Consider all the angles to get the best results > > >

1:1 Computing

A GUIDEBOOK TO HELP YOU MAKE THE RIGHT DECISIONS

Underwritten by

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SPECIAL SECTION OF TECHNOLOGY & LEARNING

CHAPTERS:

1. Technology Decisions and 1:1 Computing

TECHNOLOGY IS A CATALYST FOR STUDENTS TO BE MORE PRODUCTIVE AND TO HONE COLLAORATION AND COMMUNICATION SKILLS AS THEY LEARN.

About This Guidebook

Students live in an on-demand, technology-dependent world. They learn differently and approach schoolwork differently than students did even a few years ago. This impacts learning, and some school districts are addressing students' need to get answers instantly, to communicate as they learn, and to create information and share it with others. With 1:1 computing and wireless Internet access, students are able to learn in an environment where technology brings subjects to life and where students can own their learning environment and are so engaged that learning is meaningful. Establishing this new environment for such learning takes careful planning and consideration. We hope that the information in this guidebook provides you with useful advice, best practices and practical strategies.

While the success of any plan depends on individual goals, environments, planning, and personnel, certain strategies and ways of thinking emerge as universal. We address these issues in this guidebook to help create and implement an effective 1:1 initiative. In simple terms, the issues are planning, leadership, funding, infrastructure, professional development, instruction, evaluation, and sustainability.

Establishing well-defined goals and objectives is one of the most important components in implementing an effective 1:1 computing program. The key as you begin the goal setting process is to focus around student learning and aligning your technology policies and instructional supports with them in mind. We hope that the advice in this guidebook provides you with useful guidance, best practices and practical strategies.

Students and Technology

To anyone born within the last eighteen years, technologies such as cell phones, laptop PCs, and MP3 players are staples of life. They've never known a world without technology such as, video games, email, and instant messaging. News reports and studies confirm that the media habits of today's youngsters are very different from that of their parents and teachers. They've been called digital natives, who automatically accept new technologies as their own, while adults are digital immigrants who have to adapt to new tools and new ways of doing things.

According to the 2005 Pew study Teens and the Internet, 87% of teenagers use the Internet. 51% of them say they go online daily. 84% report owning at least one personal media device: a desktop or laptop computer, a cell phone or a Personal Digital Assistant (PDA). And 44% say they have two or more devices. 45% of teens have cell phones and 33% are text messaging. 75% of online teens — or about two-thirds of all teenagers — use instant messaging. Going to Junior High seems to be the tipping point when many teens who were not previously online get connected.

While about 60% of the 6th graders report using the Internet, by 7th grade, it jumps to 82% who are online. From there, the percent of users for each grade climbs steadily and reaches 94% for eleventh and twelfth graders.

What do teens do online? According to the Pew study, these are the percentages of teen Internet users who do the following online:

- Send or read email 89%
- Go to websites about movies, TV shows, music groups, or sports stars 84%
- Play online games 81%
- Go online to get news or information about current events 76%
- Send or receive instant messages 75%
- Go online to get information about a college, university, or other school they are thinking of attending 57%
- Look for news or information about politics and the presidential campaign 55%
- Buy things online, such as books, clothing, or music 43%
- Send or receive text messages using a cell phone 38%
- Look for health, dieting, or physical fitness information online 31%
- Look for information about a job online 30%
- Look for religious or spiritual information online 26%
- Look for information online about a health topic that's hard to talk about, like drug use, sexual health, or depression 22%

Schools and Technology in the 21st Century

Technology and technology-empowered students are here to stay. Schools can either capitalize on young people's affinity for technology or fail to engage them in learning and be perceived as more and more irrelevant. Logically, without technology, schools will not be able to prepare students for an increasingly technology-driven world of the future.

Thus technology-empowered learning is a requirement for any education institution to be an effective school. Learning for the 21st Century, a report from the Partnership for 21st Century Skills, explains how schools can best prepare students to succeed; it focuses on six key elements of 21st century learning that rely on technology as tools.

The report challenges schools and policymakers to expand their focus beyond students having basic competency of core subjects to their understanding the content at much higher levels. It proposes that students need to know how to think critically, apply knowledge to new situations, analyze information, comprehend new ideas, communicate, collaborate, solve problems, and make decisions. It stresses the need to incorporate information and communication technologies into education from the elementary grades up and use experiences that are relevant to students' lives, connected with the world beyond the classroom, and based on authentic projects. The report recommends moving beyond standardized testing as the sole measure of student learning; balancing traditional tests with classroom assessments to measure the full range of students' skills, and using technology-based assessments to deliver immediate feedback.

1:1 Computing Defined

Over the years, the question of how many computers per student or per classroom has emerged as a pivotal issue. Advocates for different perspectives agree that technology-enabled learning is important and the question is really one of available funds. The ideal is 1:1 computing, an environment in which students use computing devices, such as wireless laptops or tablet pc computers in order to learn anytime and anywhere. Yet, the focus is not on the technology. It is about the paradigm shift in how instruction is delivered and the spark that is created in students that provides a new sense of enthusiasm and ownership in their learning. In today's global economy, most adult workers use individual personal computers; they collaborate on projects but do not share computers. Student learning improves when they too have anytime, anywhere access.

> **"Usually such overwhelmingly positive results like this aren't seen for three or four years out. Clearly, our 1:1 computing program is doing what it is designed to do for our school children – enhance student learning and achievement in core academic subjects."**
>
> *– Bruce Montgomery*
> *Director, Michigan's Freedom to Learn 1:1 program*

According to Lessons Learned About Providing Laptops for All Students, a report by the Education Development Center (EDC), "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." It's all about access to information, engaging students and encouraging them to take responsibility of their own learning.

Goals for 1:1 Programs

1:1 computing addresses many challenges in education, which makes it attractive as a strategy. Each district will develop its own goals during the planning process, but some common goals for 1:1 programs are:

- To improve equity of access to technology
- To improve the quality of learning
- To institute and support best practice in technology integration
- To improve student learning of content
- To institute formative assessments and differentiated instruction
- To increase performance on standardized tests
- To improve student ability to become lifelong learners
- To prepare students for the world of work
- To improve the home-school connection

What Works

Early research shows that 1:1 computing produces impressive results. In several of these studies, researchers' findings indicate that 1:1 computing provides greater access to resources, information, and up-to-date instructional content for more students and families as well as increases student motivation, engagement, interest, organization, and self-directed learning. Educator benefits were found to increase professional productivity, encourage greater collaboration, and improve home-school communication.

More recent 1:1 computing initiatives point to improvement in student attendance, academic rigor, individualized instruction, cost savings, and Adequate Yearly Progress (AYP) goals. In Las Cruces, New Mexico, for example, the district has developed new technology-based curriculum units in math, science, English and social studies. Student attrition was reduced by 50 percent in the historically worst performing schools. They improved community outreach and enrolled more at-risk students. Patricia Miller, former Director of Technology says, "Technology is helping to increase the rigor of our academic program, and at the same time, stimulate curiosity and more interest among students in completing their education."

In Floresville, Texas, teachers have developed new skills in using technology and as a result, students are receiving more individualized education. The district's goal of student-centered learning is taking place in all classrooms. According to Melissa Ramos, Executive Director of Technology, "The 1:1 solution has proven to be ideal for our educational purposes and delivers excellent total cost of ownership for the district at the same time."

In Michigan's statewide 1:1 program, attendance increased and student test scores improved as part of AYP goals. In January and February 2005, schools took the standardized MEAP (Michigan Educational Assessment Program) test, following the implementation of the 1:1 program in the fall of 2004, providing initial data on the effects of the program. Results from the tests show:

- In Bendle Middle School, proficiency on reading MEAP scores increased from 29 percent to 41 percent for 7th graders and from 31 percent to 63 percent on 8th grade math scores.
- In 2004, Leland Middle School students were 53 percent proficient in MEAP writing, six percentage points above the state average of 47 percent. This year they moved to 87 percent proficient – a jump of 34 percentage points – and well above the state average of 53 percent.
- Across the Eastern Upper Peninsula ISD, student proficiency on standardized tests has increased in both science and math in just one year: science from 68 percent to 80 percent and math from 57 percent to 67 percent.
- Nearly all middle schools in the Flint school district are participating in 1:1 program. Some of the most powerful and positive results have been found in reading and math scores. This year, 7th grade reading scores jumped from 29 percent to 41 percent and 8th grade math scores increased from 31 percent to 63 percent.

"Usually such overwhelmingly positive results like this aren't seen for three or four years out, says Bruce Montgomery, who runs the program. "Clearly, the 1:1 program is doing what it is designed to do for our school children – enhance student learning and achievement in core academic subjects."

