *Springfield Quality Education Model* (S-QEM) process, staff and community members reiterated the need to ensure that students become technology literate throughout their K–12 education. Additionally, they suggested the use of instructional technology to increase student achievement. In response to this input, Springfield Public Schools began to explore possibilities for integrating technology into instruction.

The result was an initiative to place a laptop in the hands of each of the 300 students enrolled at Springfield Middle School (SMS), as well as the 40 students enrolled in its Gateways Alternative Middle School program. To meet the primary goal of the initiative, which is to use technology as a means to increase student performance at SMS, all teachers received laptops in August 2004; students in February 2005.

What we found is that having a laptop program is very much like owning a racecar. The purchase of the vehicle is only the beginning. It is the team that supports the car that makes the difference. A dynamic and effective one-to-one laptop program is not easily achieved; it is a combined effort of all stakeholders working toward a common goal. And, there are many hurdles to

Value of a one-to-one learning environment:

- Increase in student engagement in the learning process
- Student and family pride in the creation of student work/evidence of learning
- Accessibility to quality resources
- Differentiated curriculum through software and curriculum design
- Laptop as a tool that's available 24/7
- Producing students with school-to-work skills
- Increase of parent participation in school and workshops
- Teachers utilize tools not available to them prior to program (for example, the American Memory Project has thousands of primary source documents available online)
- Student achievement increases due to increases in reading, writing, and differentiated curriculum

navigate beyond the purchase decision. A laptop program will not succeed because of one outstanding driver, it will succeed because all the stakeholders work as a team to monitor, adjust, and support the program.

Springfield Public Schools' one-to-one laptop initiative was fully implemented in February 2005. Like a racecar, though, the program is constantly being analyzed from top to bottom. While a car race has a definite end, laptop programs are in for the long haul and must be able to survive a bumpy road, changing directions, and different drivers.

We have learned from the early months of our laptop initiative that the following components are the strength of our program:

- Teamwork of all stakeholders
- Staff development
- Feedback loops
- Up-to-date literature and research
- Collaboration on- and off-site
- Technical support
- Clear protocol

Teamwork of All Stakeholders

Stakeholders from the superintendent, department heads, school administration, technology services, school board members, teachers, and staff are involved in the implementation and maintenance of the laptop program. To fully implement the program, Springfield hired me as the full-time, on-site, one-to-one laptop initiative program development specialist to provide staff development and technology support.

Leaving my previous job of 14 years and moving my family 500 miles brought me to a district dedicated to teamwork in all aspects of the program. I work closely with the technology services department at the administrative offices as much as I do with the school administration and teachers. As with the

implementation of most new programs, we spend hours, if not days, troubleshooting details before, during, and after the initial rollout of laptops. By the fourth month, we had a system that was working quite smoothly. The "smoother ride" was built by a team of stakeholders constantly analyzing, probing, questioning, discussing, and working together to improve the program.

months before the students, we had time to work.

Springfield Public Schools purchased professional development in the cost of the laptops. I tediously sorted through the purchase agreement to understand exactly what had been purchased. Add to this, three of four new software programs offered online and staff development became a force to reckon with.

In the field of education, the term "One-to-One Computing" is used to describe learning environments in which every student is provided access to a powerful electronic computing device, and their teachers transform the teaching and learning environment to take advantage of this opportunity.

—Dr. Kyle Peck, professor, Penn State

Staff Development

Our staff development planning uncovered some small problems early in the implementation. With a small staff it is hard to differentiate learning experiences, especially when working with short time periods. Springfield Middle School has dedicated Monday and Thursday zero-period to staff development. The question was where to start!

I sent out surveys, observed classrooms, discussed options with the entire staff, and worked closely with the school site technology committee. It became apparent that not only was there an enormous variation in skills, but we were dealing with a substantial learning curve. Beyond the skills were the issues of pedagogy, classroom management, lesson plan design, and more. Although we knew we had some small struggles addressing skill levels, by giving the teachers laptops

As we proceeded, we increasingly uncovered issues to address:

- Baseline technology skills
- Care of the laptop
- Laptop rules
- Internet safety
- Software applications
- Saving files
- Locating files
- Server protocol
- Troubleshooting laptop problems

As the volume of paperwork became immense and almost unwieldy, I developed a project manual. All new protocols, forms, software instructions, step-by-step directions, staff development agendas, and other information were organized in a binder. Each participant received a binder for all relevant handouts and paperwork.

