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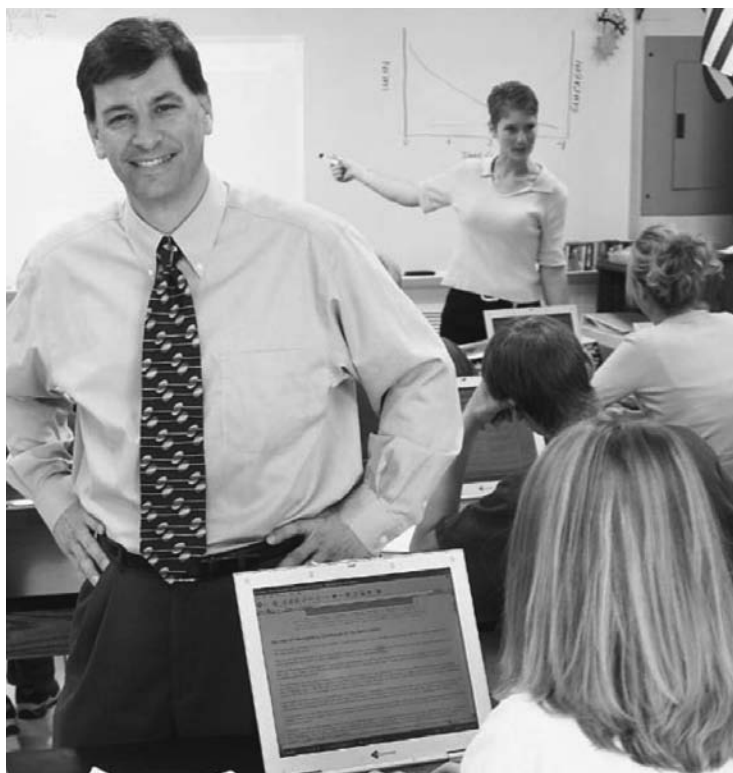
One-to-One Laptop Initiatives

*Providing Tools for 21st
Century Learners*

EXECUTIVE SUMMARY

K-12 schools are rapidly deploying one-to-one student laptop initiatives across the nation. The definition of one-to-one computing is essentially providing every staff member, teacher and student with a portable laptop, notebook or tablet PC for continuous use both in the classroom and at home.

There are several reasons why education leaders are choosing one-to-one computing programs as the cornerstone of their technology initiatives – including improving the in-class educational experience, providing universal Internet access to disadvantaged homes, and building stronger connections between teacher and parent, as well as school and community. However, there are several considerations before any successful one-to-one program can take root in a school or district, such as the selection criteria, total cost of ownership (TCO), and return on investment (ROI).



This paper will explore the goals behind one-to-one initiatives, the fundamental issues to consider before rolling out a program, and analysis of successful one-to-one programs that have transformed classrooms – and communities – using technology.

ONE-TO-ONE STUDENT LAPTOP INITIATIVES: A BRIEF HISTORY

Computer use in the K-12 classroom has evolved over the last 10 years to encompass more than just the basic tasks of learning how to use computers. In the 1990s, curriculum specialists began to establish technology proficiencies for teachers and students, while the pace of hardware advancements and technology integration into businesses and homes raced forward. Recently, ubiquitous home usage has complimented and reinforced the integration of technology into the classroom and propelled the transition from learning *about* computers to learning *with* computers.

Part of this transition involves “one-to-one laptop or tablet PC programs,” which are changing the way teachers provide instruction in the classroom and the tools students use to learn.

Teachers now have a tool, the notebook or tablet PC, which enhances the instructional experience through different electronic media such as interactive online presentations linked to resources and curriculum-related Web sites, interactive software applications, online tutorials, and more. Each student also has the same media to accomplish tasks.