2. Program Planning and Evaluation

In Chapter 1 we mentioned the need to set goals. It is also important that districts begin their journey into 1:1 learning by carefully designing a roadmap. This roadmap will help them get from where they are to where they want to be and realize those goals. Typically, this process involves analyzing the current situation, formulating strategies, and planning for implementation. Here's a warning: Launching a 1:1 program is not easy. Implementing it is harder. It is worth the struggle because an effective 1:1 program can revitalize a school and transform the lives of teachers, students and families. Careful planning is essential. A solid plan will help districts initiate and sustain the program.

Taking the First Step

Analyzing your current situation is an important first step. In order to address 21st century needs, schools have to engage in continuous renewal and improvement. Like corporations, schools are institutions that have to reinvent the way they do business in order to keep up. Reasons why may include lack of student achievement, especially in math, science, and engineering; decreasing student engagement in traditional forms of learning, and the need to prepare students for the 21st century workforce and global economy. Technology is important.

Where do you start? There are a number of tools that schools can use to evaluate the existing situation. For example, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis can help pinpoint the areas that need attention. Strengths and weaknesses are internal to the district and opportunities and threats are external factors. An educational SWOT analysis would help planners decide where the organization stands and what it needs to do to reach its goals.

Your analysis should focus on successes and resources, note areas that need improvement, capitalize on new strategies that can come from changes in such things as technology, local policies, and funding sources and flexibility, and determine how to avoid pitfalls. A planning team would use this tool to decide where the organization stands and what it needs to do to reach its goals. The Mindtools and Education World Web sites provide more information on doing a SWOT analysis.

The technology planning process is your road map for implementing the technology that a district needs. Technology policies and goals should be aligned with instructional objectives, standards, and assessments, and the results should lead to better student achievement. Combining the technology planning and instructional components with help you achieve you district's goals for student learning.

According to the EDC report cited in Chapter 1, "...a comprehensive, systemic approach is needed if the initiative is to achieve the desired goals." According to the National Academies of Science, "A view of a system requires understanding the whole in terms of interacting component subsystems, boundaries, inputs and outputs, feedback, and relationships." Components that interact include teaching, learning, administration, and finance.

As part of the process of creating systemic reform, districts must develop processes to initiate, implement, and sustain change. Because everything is related, changing one factor may impact another. Factors to change include:

- Creating the technical capacity
- Building public, political, and professional support
- Developing policies that are capable of promoting and sustaining reform
- Providing adequate financial resources
- Conducting meaningful evaluation

Systemic thinking helps planners find the relationships among structures and identify how they interact.

Technology integration should happen along with planning for school improvement, budgeting and implementation. With a systems approach, districts will integrate technology goals with goals for curriculum and instruction, student achievement, school governance and professional learning if they are to prepare students for the 21st century and global competition. To ensure adoption and implementation, each step of the planning process should include teams that involve all stakeholder groups (and yes – even students!) in meaningful planning activities and decisions.

Dixie Conner in Education World's "Utilizing the Matrix Format to Create Effective Planning Documents" writes, "If school districts are going to meet the dual

challenges of No Child Left Behind legislation and budget cuts, future district-wide planning documents need to contain well-organized action steps; steps designed to reach curriculum and professional development goals and to meet the needs of every child, teacher, administrator, and parent the district serves. In other words, planning documents need to be both usable and effective."

To accomplish that end, district planners can create user-friendly and practical formats such as a matrix to simplify the process. A matrix format allows districts to see clearly — on a single page — where they want to be in 3-5 years, and to visualize the steps they need to take to get there. In addition, a matrix can be set up to demonstrate alignment among all planning documents, resources, funding sources, and state and national requirements. Factors to consider for each goal include:

- Objectives
- Activities and benchmarks
- Monitoring and evaluation
- Timeline
- Person Responsible
- Budget
- Alignment to other planning documents

Examples of matrix-formatted planning documents that districts have used successfully are available at Education World.

Goals and Strategies

Technology planning for a 1:1 program can serve as a catalyst for planning a school or district's comprehensive school reform initiative. With any large-scale investment, districts have to identify their primary goals. For example, a 1:1 program would support the goal of increasing student learning and achievement by creating student-centered environments where youngsters can reach beyond the classroom walls for information, expertise, and resources at anytime and from anywhere. Note that the goal is not simply to implement a 1:1 program; rather, the goal is to increase student performance by creating student-centered environments. The distinction is subtle yet important.

One way to approach goal setting is for planners to list five to ten goals that they have in place and what results they want to see in each year for the foreseeable future. For example, a goal of increasing student achievement should specify by how much and over what time frame and include what measures will be used to determine if goals are achieved. In addition, since accountability at all levels is critical, goals must be set for students, teachers and administrators. For example, goals can include:

- Students - to become self-directed learners
- Teachers - to create student-centered, constructivist classrooms
- Administrators - to provide support for the changes in climate, culture and expectations that will emerge with a school world that is fundamentally different from traditional practice.

According to the EDC report mentioned in chapter 1, "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."

Individual districts will determine the goals that best suit their needs. As an example, the goals for 1:1 teaching and learning of the Michigan 1:1 computing program are in the sidebar below along with the findings on progress in achieving the goals.

Once goals are established, school leaders and planning teams will develop five to ten specific objectives that related to each goal. Objectives answer the questions, "What are you going to do to achieve the goal?" and "What do you want to accomplish?" The action plan specifies who is going to do it, when, and with what resources. Compiling the list of action items in a matrix makes them easy to understand and monitor progress.

Below is an example based upon Dixie Conner's matrix approach

Goal 1: Ensure that students, parents and staff have convenient, appropriate and equitable access to the uses and tools of technology to improve student learning both during the school day and after school hours at all sites.

Below is an example based upon Irving Intermediate School District's Long-Range Plan for Technology 2004-2007

Objectives Implement a 1:1 pilot in sixth grade classrooms.	Activities/ Benchmarks	Monitoring/ Evaluation	Timeline	Person Responsible	Budget	Alignment to other planning documents
End of Yr. 1 Prepare teachers through professional development. standards	All sixth grade teachers achieve technology integration techniques	Teacher participation in PD and their level of expertise in 1:1	Annual Complete June 2006	Curriculum Director	General fund/other grant sources	School Site Plans 2006

Professional Development Goals

Goal #2: Ensure educator professional development is ongoing, standards-based, and of high quality.

Objective #1: Provide 30% of the day towards time for staff to learn about technology integration.

Budget Amount: $700,000

Teachers need:
- A variety of methods and ample opportunities to develop their own technology-related competencies
- To know how to effectively integrate technology into the learning environment
- To collaborate with others and share best practices

Administrators need:
- To model technology
- To help teachers plan for effective use of the available tools

To summarize, the steps in the planning process are:
1. Conduct an environmental scan.
2. Conduct a SWOT analysis.
3. Form planning teams.
4. Define the mission and vision.
5. Establish goals and objectives.
6. Define strategies and specific action plans for achieving the objectives.
7. Format the plans in a matrix (really, a project plan).
8. Establish the monitoring and evaluation process (discussed next).

Action Items	Person(s) Responsible	Source Timeline	of Funds/ Resources	Formative Evaluation	Summative Evaluation
1. Establish online learning communities anytime, anywhere.	All Staff	Ongoing	Time to share ideas	Learning communities are created, listservs	Educators will collaborate with others electronically Number of hits Number of job alike courses created
2. Provide technology training that is job embedded.	Director of Inst. Tech., Tech Coordinators, ITSs	Ongoing	Tech Allotment	ITSs conduct training at campuses on specified topics	Number of hours provided at each campus Evidence of technology being used in the classroom
3. Provide more time for staff development through the district calendar.	Asst to the Supt Staff Dev. Coord. IISD Board	TBA	Two days of student instruction	District calendar is changed to provide two more days for teacher training, waiver submitted to state	Teachers have more time to learn and collaborate with colleagues

Goals & Results

How Michigan's 1:1 computing program is meeting its goals.

GOAL 1: Enhance student learning and achievement in core academic subjects with an emphasis on developing the knowledge and skills requisite to the establishment of a 21st century workforce.

FINDING: Student scores on the MEAP increased after their participation in the program. Results identify 1:1 as the reason for this increase.

GOAL 2: Provide greater access to equal educational opportunities through ubiquitous access to technology.

FINDING: 1:1 computing program primarily serves urban and rural schools that are designated high need on both academic and socioeconomic criteria.

GOAL 3: Foster effective use of the wireless technology through systematic professional development for teachers, administrators and staff.

FINDING: After spending for devices, the greatest proportion of funds is devoted to a four-phase, four-year professional development program for all teachers, administrators, and technology staff.

GOAL 4: Empower parents and caregivers with the tools to become more involved in their child's education.