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We have yet to find a simple, clear-cut solution to the staff development issues. For our second year, I will implement significant changes to our twice-weekly staff development trainings. I decided that the first week of each month, trainings will address staff development issues as a group. We will focus on pedagogy that requires the full staff to collaborate in support of the same standards. The entire staff will have the opportunity to read up-to-date research about integrating technology and research-proven techniques for improving student achievement, and will follow the progress of other laptop programs. This new school year, we will focus on Robert Marzano's book, *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement* as well as backward curriculum design.

The next three weeks of the month, teachers may choose to attend zero period on Monday, Thursday, or both. We differentiate staff development by offering a slower-paced curriculum on Monday and a faster-paced, more in-depth one on Thursday. Monday's attendees can repeat the topic in greater depth on Thursday. The issues addressed the first week of the month will carry throughout the entire month. We designed our staff development program as an ongoing process to optimize its effectiveness.

In addition to the mandatory zero period sessions we will offer a series of "just-in-time" sessions after school and on Saturdays. These just-in-time sessions are more informal and will run anywhere from 20 minutes to 2 hours, depending on need and interest. Any staff member may initiate or teach them. We discovered a key to our success is teamwork to find and enact solutions to shared needs.

Feedback Loops

With all the teams, departments, and stakeholders working together to implement and support a laptop initiative, there must be a functioning feedback loop. At the administrative level, communication must exist that allows concerns to be addressed before they become crises. Having an established chain of command, known to all parties, that responds as stakeholders and works as a team, is imperative to the success of a laptop program.

Within our own staff development spectrum we had to develop effective feedback loops because the professional development the district bought with the laptops did not include the sharing of participant feedback. We struggled with how to get the kind of feedback that would inform our process. It was the dynamic nature of interaction in a small school that brought formative feedback through our technology committee. We found this to be another key to success.

As teachers venture into new terrain in their pedagogy, they need feedback from their peers and administrators. With initiatives such as this, teachers are taking an enormous risk, often not of their own choosing, and need constructive feedback as well as constant encouragement. It is important to structure how, when, and why feedback is given. (And, there must be a mechanism for communicating with teachers who resist participating in the initiative by ignoring the laptops, established protocols, and procedures.) Teachers use our well-structured feedback channels to bring up concerns, share solutions, and collaborate toward successful outcomes.

Up-to-Date Literature and Research

Finding up-to-date literature and research on one-to-one learning environments has

not been easy. I have spent hours communicating with other programs, searching the Internet, and working with a variety of organizations. As I collected useful articles and books concerning one-to-one programs, I realized the need for up-to-date articles about technology integration, staff development, technology support, general teaching strategies to improve student achievement, and how to manage change. At this time I am developing libraries for professional development, technology skills, lesson plan ideas and support, and software support. Many of the organizations producing quality papers and books are subscription services requiring funds for membership fees and purchases. These time management and funding issues should be addressed during project planning.

Collaboration On-Site and Off-Site

Collaboration is a crucial element for successful change within a learning environment. Program participants require quality time to collaborate and communicate. How much time is required can only be learned from experience.

Although one-to-one program teachers collaborate on-site, we have discovered the need to collaborate with other one-to-one schools and programs. Given the large and growing number of one-to-one programs in the United States in 2005, we were surprised that a formal network of such schools had not been established. While there are existing collaborative networks in Texas and Maine, for the most part, programs are going it alone.

At the One to One Conference, attendees agreed on the need for a national network and an annual conference. They agreed that this April 2005 event, organized by Kyle Peck, pro-

fessor of education at Penn State University, should become the first in an ongoing series of annual conferences. In the meantime, they wanted to establish a database of one-to-one program-specific forms and protocol, technical specifications and strategies, communication samples, lesson plans, student sample work, and software effective in a one-to-one environment.