All of these capabilities transform the classroom and create positive results for learning and education. Success stories of these programs foster support for other districts to have the access to the same tools and capabilities. In fact, one in every six U.S. districts has some form of one-to-one computer learning program in one or more of its schools, according to researcher Saul Rockman, who specializes in researching the application of technology in education and authored, “A Study in Learning” that appeared in the October 2004 edition of *Technology and Learning* magazine.

How these schools come to launch a laptop or tablet PC program varies from state to state and district to district. Many different launch strategies and models exist, ranging from lease programs that are typically used in public schools to student-purchase programs traditionally mandated by private schools whose parents and students have the resources to participate.

Some districts choose to pilot programs like Houston County High School in Georgia that provided tablet PCs to 28 randomly selected ninth-graders. These students used the tablets all day and had the exact same teachers and classes – including biology, physics, English

and algebra – as the control group who were taught using traditional teaching methods. (School officials hope to someday provide a complete laptop rollout to every student and teacher.)

Other programs roll out the entire initiative to a single class during its freshman year, such as Watertown High School in South Dakota that provided laptop computers equipped with Microsoft Windows XP and Office to its ninth-graders. Students checked them out at the beginning of the school year and were required to return them at the end of the year. (Its board of education will decide based on gathered data in the third year as to whether or not it will continue the initiative.)

Another model is to provide laptops to an entire district or school. For example, Brownell-Talbot School, a private, independent, co-educational, college-preparatory, day school located in Omaha, Neb., elected to launch its laptop program across its entire ninth to 12th-grades. Students are required to purchase laptops with the minimum specifications of 128MB memory, 40GB of hard-drive space, wireless capabilities and Windows XP. The school provides productivity software. Teachers were also equipped with the same Gateway wireless laptops with the same minimum specifications.

TRANSFORMING THE CLASSROOM AND STUDENT EXPERIENCE

While educators have grappled with the best way to integrate technology into the classroom, the one-to-one laptop initiative has emerged as a logical first step toward improving the instructional process and, at the same time, improving student achievement. But the growth of one-to-one programs has also provided a tool for staff, teachers, students and parents to create positive changes within the home and broader community as well.

First among the many advantages offered by a laptop initiative is the access and ability to help bridge the digital divide in the classroom. One-to-one laptop initiatives provide

every student and every teacher with the same tool to do class work. Students are allowed to take the laptops home and can do homework on them and share this resource with their parents. It enhances communication for students and parents who have Internet access at home by providing e-mail applications that allow them to send and receive messages from teachers, staff or fellow students. Disadvantaged students and parents can take their laptops to local community centers – such as libraries and after-school community programs that are currently being funded by federal 21st Century Community Learning Center grants, private grants and donations – to facilitate communication with the school staff and teachers.

Private schools don't necessarily face the same challenges, but do have access issues – and one-to-one laptop programs also help overcome these difficulties. For example, Minnesota-based Shattuck St. Mary's, a private school for sixth to 12th-grade students, boards its students. Many parents live abroad, and are not readily available by phone. Enhanced communication via e-mail with parents, teachers and students created the rationale to launch its one-to-one laptop lease program that provides Gateway® 450SX models with 15-inch screens, Pentium processors, 512MB of RAM and 20GB hard drives to staff, teachers and students.

Parents who have the student's laptop available or their own computers at home are able to e-mail staff, teachers and students with questions, comments or concerns. Students who live in the dorms have a 24-hour connection with their par-

PILOTING A ONE-TO-ONE TABLET PC INITIATIVE TOWARD SUCCESS

Houston County High School based in Georgia eventually wants to ensure that all of its students learn technology skills and have ubiquitous access to the Internet. They began working with Gateway, Intel and Georgia Technical College to devise a one-to-one tablet PC pilot program to find out if such an initiative would be feasible.

School officials developed a pilot where they randomly selected students, provided them with Gateway tablets and had them attend the exact same classes (physics, English, biology and Algebra) and teachers as the control group.