FINDING: Web-based applications allow parents and caregivers to follow and monitor student progress, homework and assignments online.

GOAL 5: Support innovative structural changes in schools and sharing of best practices through the creation of human networks among program participants.

FINDING: Professional learning roundtables for teachers, administrators and technology personnel foster connections and sharing of best practices and troubleshooting and are leading to comprehensive school reform.

Monitoring and Evaluation

How do you measure the outcomes of these goals? In this era of accountability for results, it is important to monitor any new program's progress and evaluate outcomes. Careful attention to monitoring and evaluation is critical to building success and replicating best practices. As part of the planning process, participants should identify an evaluation team that will determine what will be measured and how. Evaluators will look at such outcomes as teachers' instructional techniques, students' learning activities and degree of engagement, professional development needs, and impact on student achievement. Establishing measurable benchmarks prior to the program's implementation allows for a stronger and clearer "before and after" evaluation.

Both qualitative and quantitative measures are needed to determine success. For example, observing classroom performance provides a picture of student engagement and use of technology and shows how teachers implement new methodologies. Using participant surveys and assessing students' skill development after the introduction of technology provides data that determine participant acceptance and student improvement. The use of control groups can provide additional evaluation of program success.

Evaluations of 1:1 programs can also include a Global Descriptive study that examines the implementation and outcomes. Such a study would include observations of instruction; perceptions from key stakeholders, and analyses of high stakes test scores to examine the extent to which the program goals are being attained. For example, the Center for Research in Educational Policy/Educational Innovations (CREP/EI) at the University of Memphis is using multiple data sources for its Global Descriptive Study of the 1:1 computing program in Michigan. An example of a similar study by CREP/EI can be found in Deborah Lowther and Steve Ross' 2003 paper, Influences of Using Laptops in the Classroom. One additional study is at the University of Memphis and another at Ubiquitous Computing.

A Quasi-Experimental study could provide a more intensive and controlled investigation using scientifically based research methods. This study would gather in-depth information regarding the impact of the program through tools such as interviews and questionnaires that look at technology integration as well as school climate. Randomly selected students would also complete technology related performance assessments.

Another, equally important assessment component would be the teachers' use of a classroom level formative assessment tool with students. Assessments would measure student improvement of state curriculum standards and grade level benchmarks. The evaluation would gauge teachers' use of formative assessments to measure students' progress and adjust teaching and learning strategies accordingly.

In Michigan, for example, teachers use Scantron's Assessment Connection™, which is tied to Michigan's Grade Level Content Expectations and Curriculum Framework. Teachers have access to scientifically based questions that are tied to standards for classroom level assessments. Instruction is then tailored according to students' group and individual data.

Research Results

Michigan's 1:1 teaching and learning initiative, 1:1 computing program, is engaged in implementing these evaluation measures and has partnered with the Center for Research in Educational Policy/Education Innovations (CREP/EI) at The University of Memphis for evaluation. Preliminary results indicate a measure of success in reaching each of the goals identified here. See the sidebar for details.

Results in Walled Lake, Michigan were positive as well. Wayne State University and the University of Memphis conducted a three-year study on the effectiveness of learning activities, technology usage, writing achievement, and problem-solving ability. Benchmark assessment and MEAP scores were analyzed. The Year 3 evaluation of the laptop program was structured around six primary research questions that focused on classroom practices, student achievement, and student behaviors and attitudes. Results of this study suggest positive impacts of students using laptop computers as learning tools. However, students who had continuous access to the laptop computers in 1:1 programs had significant advantages over students who only had classroom access to laptops from a mobile laptop cart.

Anecdotal Measures of Success

By Patricia Miller

Anecdotal information also provides insights into the benefits of a 1:1 computing program. District schools collect and maintain such data as attendance, free/reduced lunch participation, ethnicity, home language, GPA and specific course grades. In addition, they can use observational assessment tools such as a rubric to evaluate student competence with technology. For example, students in Fort Sumner Municipal Schools in New Mexico used a rubric of Basic Student Skills Continuum in Technology that was keyed to ISTE's National Educational Technology Standards (NETS).

Teachers of grades K-8 assessed student skills in word processing, spreadsheet, Internet, productivity and communication tools, multimedia, and database skills. For example, they noted at what point students mastered each of the following skills. More information is available online.

Grade Level	Internet Skills	Date Mastered
K-2	1. Knowledge of "netiquette"-acceptable use on the Internet and District Acceptable Use Policy (AUP) agreement 2. Access Internet browser 3. Access web pages using Favorites or a hyperlink	
3-5	4. Conduct simple searches 5. Conduct complex searches 6. Save text or graphics from web pages 7. Copy/Paste text or graphics from web pages 8. Use information accessed on the Internet in integrated learning projects 9. Knowledge and adherence to copyright laws	
6-8	10. Evaluate credible Internet resources (Information Library) 11. Know correct annotation of Internet resources within a document or presentation	

3. The Education Landscape

Another important step in implementing any new change-generating program is to evaluate your education landscape and each major aspect of the system that exists. Considering all of the components that affect a successful implementation and getting buy-in for the program from all stakeholders can be one of the biggest challenges in creating a 1:1 learning program. Many factors are involved and they may vary from district to district. Common factors that make up the education landscape are leadership, technology readiness, staff readiness, and community support and understanding.

Evaluating the Status Quo

The process of evaluating the status quo includes looking at infrastructure and people's readiness to change. If the technical infrastructure can't handle new demands, plans have to include how to upgrade it. If the individuals who are needed to make change happen are not ready to implement new ideas, technologies, or other aspects of change, planners must design effective and worthwhile staff development to prepare them. If current funding levels won't support new programs, planners must find strategies to get those funds allocated.

Evaluating the key areas of leadership, technology, teachers, the community, and funding are important before creating a 1:1 plan. Change happens only when everyone and everything are ready. Michigan's 2003-04 1:1 computing program School Readiness Rubric (see page 13) is an example of a rubric that can be used to assess these areas as part of your planning process.

Leadership

The second step is to anticipate change and get buy-in for the program from all stakeholders. These stakeholders might also include the school board and community. Schools face a variety of challenges and opportunities in trying to implement any new program. Behaviors will need to change and leadership must be encouraged at all levels. For example,

- Teachers will need to adapt and change their teaching styles.
- Administrators will need to provide the support, time and resources for teachers to prepare.
- Technology staffs will need to make the infrastructure work consistently and reliably.
- School board members and Superintendents will need to establish policies regarding Internet access, student responsibility, insurance, data management and back up, and security.
- Parents and community members may need to fund technology programs and policies.
- Districts will need to implement sophisticated database management to monitor and support academic progress.

Technology Standards for School Administrators states, "Comprehensive implementation of technology is, in itself, large-scale systemic reform and leadership plays a key role in successful school reform." The standards below suggest the role for administration in enhancing learning and school operations by using technology. These are the traits of effective leadership.

I. Leadership and Vision:
Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

II. Learning and Teaching:
Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

III. Productivity and Professional Practice:
Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.

IV. Support, Management, and Operations:
Educational leaders ensure the integration of technology to support productive systems for learningand administration.

V. Assessment and Evaluation:
Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.

VI. Social, Legal, and Ethical Issues:
Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision-making related to these issues.

HOME

For more specific information and direction on leadership, please see chapter 4.

Technology Readiness

A technology readiness assessment examines the existing infrastructure demonstrated technology capabilities against new program goals, technology requirements, and expansion plans in order to determine the level of sophistication of the current system and its needs for future growth. Steps include:

- Determine the real needs for technology infrastructure now.
- Evaluate the ongoing needs.
- Evaluate staff capacity
- Get estimates from outsourcers on system upgrading and maintenance.
- Clearly communicate system status and needs.

Over the years, most schools have purchased technology for classroom and office use. It may have been a carefully planned investment or a hodgepodge of computers and peripherals that were needed for specific purposes at any given time. Through eRate funds, many districts have wired the schools for Internet connectivity but may not have the complete network to support it. Assessing the current technology infrastructure is key to planning. Some components will be useable; some will need updating or replacing. The backbone network itself, if it exists, may need an overhaul.

Planners should assess the technology infrastructure to see how close each school is to being ready on Internet bandwidth, the network, network support, and end user support. Only after that information is known can planners decide what technology is needed for the future. Optimal criteria would be:

- The building has a dedicated T-1 connection or greater to the Internet & has unused bandwidth capacity sufficient to provide 100 Kbps per new wireless device.
- At least one free or unused functional Ethernet port exists in more than two thirds of the building's instructional rooms and the network has the capacity to add additional computers.
- The average response time to network problems in the building is one day or less.
- The building has at least one trained and qualified person available whose primary responsibility is to assist teachers and students with technical end user support issues.