Teachers, administrators, technology services, school board members, vendors, and others who attended agreed that the conference accomplished these objectives:

- Helped schools understand how to create learning environments in which every student

has access to a powerful computer and every teacher uses the opportunity well

- Provided opportunities for educators interested in implementing a one-to-one project to meet, discuss, and collaborate with peers
- Focused exclusively on the unique needs and requirements of one-to-one programs imperative to the professional development of the participants
- Offered school districts considering one-to-one programs data and a clear “picture” of one-to-one programs that they could share with their stakeholders.

As an outcome of the conference, Peck and I are collaborating on an Internet Web site that will allow the sharing of one-to-one programs while encouraging collaboration. We are launching the Web site with an international event called a “Day in the Life of a One-to-One Learning Environment” (see sidebar p. 12).

We expect to collaborate internationally to build a network that provides a central repository of one-to-one program resources including research studies and literature pertaining to all aspects of one-to-one learning environments.

Technical Support

Technical support means much more than establishing and maintaining a reliable network: it includes the day-to-day troubleshooting. What technical support will encompass must be delineated at the start, including what departments and individuals are committed and to what degree. We have found that without immediate technical support, especially at the initiation of the program, teachers are less willing to take risks with their new laptops. Clear protocol is imperative for the students, staff, and technology support person on-site.

We started by requiring all staff and students to complete a “Problem Report” form

whenever they bring a laptop in with any technical issues. The report serves multiple purposes from data collection, to problem tracking, to solution procedures. We refined the form during the first four months of our program.

Our next obstacle was tracking laptops shipped out for warranty work or damage repair through the insurance carrier. With two or more laptops shipping out each week and an equal number being returned, we quickly realized that we needed forms to track the shipments and repair status. As each laptop was returned to the school, the technical support person had to assess the laptop to ensure it worked properly, re-image it, collect the loaner, and move the necessary data back to the returned laptop. Beginning next year, backing up student laptops upon authentication into the network will be automated. Also, we have opted to assign a new laptop to students when laptops require outside repair.

Because Springfield Middle School hired an on-site technology support person, we have avoided many of the basic technology problems that would have become a hindrance to teachers and students. We learned from the experience of other successful programs to set up a triage room to facilitate fast turnaround of defective laptops.

Clear Protocol

Think your district's Appropriate Use Policy (AUP) is tough enough for a one-to-one laptop program? We thought so, only to discover that the consequences of inappropriate use were not constructive in a one-to-one environment. For instance, if the software purchased is a component of the learning environment, then removing access to it can be a double-edged sword.

Resources for One-to-One Learning Environments

Springfield Public Schools links:

- www.sps.lane.edu/STARTT/

Information about the one-to-one program, with links to timelines, press releases, etc.

- www.sps.lane.edu/sms

Springfield Middle School's Web site

Penn State's One-to-One Web site

- <http://1to1.ed.psu.edu>

Excellent resource currently under development

Other resources:

- <http://1to1learning.blogspot.com>

Blog developed by a group of Apple Distinguished Educators

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But allowing students who violate the AUP continued access is not constructive either.

We had to rethink and restructure consequences for specific behaviors. Clearly outlining behavior into the preexisting school behavior plan seemed the best plan of action. For some infractions, we restricted students' use of the laptops to school only. For other infractions, the Internet was not accessible over wireless and could only be accessed through hardwired connection. Teachers have CAT5 cables in specific locations in the classroom for close observation of the student's activities.

It was a major hurdle to decide how to deal with damage to laptops because of student misbehavior or misjudgment. Some students left laptops at the skateboard park, on the floor at home, or allowed younger siblings to play with them. We had broken screens, damaged keyboards, and destroyed cases because of such poor judgment. At first, once the deductible was paid, we assigned a loaner laptop to the student to use while the broken laptop was being repaired. But this approach did nothing to change behavior. It was not until we stopped issuing a loaner and took away laptop privileges that we began to see improvement in laptop care.