The results bolstered the argument to launch a full-scale initiative sometime in the future. Students with the tablets didn't need guidance from the teacher. They immediately went to the Internet, found research materials, put it into databases, and produced incredible projects that were far superior to the class that didn't have the tablets. Ultimately, the school believes that these students are now better prepared for college or the workplace.

ents and teachers, while students who commute and have at-home Internet access can log on anytime. Those who do not have an at-home Internet connection can pick up their machines at 7:00 a.m. at the school and log-on at that time.

Students can use e-mail to ask questions about homework, enquire about assignments, or use resources (Web links, PDF files, online textbooks, etc.) sent directly to them by the teachers. Parents can send e-mail requests about student grades, assignments and other concerns; teachers can respond to these questions or send requests to parents as well.

Watertown High School cited that as a result of its ubiquitous access to laptops for students and parents who have the laptops available at home and have Internet access, has resulted in an increase in communication with parents and teachers. "I think communication has grown greatly," says Principal Kimberly Bellum.

Laptops and tablet PC advantages transform the classroom experience as well. Laptops create an interactive classroom where teachers present

WATERTOWN HIGH SCHOOL'S ONE-TO-ONE LAPTOP INITIATIVE SHOWS RESULTS

Watertown High School based in South Dakota viewed the idea of a one-to-one laptop initiative as a way to level the playing field for all students by providing them the same technology and wireless access to the network.

In order to establish the laptop program, Watertown partnered with Gateway to provide equipment and service over the four-year trial period where every staff member, teacher and student would receive his or her own laptop. At the end of the third year, school board members are expected to gather data, provide analysis and make a decision about the program's future.

Currently, officials cite the ROI as being the increased use of technology in the classroom and its impact on learning. Students have greater access to online curriculum, research and information. The technology and access create effective communication that makes students more successful in everything they do.

materials using multimedia tools, Web sites, online textbooks and other electronic tools to deliver curriculum right to the student's laptop or tablet PC. For example, Brownell-Talbot instructors use laptops with common business applications – such as Microsoft Word, PowerPoint, Excel and databases. Static presentations give way to interactive PowerPoint slideshows that provide Web links for kids to click right to online examples of discussion points. Excel spreadsheets teach students organizational skills, methods to track information and apply math and accounting skills. Database applications demonstrate the power of overall organization, techniques to move and relate data on the tablets. Kids can actually write notes that translate into text and more.

It also cannot be overlooked how laptops and tablet PCs change the delivery of information to students, and therefore, require teachers to think differently about how the classroom is managed. Live Internet (hard wires or wireless) connections give students freedom to explore the

magazine Web sites) when they're supposed to be doing homework are disciplined. They receive a warning and repeat offenders have their tablet taken away, which is a big deal for students who depend upon their tablets for homework and study materials.

Students are enthusiastic about having laptops or tablet PCs versus traditional pen and paper, because it mirrors the reality of many students' home lives where computers and electronic games have become commonplace. Coming to school to learn the old fashioned way seems obsolete to a generation raised on electronic media as entertainment.

This renewed enthusiasm makes students more motivated to work in school. And motivated students show more creativity and produce higher quality work. Teachers report that students seem to enjoy presenting their work, often asking for more opportunities to use presentation software. At Brownell-Talbot, students frequently perform PowerPoint or media presentations that can be hooked up to classroom whiteboards or smart-boards and

Web and its vast resources right on their laptops or tablets, but also this freedom requires careful control.

Mary Royal, Houston's assistant principal, reports that her teachers changed their classroom management strategies. Teachers can no longer stand in the front of the classroom and deliver a presentation. They take an active role by roaming the room and monitoring student activities on tablet PCs, which can be laid flat to write notes on with a stylus. Students caught visiting random Web sites (e.g. visiting

use their skills to present something that looks professional, with Web links, graphics and illustrations that make it interactive and interesting. They can also do online research to improve the overall content of their papers and even add simple graphics, such as charts and graphs to illustrate their work.