For more specific information and direction on networks, please see chapter 9.

Principal Readiness

In individual school buildings, where educators often feel isolated and unconnected to decision-making, any large-scale change creates a sense of unease. In a school district that is planning for technology integration, school building leaders, the building principal in particular, must anticipate and prepare themselves and those who report to them to accept change gracefully. His or her leadership skills have a direct impact on the success of the program. Planners should evaluate principal leadership skills in the following areas:

- Promoting cooperation among staff
- Promoting a sense of unity among staff
- Developing a shared understanding of purpose
- Developing a shared vision of what the school could be like
- Supporting a climate and culture for change
- Supporting teachers to take risks
- Communicating with staff, parents, students, and others
- Providing professional learning opportunities for staff
- Providing feedback, involvement and troubleshooting
- Creating opportunities for teacher to teacher training and support

Teacher Readiness

Teachers are crucial to implementing technology integration and new methods of teaching. Without teacher buy-in, the learning environment does not change. Developing teacher readiness is important for the classroom changes that occur with true technology integration. Steps include:

- Determine a reasonable timeline.
- Identify a small cadre of teachers interested in expanding and integrating technology in their classrooms.
- Provide a series of developmental professional learning experiences for these educators.
- Focus on technology integration
- Establish the expectation for teachers to practice, communicate with others, and self-evaluate
- Use these teachers' classrooms as laboratories for a pilot
- These teachers become trainers within their buildings

There are resources to identify teachers' readiness to use technology in the classroom. Following are

sample rubrics from My eCoach that teachers can use to assess their readiness. The first chart below helps determine teacher comfort level in using technology. The second chart helps determine teacher readiness to integrate technology and use new pedagogies. Both will help planners design professional development. Other rubrics are available at Discovery School.

Teacher Technology Assessment Rubric

I. Basic Computer and Technology Use (Current Level____ Preferred Level___)

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
I am aware of the technology available but do not use it. I am uncomfortable with the thought of using technology.	I do simple tasks on the computer as long as they do not overwhelm me. I can use a computer if someone sets it up for me and is available to support me if there are problems.	I am comfortable using technology, but I still ask for help. I use technology for my written and oral communications and personal use.	I realize technology can affect student achievement and the curriculum. I can manage the technology, paper, and files I create. I have started using technology with my students.	I use technology with my students as an instructional tool. Technology is just like a pencil or a book. I use new ways of enhancing the curriculum with technology.	I explore, evaluate, and use digital information for my work and play. I share student work and enjoy collaborating with colleagues. I am learning from my students.

II. Integration of Technology in Core Curriculum (Current Level____ Preferred Level___)

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
I have my students go to the computer lab or library on their own. The computer teacher or librarian supervises them. I have not included technology as part of the curriculum.	I have programs on computer(s) in the classroom that students can use, but they are used as a stand-alone program and as a supplement to the curriculum. When my students go to the lab, they are working on a project that the computer teacher developed.	I use my computer connected to a TV or projector to present projects and demonstrate programs. My students are using technology for writing projects. I use interesting software programs, internet sites, and support materials as part of the curriculum.	I have reviewed the curriculum and found technology resources that enhance it. My students are using technology as one more tool that is in the classroom. I have found ways to adapt technology to fit the curriculum and align with state or district content standards.	I am interested in creating exciting curriculum that involves and motivates the students. I have seen what other teachers in the same grade and subject area are doing with technology as part of the curriculum. I have invented new strategies of using technology as part of the curriculum.	My students create exciting projects that expand the curriculum. I collaborate with other teachers (critical friends) that teach the same subject so we are not reinventing the wheel. I have formed partnerships with companies, agencies, or parents that see new ways of teaching and learning.

2003-04 Freedom to Learn School Readiness Rubric

Points	1. Technology Integration	2. Teacher Readiness	3. Curriculum Integration	4. Professional Development	5. Student Readiness	6. Internet Bandwidth	7. Building Network	8. Network Support	9. End User Support
0 points Not Ready	Less than 10% of the teachers in the building require student use of computer-based technology to support learning activities	Less than 10% of the teachers regularly use a word processor, email application, presentation software & Web browser in a school setting	No plan is in place to align the building's curriculum to existing state or national technology standards	No formal support is available to assist teachers with training & mentoring activities related to technology integration	Less than 10% of the students regularly use a word processor, email application, presentation software & Web browser in a classroom /lab setting	No Internet connection is available in the building or only dialup connections are available	A computer network does not exist in the building or the existing network is inoperable	No formal support is available to maintain & support the building network	No formal support is available for teachers & students to assist with technical end user support issues
1 point Partially Ready	Up to 50% of the teachers require student use of computer-based technology to support learning activities	Up to 50% of the teachers regularly use a word processor, email application, presentation software & Web browser in a school setting	A plan is in place to align the building's curriculum to existing state or national technology standards & implementation is expected to begin in a year or more	Limited central office or district level support is available to assist teachers with training & mentoring activities related to technology integration	Up to 50% of the students regularly use a word processor, email application, presentation software & Web browser in a classroom /lab setting	The equivalent of a DSL line or fractional / shared T-1 connection to the Internet exists in the building	At least one free or unused functional Ethernet port exists in up to one-third of the building's instructional rooms	Average response time to network problems in the building is one week or more	Limited central office or district level support is available for teachers & students to assist with technical end user support issues
2 points Moderately Ready	Up to 75% of the teachers require student use of computer-based technology to support learning activities	Up to 75% of the teachers regularly use a word processor, email application, presentation software & Web browser in a school setting	A plan is in place to align the building's curriculum to existing state or national technology standards & implementation is expected to begin in less than a year	Building has at least one trained & qualified person available part-time to assist teachers with training & mentoring activities related to technology integration	Up to 75% of the students regularly use a word processor, email application, presentation software & Web browser in a classroom/lab setting	The building has the equivalent of a dedicated T-1 connection to the Internet	At least one free or unused functional Ethernet port exists in up to two-thirds of the building's instructional rooms	Average response time to network problems in the building is less than one week	Building has at least one trained & qualified person available part-time to assist teachers & students with technical end user support issues
3 points Ready	More than 75% of the teachers require student use of computer-based technology to support learning activities	More than 75% of the teachers regularly use a word processor, email application, presentation software & Web browser in a school setting	A plan is in place to align the building's curriculum to existing state or national technology standards & it is currently being implemented by instructional staff	Building has at least one trained & qualified person available whose primary responsibility is to assist teachers with training & mentoring activities related to technology integration	More than 75% of the students regularly use a word processor, email application, presentation software & Web browser in a classroom/lab setting	The building has a dedicated T-1 connection or greater to the Internet & has unused bandwidth capacity sufficient to provide 100 Kbps per new wireless device	At least one free or unused functional Ethernet port exists in more than two-thirds of the building's instructional rooms & the network has the capacity to add additional computers	Average response time to network problems in the building is one day or less	Building has at least one trained & qualified person available whose primary responsibility is to assist teachers & students with technical end user support issues

Planning for the Future

Basic components of the planning process include the following issues and questions for the team to consider on the road to getting buy-in from all stakeholders.

Issue	Questions
Vision	Where are we now and where do we want to be in the future? How do we get there? How will we know that we are successful?
Leadership	Who are the teacher, administrator, technology and community leaders of this initiative? What are the obstacles/challenges? What are the opportunities
Funding	What is the total solution? What is the true total cost of ownership? How will we pay the total cost now and in the future?
Implementation	Where will we start? What is the best strategy? Should we start with teachers first? Should we pilot the program in one grade level or even in one classroom? How will we expand the program to all students?
Professional learning	What initial professional development is needed? How will we time it? What ongoing opportunities for professional growth will teachers, IT staff, counselors, and administrative support need? How will we share best practices?
Situational awareness	How will implementation of a 1:1 initiative impact the culture, climate, budget, community, relationships of the school and district? What are the pros and cons?
Communication	Who are our key stakeholders? Are we clearly informing them about the plan? Do we have buy-in from everyone including parents/caregivers, local community leaders and associations?
Evaluation	What metrics do we have defined to evaluate the success of the program? What systems do we have in place to identify future adjustments that may need to be made to the program?

Community Support and Understanding

For any program to succeed, let alone one as complex and expensive as a 1:1 program, all stakeholders must be involved in the process of determining what to do and how to do it. They must reach consensus, which is usually defined as meaning general agreement and the process of getting to such agreement. Building consensus means getting participants to agree and resolving any objections in order to reach the best decision. This involves everyone being flexible and accepting compromise. When consensus exists, all participants will promote the plan.