Students who lost laptop privileges had to access online programs through old desktops in the classroom. In fact, at times we issued an Alpha Smart for keyboarding lessons. It was a ghastly enough experience for the few students who earned it that it led other students to reevaluate how they treated their laptop. As soon as we implemented this new protocol, the number of damaged laptops decreased significantly.

Protocol was not set in stone. During weekly technology committee meetings, staff

Share a Day in the Life of Your One-to-One Learning Environment

Ready? Set? Start recording! On October 26, 2005, the race to document one-to-one learning environments is on. Photographers and videographers are invited to begin a 24-hour digital journey through any part of their programs to document, so that the world might celebrate, the incredible one-to-one learning environments that are springing up in schools and classrooms across the country.

All media formats are encouraged, including digital pictures, videos, sound files, text files, and QuickTime Virtual Reality™. With worldwide access to schools, classrooms, laboratories, and other learning environments, these multimedia documents will create a rich online tapestry about life in diverse and far-flung one-to-one learning environments. A searchable Web site of these "Day in the Life" accounts will be hosted by Penn State University.

At the "One-to-One Conference" hosted by Penn State in April, schools already involved in one-to-one programs were busily networking with each other, sharing problems and solutions, as well as working on strategic plans. Many of the school districts considering one-to-one programs expressed the need for data and a clear "picture" of one-to-one programs that they could share with their students, teachers, parents, school board members, administrators, and greater community.

Based on this expressed need and using the theme, "A Day in the Life," educators implementing programs are asked to document their real-life, one-to-one learning environment in action so others can assess the possibilities of the programs for themselves. It is hoped that the documented programs will reflect the great variety and diversity of one-to-one programs that will help others to understand how these environments differ from traditional ones and how they might implement such a program. Schools, programs, teachers, and students are asked to not only share pictures, videos, sounds, and/or video cameras to document their program, but also to write about the context so viewers will understand what is being shown in the media.

Are laptops and other one-to-one digital devices becoming a certainty in education?

With the Internet offering multitudes of resources in the form of documents, images, movies, encyclopedias, dictionaries, and more, and with such access and opportunity to create and incorporate these myriad resources into the learning process, how can education not be profoundly affected?

One-to-one learning environments provide the access and opportunity that many schools, administrators, school board members, parents, and community members are exploring and evaluating. By creating a rich tapestry of one-to-one learning environments that have been implemented around the world and shared in a "Day in the Life" format, educators can see for themselves that implementing a one-to-one program is not radical, unexpected, or impossible.

Eva La Mar, One-to-One Laptop Initiative Program Development Specialist, Springfield Public Schools, Oregon

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evaluated existing protocol, made necessary alterations, and set goals for each change. By debriefing our laptop distribution protocol, we redesigned our fall laptop distribution within weeks of the initial distribution. Key issues and problems were not forgotten over time and the issues were immediately examined and remedied with new protocols. We also found that if we changed protocol too much or too often, it became unmanageable to enforce.

The Future of One-to-One Computing

In his book, *The Tipping Point*, Malcolm Gladwell tells us that ideas, products, messages, and behaviors behave just like epidemics—that old ideas, emerging educational trends, radical fashion statements, and peculiar behavior spread around the world like viruses, once they've reached the tipping point. He explains, "The world of the tipping point is a place where the unexpected becomes expected, where radical change is more than a possibility. It is—contrary to our expectations—a certainty."

What underlies a successful epidemic is a bedrock belief that change is possible, that people radically transform their behavior or beliefs in the face of the right kind of impetus. Tipping points are a reaffirmation of the potential for change and the power of intelligent action.

I don't think there is an education community that is not concerned about the ability of its youth to succeed and prosper at a global level. Does the public concede that technology affords the tools and the skills to prepare them? Have we reached the point that we accept and expect schools to make technology available to every student? Are laptops and other one-to-one digital devices poised to become a certainty in education?

I believe that by creating a rich tapestry of worldwide, one-to-one learning environments, we can show the education community that one-to-one programs are not a radical idea, unexpected, or impossible. And, that with the slightest push, in just the right place, we can tip it so that seemingly overnight, universal one-to-one learning environments become a certainty. ■

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