The skills acquired by students who use many applications on their laptops or tablet PCs are a desired outcome of creating a 21st century learner who is able to easily translate these capabilities into postsecondary education or the workplace. These new skills, however, cannot necessarily be quantitatively scored using the same traditional tests that measure skills acquired using traditional teaching methods.

Programs such as Watertown High School, where the laptop program is still in its infancy, therefore, cite creation of 21st century skills as a marker of their program's success.

Bellum cites the following skills as measures of success: "If we don't provide students with 21st century skills," she says, "then we're doing them a huge disservice. The world our students live in is not the world we grew up in. The world they're going to work in involves access to technology and it requires these skills to function."

While Watertown's claim of success offers an alternative measure, other schools cite quantitative test-score increases as successful outcomes. In a *Technology and Learning* magazine article, called "Observations, Reflections and Research of a Laptop Classroom," Dr. Mark Edwards, superintendent of Henrico County Public Schools in Virginia, reports that students with laptops have shown large gains in pass rates of 96-97 percent in English and world history in Virginia's Standards of Learning statewide testing. A British Columbia school, Peace River North also cited success. An *eSchool News* article, called "Studies Validated Programs in the U.S., Canada," suggested that students in Peace River's

one-to-one programs scored 92 percent on the province's performance standards in writing compared with 70 percent prior to receiving their laptops.

BUILDING THE BUSINESS CASE TO INVEST

Strengthening the parent-school connection, improving the learning environment and raising academic achievement all build a strong case to persuade educational leaders to implement one-to-one programs. But it makes dollars and sense as well. In fact, the overall improvements to the business of education and the soft-dollar ROI of one-to-one programs create an equally strong argument.

A breakdown of the TCO provides the foundation for understanding necessary components of a laptop program. The TCO includes the purchase or lease cost of the computers, infrastructure investments (such as installing wireless access points), staff development and in-service training, ongoing tech support and additional support during implementation, hardware maintenance, software licenses and upgrades, costs to adjust instruction and purchase online curriculum, distribution, insurance and replacement expenditures, and costs associated with program evaluation.

Some expenses can be absorbed in other budgets, such as the Capital Outlay Fund or staff development budget, or redirected from computer lab operation costs, but the TCO extends beyond the initial purchase or lease of the computer.

The total budget for a leasing program, for example, can range from \$500,000 per year to \$2 million over four years. Watertown figures a total cost of \$1,200 per machine for approximately 1,200 students, 200 staff, as well as extra machines for replacement or staff needs (1,400 total). The estimated \$2 million overall budget covers the machines, infrastructure costs (wireless hubs, servers), staff development, technician training and more.

Individual per laptop costs vary. For example, Cobb County, Ga., spends \$450 per laptop, while Henrico reports costs of \$300 per student per year, which is consistent with many other districts and schools, which spread the costs over four years. Most schools also charge families an annual insurance fee of \$25 to \$75 to cover loss and damage (or waive this cost for economic hardship). With all elements included, total costs for one-to-one initiatives range from \$1,000 to \$1,600 per student, including the hardware, software, staff development and IT support.

EFFECTIVE PLANNING TEAMS

An executive sponsor or champion who supports a laptop or tablet PC program is usually required to move the process forward. The champion can be a superintendent, principal or education technology specialist who has aligned himself or herself with a decision-maker who has the authority to pilot or launch a project. This person can also evangelize the program to the district as a whole.

The executive sponsor often works with the head of technology to begin the planning process, which typically involves the creation of a task force. The task force organizes and studies the process, and also gains buy-in from the staff and teachers that will utilize the laptop or tablet in the classroom. Members that comprise the task force are usually representatives from the education technology area, instruction, administration, and any areas impacted by the change.

The primary challenge of the task force is to investigate the feasibility of a one-to-one initiative. This study considers various funding sources — including grants, private donations, federal funds, state funds, local revenue, general district funds, or combinations of these — and whether to purchase or lease computers. There are benefits to either arrangement. Schools often rely on the chosen PC vendor as a partner in the process to determine which

agreement best suits the district or school's needs and cost effectively meets the program goals or ROI.