Before they begin, stakeholders should understand the consensus-building process they will undertake. Some guidelines for anyone managing this process are:

- Establish trust among the participants.
- Make sure everyone understands the issues.
- Everyone's ideas are valuable and all should contribute.
- Disagreement is good but flexibility is important to reaching agreement.

Using consensus-building strategies leads to getting buy-in for the program from all stakeholders. The process involves specific steps:

- Agree on goals for the project.
- Define the decisions the group must make.
- Brainstorm solutions.
- Define pros and cons of the alternatives.
- Make the decisions.
- Analyze forces for and against implementation.
- Put in place the best strategies to achieve the goals.

Building support for any program within the education community involves issues that school districts are used to. Use the questions below to evaluate how well your district involves the education community:

- Is there an executive committee comprised of state leaders, including the governor's office, the evaluating organization and top level management?
- Is there a statewide professional learning core team made up of state organization representatives, technology and education leaders and education associations?
- Is there an advisory committee that includes university faculty, school superintendents, intermediate school district representatives, regional educational media coordinators and other school personnel?
- Is there a regular system of communication with

these groups and the wider community to share progress on issues?

The local community is very important and may be critical to ongoing funding and support issues. To evaluate how well the community is ready to work with planners, schools and districts can ask themselves the following questions:

- Are families included as participants in district decisions, governance, and advocacy through PTA/PTO, school councils, committees, and other parent organizations?
- Is there a history of including families in school decisions through school councils, committees, and other parent organizations?
- Is there an existing collaboration with the larger community to meet with and get and integrate input from parents and students, businesses, local agencies, and others who are community leaders?
- Is their a communication plan in place that articulates your plan or what goals the plan with achieve? Does the communication plan include followup to the community on the success of the project?

Funding

All public school districts have different funding circumstances. Yet all have the same funding sources: local, state, gifts, and grants. Maximizing these resources is challenging, particularly when most schools are locked into contracts that use a substantial proportion (as much as 90% in some districts) of budgets for teacher and staff wages and benefits. Even so, some districts have found ways to fund 1:1 programs by acquiring new revenue streams or redirecting existing resources. The first step is to analyze the current budget to identify what portion is currently being spent on technology and where priorities can be shifted to result in additional funds being available for technology. The second is to determine what the real costs of implementing a large-scale technology program will be. Then the district can find ways to increase technology budgets or find funds from elsewhere to leverage for technology programs.

An excellent strategy for evaluating costs is to use a tool developed by The Consortium for School Networking (CoSN) to determine the Total Cost of Ownership. CoSN's Taking TCO to the Classroom project provides school leaders with tools to help them estimate the costs involved when they build a network of computers and wire their classrooms to the Internet. "Ownership" in this context includes all of the costs associated with using and maintaining networked computers, no matter whether a school district owns or leases them. TCO traditionally also includes calculations of costs that may not turn up in a budget, but that can still have an impact on school district operations--for example, when teachers must take time out of their day to address their own tech support problems. Please turn to Chapter 8 for more information about funding.

Communication Plan

Who Should Be Involved

Stakeholders from every interest group should be included in the planning process. Anyone left out will find reason to undermine the results.

- School Board
- Superintendent's cabinet including curriculum/instruction and technology personnel
- Parents/caregivers and students
- Teachers and all staff
- Local community and media outlets
- Business and industry partners
- State or federal elected officials or education agencies
- Funding agencies (those giving grants or sponsorships)

Means of Communication

Various communication means are available for school districts to use to promote change, including:

- The district's and schools' web sites (This is a critical source of information in today's technology based world. We have found that very few schools that are implementing one-to-one programs maintain well-designed or informative web sites on their programs).
- Newsletters
- Local newspapers
- Listserv or other virtual discussion areas
- School open houses and community forums
- Press releases

4. Leadership in Action

STRONG LEADERS ARE CRITICAL TO THE SUCCESS OF ANY 1:1 COMPUTING PROGRAM.

In the previous chapter, we stressed the importance of leadership and provided basic guidance. In this chapter, you'll find more specific advice to help as you plan for a 1:1 program. An effective leader is someone who commands respect, takes ownership and responsibility, has expertise and experience, and who can provide guidance and direction and inspire others to change. Someone who is going to lead a 1:1 program would need additional skills such as:

- Has a clear and strong belief system that is clearly articulated
- Has a knowledge base on 1:1 computing and its relationship to curriculum and instruction
- Keeps teachers and principals informed on the latest 1:1 literature, research
- Challenges the status quo and takes responsibility for achieving results
- Has a positive attitude and inspires teachers and principals to believe they can accomplish the goals
- Creates the environment for success: Establishes lines of communication; a system for input that includes teachers and principals in the decision making process; a system of procedures to ensure that problems are solved in an efficient manner
- Knows when to push folks forward and knows when to pull back
- Isn't afraid to make decisions and make them happen

Change is essential to implementing school reform, improving student achievement, and integrating technology. Real change is systemic; this means thinking about the systems at work in a district – policies, processes, services, information, and technology.

According to the National School Boards Association's Education Leadership Toolkit, "Systemic change is a cyclical process in which the impact of change on all parts of the whole and their relationships to one another are taken into consideration. In the contexts of schools, it is not so much a detailed prescription for improving education as a philosophy advocating reflecting, rethinking, and restructuring."

An educational leader will work with stakeholders throughout the system to create a vision of what they really want the system to look like and accomplish. The following components represent the essential ingredients for leaders in building a 1:1 program.

Building the Vision

A leader asks stakeholders to decide what they want for the district's education in the future. This vision is a statement of values that must address the district's mission and goals, describe outcomes, be practical and specific, and reflect the best thinking and judgment of the community. A vision for 1:1 computing requires knowledge of the research on technology integration and the effect it will have on the system, especially on curriculum and instruction. Too often technology is offered as a solution that, in and of itself, will raise student achievement. A leader must guide planners to develop realistic expectations and plans to achieve them. Some ways that a leader can provide this guidance include:

- Examine the literature/research on 1:1 computing to create a realistic framework regarding expectations.
- Create goals and expectations based on the research.

- Learn how to help teachers create technology enhanced lesson plans.
- Create time for teachers to develop technology-enhanced lessons in the context of the curriculum.
- Visit schools that are experienced in 1:1 computing.

Managing Change

A leader creates the structure for stakeholders to evaluate the current situation and identify strengths and weaknesses, target priorities for improvement, establish plans to address these priorities, measure success, and make revisions accordingly. Everyone wants to succeed and fear of failure is a big issue in schools. An administrator must practice a leadership model that demonstrates he or she knows when to push and when to back off. He or she should practice a model of high expectations and high support, which is a model of what we want employed in the classroom. Strategies include:

- Structure a meeting schedule that allows teachers to address all concerns from instructional to classroom management.
- Be prepared to offer immediate support.
- Learn from districts with experience to help anticipate problems and seek input on issues where the answer isn't clear.
- Practice high visibility.
- Visit classrooms often.
- Make it safe to take risks by praising and encouraging.

Managing change is challenging. While people who are positive and receptive to change see the benefits and are eager to begin, others have difficulty and are recalcitrant. A careful leader will work with those who are reluctant to change to overcome their fears and encourage them to take the necessary risks. A leader can:

- Listen to and acknowledge different points of view.
- Expose invalid excuses.
- Solve problems. For example, if there are not enough outlets, provide power strips.
- If instructors don't know how to build a lesson, provide examples and release time to visit more experienced teachers' classrooms.

Leadership exists at many levels. From district staff to classroom teachers, some will accept the vision more eagerly and become leaders in their own right. Since entering into a 1:1 computing environment requires a new way of doing business, everyone involved needs ongoing support and encouragement. Leaders must be willing to continually challenge the status quo and foster the belief that positive results will occur if everyone continues to work towards the vision. Strategies include:

- Expose tentative teachers to classrooms where the model is working.
- Let skeptical participants see the enthusiasm of teachers and students who have embraced change.
- Create situations where peers recognize problems and help address them.
- Be positive; don't let negativity get you down.
- Be attentive; be visible and listen.
- Be supportive; meet reasonable requests.
- Keep focused on the goals.
- Follow up!

Changing the Culture

Stasis is comfortable. Many people believe that the ways in which they've done things has been fine up to now, so why change. A process called Force Field Analysis is one way to overcome resistance to change. It identifies potential obstacles within the culture – in anything from back office to classroom procedures – and finds strategies to address each area of concern.

In this process, participants identify the processes that are targeted for change and evaluate the forces for and against implementing change. In situations where negative forces are more powerful, participants address the issues and find strategies to decrease anxiety of those against and reduce the negative forces, starting with items that are least resistant to change. From there, they develop strategies to strengthen the positive forces for change and find solutions that those against it will accept. Together, they translate these strategies into action plans and develop ways to evaluate the results.