Some schools such as Brownell-Talbot have also justified their investment by showing how their one-to-one initiative eliminated the need for computer labs, thus allowing them to redirect funds toward the purchase or lease of laptops or tablets and reduce their TCO for technology. Since every student has a laptop, the need for seat time at a computer lab is greatly reduced and allows the school to either reduce the number of computers required to fill the lab or reduce the number of labs.

All successful one-to-one initiatives have these things in common — a thorough evaluation of costs, a clear understanding of the TCO, and a comprehensive plan communicated to the stakeholders (teachers, parents, students, legislature, school board members and administrative staff). Most have also engaged in a small-scale pilot program to work out details and make adjustments before wide-scale deployment.

While every conceivable detail should be considered and written into the plan, a process must be established to regularly collect input and adjust as necessary. Effective planning teams also communicate the complexity of dramatic change to any organization including schools, and that it is impossible to foresee every possible issue.

Consequently in planning a program, the task force of all stakeholders should focus on the overall learning goals and how best to meet those goals. The task force considers major elements and determines all affected levels of personnel — from students to administrators — and then identifies key elements of the plan — implementation, infrastructure, curriculum, facilities, funding, legislation and maintenance.

The task force establishes parameters, goals, funding sources and evaluation parameters, and then issues the program plan to the chosen PC vendor. The program plan should detail what the vendor is expected to provide and the evaluation

team should consider these expectations as well as the intangibles such as company vision, commitment and passion for the program. (See sidebar on Vendor Selection Criteria.)

Working with local or state governments may also be necessary, particularly if grant money is involved. For example, the state of Georgia Department of Education recently invited eligible Local Educational Agencies (LEAs) to apply for Ed Tech Competitive “21st Century Learning Environments” grants for FY05. Grant recipients will be able to use the funds to explore the deployment process and effects of wireless on the learning environment, which includes laptop or tablet PC programs. Suppliers may work with LEAs to help them develop grant applications and answer strategic questions about what should be contained in the proposal.

It should be also noted that vendor-partners can be important members of the implementation team. They have a vested interest in

ensuring the one-to-one initiative is successfully implemented and will often commit staff and resources above those named in the program plan. They have also experienced large-scale education and corporate deployments where excessive demand on network infrastructure, power and Internet access are daily occurrences.

As one-to-one initiatives proliferate, most large vendors also have direct experience with broad-scale deployments and ongoing maintenance at schools.

ONE-TO-ONE PROGRAM DEPLOYMENT

Internet connectivity with one-hundred percent coverage on the school grounds is a must. For wireless deployments, this means purchasing enough wireless access points to provide adequate bandwidth across the educational campus. Vendor-partners can evaluate and troubleshoot the network before students receive their computers. Other considerations should be

given to the battery system and emergency power (batteries or extra chargers), cart systems, virus protection, network, and file security, inventory systems and software selections.

Staff training should occur early and often. Houston’s Royal points out that “training teachers has to be a major part [of the plan].” Staff development is a year-round process that can be addressed at weekly staff meetings and should include technology training as well as instructional training. Another approach is to train technology coordinators that are then sent back into the schools to provide training and workshops to teachers at a single site.