To implement a 1:1 program, districts should consider the most important factors and how they affect the success of the program. Force Field Analysis is one strategy for evaluating the forces for and against change that results from implementing any new strategy. By understanding these forces, planners can find ways to make the forces for a decision stronger and reduce opposition. The process includes:

- Make two columns to list the positive and negative forces.
- List a score from 1 to 5 for each to indicate the strength of each force.
- Decide which forces are strongest.
- Decide which positive forces can be made stronger and which negative forces can be reduced.
- Find strategies to accomplish both or modify the decision.

Staff Development

Transforming classrooms requires leaders to commit the time and money needed for professional development. Even when teachers are willing to use new tools

and new methods, they need ongoing instruction and support. 1:1 computing can transform classrooms into constructivist student-centered learning environments. Teachers need strategies to replace lectures and whole group methods. It is not enough to just provide technology lessons. Leaders must develop a comprehensive staff development program that offers teachers time to learn - after school, released time during the day, weekend retreats, summer programs, and online. Leaders who are thinking of the future understand that teachers also need opportunities to discuss the curriculum, technology integration, and the best instructional practices that will result in improved student learning. In addition, it is important for leaders to include themselves in professional development so they can be familiar with technology and with the program they are asking their staff to deliver.

Classroom Management and Technical Support

1:1 classroom looks very different from a traditional environment and brings with it new management issues and challenges for teachers. Even though the benefits far outweigh the problems, teachers need strategies for coping with emerging management and technical issues. School leaders have to plan for their support. Adequate professional development can assist teachers and provide them the tools to manage this new classroom environment successfully. Most important is making sure that there is technical support and that equipment works properly when teachers and students need it. In addition, district leaders must make sure that strategies are in place so that students know what good behavior looks like.

Strategies for success can include:
- Make sure there is adequate power.
- While newer laptops have longer battery life, it is a good idea to equip each classroom with ample surge protected power strips.
- Provide multiple printers or allow printing from any printer in the building.
- Create an Acceptable Use Policy
- Use filtering software
- Provide a list of relevant and acceptable Web sites for students to access as a part of the lesson.
- Reinforce the idea that the current discipline policy applies to technology infractions too.
- Have a building procedure for how re-imaging occurs.
- Have loaner laptops (if possible) for students to use while their laptop is being re-imaged.
- Have a policy in place that students can only use software that the school or district loads.

The IT department, the operations department, the building principals, technical support staff, and teachers must work together to develop plans for potential problems prior to program implementation. A proactive approach to addressing these concerns at the outset will alleviate later problems.

Communication and Input

Education leaders have to set up a system that establishes clear lines of communication and input before implementing a 1:1 computing program. Stakeholders must be able to address areas of concern such as curriculum integration, technical issues, and classroom management. Without the sense that someone is listening, the people who feel left out will become obstacles to achieving the desired outcomes.

There are several ways that leaders can prevent this from happening. First, they can set up regularly scheduled meetings to address ongoing and new issues, provide insight into general dynamics and emerging problems. Leaders must be prepared to provide immediate support for problems and concerns. Second, leaders should use e-mail regularly because it provides an opportunity to foster collaboration and team spirit. Leaders can share successes, engage people in problem solving, invite stakeholders to related events, and ensure that problems are addressed immediately. Finally, it is essential that the all stakeholders be informed about progress on a regular basis.

Monitoring and Sustaining Change

Entering into the world of 1:1 computing carries with it many responsibilities and challenges. The results, however, are powerful and will energize the school system. District leaders should prepare participants that a system for monitoring and evaluating will be in place and there are systems for regular assessment. Some strategies are:
- Use the research to inform decisions for goals.
- Create rubrics for each goal and monitor through survey, teacher observation, and hard data such as problem solving task, written work, attendance, and GPA.
- Hire outside consultant or evaluator to research goal implementation and to evaluate progress on goals.

Reporting these results to the school community including the media is a powerful way of growing support for the initiative. Success breeds success. Once teachers experience the benefits of having a 1:1 environment, they will be the best advocates of and leaders for change to others.

5. Instructional Support

The goal of technology integration is to use technology seamlessly in the classroom so that the technology itself is invisible in support of learning a standards-based curriculum. Employing technology provides a variety of new ways to learn, and in the process, fosters independent thinking, problem solving, and collaborative learning. Students can test scientific theories with simulations, find ways to prove ideas with multimedia, and collect environmental data with hands-on experiments. They can use the Internet to experience the world through virtual field trips and find information to prove almost any point of view. They can exercise their creativity with art, writing, and music software and more. All of these opportunities mean using technology as a tool to promote content learning.

As we'll see in Chapter 7, professional development is the key for educators to learn how to implement technology in their day-to-day teaching and curriculum. Training is essential because it helps them understand how technology supports learning and how to use technology.

Supporting a standards-based curriculum with technology involves learning what tools work best in which situation, creating lessons, and monitoring their effectiveness. All must be learned. Many districts find that arranging professional development workshops that provide instructional support to help teachers hone their technology integration skills is just as important as employing technical support staff to troubleshoot equipment and answer technical questions.

Professional development classes provide templates and support materials, help teachers understand which technologies to use and when, model lessons, offer lists of resources, and give teachers time to learn, practice, and give constructive feedback. The goal is to provide a learning environment for teachers that enable them to use technology effectively in their classroom whether they are creating new lesson plans or converting existing plans. As an interim step to confidence in employing technology, teachers can use the North Central Regional Technology in Education Consortium's, Scoring Guide for Lesson Plans That Use Technology Resources in evaluating lesson plans that use technology.

Managing the New Environment

As you can imagine, using technology in the classroom changes the classroom structure, operation, and management. Teachers learn to become a "guide on the side" rather than a "sage on the stage." Getting there involves changes in philosophy and practice. In addition, in a 1:1 environment, because students have access to tools and online resources, teachers need assistance adjusting to how they organize their classrooms and make assignments. Three categories of adjustment where teachers will need the specific professional development assistance are classroom management, student management, and time management.

Classroom Management

Managing a classroom that has technology requires advance planning. Classrooms with laptops require even additional planning because of their mobility. As an outgrowth of professional development, teachers need to plan for change. They can participate in workshops and online courses. They can access online professional development resources. They can observe and talk to teachers who are already using technology in their classrooms. They can join online discussions to gather ideas from teachers outside of their school or district. They can explore answers to questions such as:

Technology use:
- How will laptops be used to differentiate instruction?
- How will students engage in research and create presentations and reports?
- Will students work on whole and/or small group lessons?
- How can teachers manage laptops in the classroom?

Daily schedule:
- Will students use technology only when directed?
- Will students use technology on a daily basis or just for special projects?
- Will students have access to their laptops all the time?
- Will laptops really facilitate and/or enhance learning?

In examining classroom management issues, teachers should consider both laptop carts and individual student laptops. Since laptop carts are generally a shared resource within a building, certain procedures need to be in place to ensure all computers are

user-ready. For example:
- Create rules for laptop distribution and storage.
- Make certain all laptops are connected to the power supply and fully charged.
- Make certain all laptops in the cart stay together in the same room.
- Sign up ahead of time for adequate access. Remember a laptop cart is a shared resource.

A 1:1 laptop initiative requires specific strategies including:
- Providing a recharging center for laptops that need immediate charging.
- Providing backup laptops in case of missing or broken laptops.
- Setting up a procedure for sharing laptops when none are available.
- Infusing alternative offline activities.

Teachers must set expectations and model appropriate use of laptops prior to classroom application. Therefore, the most important strategy is to create classroom guidelines in laptop etiquette. These guidelines should be clear and concise in how you expect students to use their laptops on a daily basis. Teachers may use the following guidelines as an example.
- Bring your laptop to class every day.
- Every cell phone, PDA, pager and laptop volume should be set to mute or off when coming to the classroom.
- Laptop batteries should be fully charged before coming to class.
- Laptop may not be opened until told to do so.
- Hold your laptop with two hands when removing from case and carrying.
- Bring your laptop to class in sleep mode to avoid long boot-up times.
- You may not be engaged in unauthorized communication or entertainment during instruction and/or test/quiz.
- Shut down laptop only when given permission.

These guidelines can address school wide use or be tailored to meet specific classroom needs. Although not listed, consequences for inappropriate behavior should be developed as well. By and large, the guidelines should provide the foundation for a smooth transition in the consistent and appropriate use of laptops in the classrooms.

Student Management

Setting expectations by using guidelines is an important step to management but there are other strategies to consider as well. The purpose of using laptops is to improve learning, and teachers can keep students focused and on task. Some of the strategies to use include:
- Use your laptop as a presentation tool to review the purpose, roles, goals and outcomes of the lesson before using the laptops.
- Set expectations and times according to each lesson and project When students know what outcomes are expected, they are less likely to stray off task. Use tools such as graphic organizers to define roles, responsibilities and tasks.
- Create a help system that students can use when they have questions or need assistance. Common objects such as a piece of construction paper or a sticky note can be useful as flag signals. For example, a green flag could signify "Everything is okay." while a red flag could signify "I need help."
- Move around the room to monitor progress and answer questions.
- Require students to lower laptop lids to a 45-degree angle for any direct instruction or to show when they have completed assignments.
- Use a simple participation assessment system such as a checklist or rubric so that you can grade desirable behaviors in staying on task and working cooperatively. Students respond more when they feel they are being evaluated for on task behaviors.
- Create a sign off sheet or checklist for each project-based lesson so that you can monitor progress easily while keeping students on task.

You can find specific examples of these management tips, strategies and guidelines as related to schools and districts by conducting Internet searches. For example, you find an assortment of online graphic organizers at EduPlace and S.C.O.R.E.. In addition to these strategies and the classroom guidelines, each school district should have policies and procedures that outline what is allowed for staff, students, and parents at school and even at home. Some districts have separate copyright, acceptable use, and Internet safety policies.

Acceptable Use Policy

A district's Acceptable Use Policy (AUP) establishes the rules for how technology is to be used throughout the district and should include student responsibilities so that teachers have further direction on appropriate student behavior, guiding their students, and enforcing the district rules. In developing an AUP, districts should include administrators, teachers, parents, and students in the planning process. More information is available at Education World. In preparing such a document, some items to address include:
- Who can use the district's network and what users can access and from where
- How users (staff, students, parents) should behave.
- Filtering provisions to address pornography, obscenity, materials and individuals harmful to children
- Monitoring of online activities of staff and students
- Protection of the safety and security of minors
- Prevention of unauthorized access

- Rules for what is authorized use and dissemination of personal information
- Rules for consent – who has to sign before access is allowed

Copyright Policies

A district's Copyright Policies should guide teachers and students in what the law allows. Teachers should be able to implement fair use regulations and students should be taught to understand intellectual property rules both for printed and online materials. Articles and quizzes on copyright are available on techlearning.com.

Parent Orientations

Teachers can do just so much in helping students to learn the new rules that having technology requires. Parents must be informed and trained as well. Getting parent buy-in about the appropriate use and maintenance of the laptops helps students behave appropriately and at the same time, prolongs the life of each computer.

Time Management

Making good choices leads to effective time management. Teachers have to determine what their students need to learn for each assignment. Then they choose the best way to provide the material and the best way for students to learn it.

They can begin by enhancing lessons with technology. They start by identifying the objectives of a lesson and looking for ways to infuse technology into activities. For example, if students were writing an essay by hand, they could use word processing instead. Better yet, if students were using a spreadsheet to record data, they could use the same tool to create a graph or chart displaying the data. Teachers can look at what traditional classroom tools they can substitute with technology and what offline activities would be performed better online? This process leads to better time management. Technology is enhancing accepted activities and improving them in the process.

Looking at technology-based activities, teachers can locate online projects such as hotlists, hunts and WebQuests that already infuse technology within the lesson while providing all the lesson resources, templates and assessment. These projects are often teacher-created and offer a tried and true option in using effective activities and projects. As the result, this saves time in creating such technology-based experiences for their students. A good example of such a resource is Bernie Dodge's WebQuest Page. This site contains inquiry-based projects that have been developed by teachers as well as training and teacher materials.

In addition, using laptops affords teachers the opportunity to give formative assessments and get immediate feedback and tailor student assignments to match what they still need to know. This saves teachers' time in creating only necessary lessons and students' time in targeting what they need to learn.

As technology use becomes increasingly interwoven in lessons and instructional units, it becomes increasingly important to measure student progress using a variety of tools. In addition to summative and formative tests, teachers should have rubrics, portfolios, and other assessment tools to gauge not only how

Internet Safety Policies

A district's Internet Safety Policies help guide students to use online resources appropriately. In addition, conditions must be met that comply with the Children's Internet Protection Act (CIPA) that went into effect in 2001. All schools receiving discount rates for Internet access, service, or connections through the eRate program have to comply with rules on:

- Minors' access to inappropriate materials on the Internet or World Wide Web
- Restriction of access to material deemed 'harmful to minors'
- Plans to monitor minors' Internet use at school
- Safety and security for minors when using email and other forms of electronic communication such as Instant Messaging
- Unlawful online activities committed by minors such as 'hacking'
- Unlawful disclosure, use, or distribution of personal information about minors

well students are using technology, but also how well they are learning subject matter. In turn, this will provide feedback that can be used to improve future technology integration. Teachers can access a variety of these tools online. For example, rubrics, checklists and quizzes are available from 4Teachers.org.

Technology isn't a cure-all for today's educational woes, but it does make student learning more effective and efficient if used properly. Therefore, 1:1 computing programs should include:

- Curriculum standards and learning objectives that are specific and focused by which technology drives the learning through integrated lessons.
- Technology use that leads to students learning new information with new tools and methods.
- Guidelines and strategies that deal with effective classroom and student management.
- Technology that enhances and expands learning opportunities.
- Projects that lead to analysis and synthesis of information.
- Students creating knowledge and intellectual projects.
- Assessment that includes students' use of technology.

Student Training

While young people today are certainly more technology-savvy than in earlier generations, often they need guidance in using technology for learning. Teachers can begin with skills that support laptop use and then the specific technology skills and software to use in the curriculum. In short, it means laptop training, basic skills training and software applications and tools training. First, when students receive their laptops in the 1:1 programs, they need to know the basics of how to maintain and take care of them. Schools that provide students with basic training on how to take care of their devices have fewer problems with breakage. In addition, getting a better understanding of the operating system and file management will give students the foundation in understanding the laptop's capabilities and in using the laptops in a learning environment. Some of the basic skills may appear as follows:

LAPTOP SKILLS

- Operation of the laptops
    - Features and functions
    - Operating system
- Care and maintenance of the laptops
    - Handling
    - Cleaning
    - Batteries
- Management of files
    - Organizing files on local drive
    - File sharing via
        - Networks and wireless network
        - Infrared beaming
        - Email

ISTE's Technology Foundation Standards for All Students (NETS) include six categories for addressing necessary technology skills:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

Teachers can then help students learn the specific software applications and tools within context. For example, they may want to teach students to track changes in Microsoft Word as they revise an essay. The software can include productivity tools such as word processing, spreadsheet and database, desktop publishing and presentation tools, graphics and design applications such photo editing, drawing, and web design. In addition, teachers can include showing how to use the Internet for research and communications.

Technology training should be within the context of performing activities and projects as "just in time" learning and not as a stand-alone experience. There are various web resources such as Atomic Learning and LearningElectric.com that offer tutorials and how-tos. Some companies provide online support. For example, Microsoft supports the Office Suite.

A teacher modeling the appropriate use of technology gives students meaningful examples and experiences that they can apply. Some websites that provide technology and tech integration skills and strategies include WebTeacher, Microsoft Tutorials, Microsoft How-to Articles and Internet4classrooms.com.

Teachers can identify the ongoing skills that students need to know by asking themselves:

- What things do you hear student asking for?
- What activities in the classrooms appear to need more hands?
- What can students do that the class and/or school could use?
- What areas of technology expertise do your students possess?

The goal of technology integration is to use technology in the classroom so that it becomes a tool to help students learn new things in new ways and prepare for the future. Yet it is a catalyst for greater change. Employing technology affects the classroom's structure, operation, and management and requires new skills – both for students and educators. The next two chapters address the content and teacher preparation for 21st century education.

6. Technology and Curriculum Integration

As we mentioned in Chapter 5, technology integration is the use of new tools to support existing curricular goals and objectives. Teachers use technology in different ways to enhance instruction and support student learning of required curriculum areas. Because students are technology-savvy, they are eager to use technology to learn. Teachers offer these tools so that students become more engaged in acquiring the skills they need.

Technology and Content Standards Alignment

The International Society for Technology in Education (ISTE) believes that "To live, learn, and work successfully in an increasingly complex and information-rich society, students must be able to use technology effectively." They developed standards to guide educational leaders in recognizing and addressing the conditions for effective use of technology to support Pre K-12 education. They state, "Within an effective educational setting, technology can enable students to become:

- Capable information technology users
- Information seekers, analyzers, and evaluators
- Problem solvers and decision makers
- Creative and effective users of productivity tools
- Communicators, collaborators, publishers, and producers
- Informed, responsible, and contributing citizens

To help educators achieve these goals, ISTE developed national technology standards that describe what K-12 students should learn and what teachers should be able demonstrate. Their Technology Foundation Standards for All Students describe what students should know about and be able to do with technology. They worked with professional organizations to develop models for using technology in the content areas. They also developed Connecting Curriculum and Technology to provide curriculum examples of effective use of technology in teaching and learning. Lessons are available from a searchable database.