Staff training in the summer is another alternative. It should provide teachers with the chance to convert all the details of a few lesson plans to a laptop-learning environment. And while summer preparations are important to build staff commitment, teachers will further invest

STRATEGIC PLANNING CHECKLIST

- Establish task force.
- Program plan to technology vendor.
- Have a plan for gradually distributing equipment and automating the process as much as possible.
- Establish a wireless network with complete coverage and enough access points to handle the load. This is far less expensive than installing fiber optics or copper wire, and with similar bandwidth speeds.
- Standardize everything: hardware, software, Internet access, browser and e-mail. Make sure a standard “image” or software download is included on each notebook, so that set up and recovery is simple.
- Be aware that models and hardware technology change quickly. Don’t select outdated hardware. For example, select Centrino processors if at all possible and Pentium fours over Celerons.
- Have power options: extra batteries, extra chargers and quick hook-ups in class.
- Explore the option of becoming an authorized service center and having the tech vendor reimburse you for repairs.
- Provide teachers with their laptops months in advance and provide adequate training on hardware and instruction integration. This will greatly help reduce IT help time and associated costs.
- If improved assessment results are your goal, establish benchmarks before deploying the laptops.
- Run a small-scale pilot for one year before school or district-wide deployment.
- Start simple — leave the more difficult educational applications for later use when confidence is high.
- Have a plan for cycling aging computers out of the program through purchase by students or via the lease. Another option may be an asset recovery program from the PC vendor, which disposes outdated notebooks in an environmentally friendly way and provides a credit toward a new purchase.
- Arrange for a low-cost ISP for families without Internet access or plan to subsidize if necessary.
- Do not underestimate the need for technical support for students and staff.
- Develop a comprehensive plan for backing up files and teach students the importance of backups.

VENDOR SELECTION CRITERIA:

- ✓ A true partner with commitment beyond selling hardware.
- ✓ Strong service metrics and domestic-based technical support. The human touch is critical here.
- ✓ Delivers solid equipment with reputation for reliability and value.
- ✓ Can assist with infrastructure development.
- ✓ Will train staff on the use of hardware.
- ✓ Has a delivery plan matching school/district needs, including timing and location of delivery.
- ✓ Will train staff to perform repairs and establish an authorized service center at the school/district.
- ✓ Quickly provides for returns or major repairs that cannot be completed on site.
- ✓ Has an adequate supply of parts.
- ✓ Recognizes need to control costs and can arrange for financing.
- ✓ Will help develop a plan to replace aging computers.

themselves when they receive immediate help with technical issues, instructional guidance, and a clear show of support from their administrators.

After training comes laptop preparation for distribution. Regardless of the software in use, schools must create a standard image and burn CDs of the cloned image for quick re-imaging. While it would ideally seem that students should be prevented from installing their own software, which may affect configuration, some schools allow students to install software, apply stickers and select their own fonts. However, this vastly complicates maintenance.

Once laptops are distributed, officials should also be prepared to address machine replacement and removal cycles. Shattuck's Jeff

Barnsness, director of Information in the Department of Information Technology, reports his school established a self-maintenance license to repair its computers on site. Most schools also have one replacement machine for each 200 notebooks to accommodate loss or breakage during the normal lifespan and have agreements with vendors to perform on-site repairs. Vendor partners can train school personnel for most repairs and set up programs for supplying parts.

Like any technology, laptop and tablet PCs will need to be replaced or upgraded. Schools can work with suppliers to develop a removal plan or provide a lease-to-own program for students willing to purchase their machines.

CONCLUSION

In the overall picture, K-12 school executives looking to build the case for one-to-one laptop initiatives should look beyond funding, budgets and financial justifications. They should look to the ultimate beneficiary, the students. Twenty-first century learning facilitates learning comprehension through access to interactive resources and mirrors what skills students will be expected to have upon entering postsecondary education or the workforce.

RESOURCES

Brownell-Talbot College Preparatory School
<http://www.brownell.edu/>

Houston County Schools
<http://www.hcbe.net/>

Shattuck St. Mary's
<http://www.s-sm.org/default.asp>

Watertown High School
<http://www.watertown.k12.sd.us/schools/srhigh/default.htm>

Georgia 21st Century Learning Environments Grant
<http://www.doe.k12.ga.us/doe/media/04/111804.asp>

21st Century Community Learning Centers Grant
<http://www.ed.gov/programs/21stcclc/index.html>

Technology and Learning
<http://www.techlearning.com/>

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