Two additional documents are in progress. *Educational Technology Support Standards* will describe standards for professional development, systems, access, and support services essential to support effective use of technology. *Standards for Student Assessment and Evaluation of Technology Use* will describe means of assessing student progress and evaluating the use of technology in learning and teaching.

Lesson Planning and Integration Assessment

Implementing technology-infused lessons and activities isn't an innate skill for educators. Thus professional development must include resources to develop effective models. In addition to using ISTE's lesson database mentioned above, some ideas to encourage teachers to use technology effectively are available in an article on techlearning.com. These include:

- Review content standards so teachers can make sure the topic meets what they are supposed to be teaching.
- Model several lessons with student examples, including some simple lessons so teachers are not discouraged or afraid to jump in.
- Show teachers how to find rich, relevant and appropriate resources.
- Provide templates, support materials, and a mentor or coach.
- Team an early adopter with a teacher new to technology so the excitement rubs off.
- Give teachers lots of hands-on time to practice, plan and reflect on what they learned.
- Feed them and provide incentives such as prizes and stipends.
- Provide "talk time" so teachers can share what they learn.

With limited time and opportunities, teachers can also turn to online courses, tutorials and how-to guides to help them keep their skills up-to-date and to find resources and lesson plans that infuse technology. Resources include

- Teacher Tap
- Staffdevelop.org
- Concept to Classroom
- Discoveryschool.com's Lesson Plan Library
- Kathy Schrock's Guide for Educators
- Thirteen Ed Online
- AOL@School
- Internet4classrooms
- Filamentality
- Trackstar

While developing and delivering quality instruction, teachers need to gauge the extent to which technology is making a difference in student learning in core competencies. Consequently, there should be ongoing assessment of the effectiveness of technology for

learning to inform planning, teaching, and further assessment. For example, the North Central Regional Technology in Education Consortium's Learning with Technology Profile Tool helps administrators and educators compare instructional practices with a set of indicators for engaged learning and high-performance technology use. For each category, there is a description of the indicators and examples that fall along a continuum that districts can use to evaluate their current status. Indicators of engaged learning include vision of learning, tasks, assessment, instructional models, learning contexts, grouping, and teacher and student roles. Indicators of high-performance technology: access, operability, organization, level of engagement, ease of use, and functionality.

Formative Assessment and Differentiated Instruction

While standardized tests determine student, school, and district success, recent efforts to help students do well include using formative assessments, which assess how students are learning during the course of the year, week or day. Armed with information from the formative assessment, teachers can adjust instruction and materials and make changes.

Teachers use several tools for formative assessment. These include observation, classroom discussion, and analysis of student work, including homework and regular tests. In a formative assessed environment, student can take tests and get immediate feedback on how they performed. There are applications in the market place that provide 100% participation and collaboration during instruction. With these applications, teachers can gauge the pace of the instruction with real time student feedback. There are also many free online tools that help teachers easily create a variety of formative assessments. Some include:

- QuizStar
- RubiStar
- 4Teachers.org
- Kathy Schrock's Guide for Educators

Adjusting lessons and using this information to fill in the gaps between the students learning style and performance involves differentiating instruction, which is based on the beliefs that students differ in how they learn, classrooms that are not "one size fits all" are more effective, and students must be able to make meaning from subject matter. A differentiated classroom offers students different ways to learn subject content, make sense of ideas, and demonstrate learning. Teachers have many ways to provide instruction that is targeted to specific groups of students. Using 1:1 computing for this purpose makes it easier for teachers to assemble and assign materials and then assess progress. Strategies, lesson plans, content-based sites and resources are available online from the Association for Supervision and Curriculum Development and Edutopia.

Digital content such as video, Web sites, Email, threaded discussions, databases, streaming video, videoconferencing, primary sources, software, and interactive games can play a role in professional development, especially in the form of videos of best practices, interactive experiences and threaded discussions that provide a community of learning in which teachers to interact and collaborate. In addition, teachers can also find tutorials, templates, Web-based lessons, student guides, handouts, rubrics and links to resources. There is almost too much to deal with and the task of finding the best resources can be challenging. Districts can make the process easier for teachers by:

- Collecting existing materials and resources that support curriculum
- Aligning content and technology standards to the curriculum
- Finding resources that supplement and enhance the curriculum
- Creating sites and resources aligned to curriculum and standards
- Modeling how to utilize these resources as part of the curriculum

There are numerous supplemental content providers that provide resources and lessons based on state and federal standards. This helps and can help eliminate a great deal of the internal legwork.

Though printed textbooks are not going anywhere, anytime soon, publishers have started to introduce digital textbooks into the education market, which can provide certain advantages over the traditional publishing.

- Students find the presentation more engaging; they can turn pages with a digital button, bookmark passages, search the textbook, and look at information across chapters rather than linearly.
- Teachers can focus assignments and link to other resources.
- Administrators can reduce costs
- Publishers can add recent events and provide regular upgrades to the content
- The need to carry heavy books from class to class is reduced or eliminated

As discussed earlier, teachers need support in order to adapt to change. Professional development should help them integrate technology into their classrooms by showing them how to use technology, providing ways in which it supports instruction, and helping them to employ these methods as classroom practice. The next chapter addresses these needs.

7. Professional Development

Professional development is crucial to an effective 1:1 computing initiative. It includes preparing teachers to use technology to support standards-based teaching, student-centered learning, and using more effective strategies to reach today's "wired" students. The goal of technology integration is to use technology seamlessly so that the technology itself becomes a transparent and integral tool to teach core curriculum.

Professional Development Goals

The Association for Supervision and Curriculum Development (ASCD) outlines six goals for effective professional development in Design Your Professional Development Program: Where to Start:

- Directly focused on helping to achieve student learning goals and supporting student learning needs
- A collaborative endeavor - teachers and administrators work together in planning and implementation (of what?...the professional development or rolling out the 1:1 program?
- School-based and job-embedded
- A long-term commitment
- Differentiated
- Tied to the district goals

In addition, ASCD identifies five areas of focus. Professional development programs should take into consideration a district's organizational needs, but research and best practice show that for continuous improvement, they should focus on the following categories and the connections among them:

- Instructional leadership
- Instructional practices
- Assessment
- Curriculum development
- Understanding the learning process

Creating the Plan

Planning for effective professional development begins with assessing the skills and abilities that educators have in using technology and integrating it into their classrooms. Districts can't put in place a program if they don't know where they need to go. One place to begin is by using NCREL's Self-Assessment Tool for School Leaders. Once a district has found its strengths and weaknesses, it can create the plan. An article on techlearning.com identifies 10 steps to Effective Professional Development Plans. These steps are:

1. Develop a professional development subcommittee as part of the school technology committee.
2. Demonstrate some examples of how technology can be used in the classroom.
3. Use multiple needs assessment instruments that follow the NETS Teacher Technology Standards (ISTE) and that identify comfort level and attitude about technology, basic technology use, and level of integration.
4. Design individual learning plans (ILP) compiled from the data collected from each teacher.
5. Identify the leaders at your site who can provide expertise.
6. Create a list of on-site learning opportunities with goals, objectives and outcomes.
7. Share a list of off-site and online learning opportunities.
8. Build in time for grade-level or department meetings to plan and correlate standards with technology; develop activities, projects and lessons that include technology, classroom management strategies, and assessment instruments.
9. At staff meetings, share successes as well as expectations not met.
10. Continue with ongoing planning and re-evaluating where you are and where you want to be.
11. Create teach the teacher programs or mentor programs that provide on-going support.

Evaluating the Plan

A professional development plan is only as good as the extent to which it addresses the district's needs. Before they implement the strategies, planners can evaluate the items against the goals for integrating technology into teaching and learning. The North Central Regional Technology in Education Consortium developed Guiding Questions for Technology Planning that leaders can use. These are:

1. To what extent have we developed a professional development plan that addresses the skills teachers will need to integrate technology into the curriculum?
2. To what extent have we budgeted sufficient monies for professional development and support for teachers and instructional staff that will increase

both their knowledge base about technology and their understanding of engaged, authentic learning?

3. To what extent have we projected monies for professional development and technological support for school staff over a sufficient time period (e.g., five years)?
4. To what extent do our board of education and community members understand and support our professional development plan and its budget?
5. To what extent have our teachers, building principals, and other staff had input into determining the type, content, and length of professional development necessary to integrate technology throughout their instruction?
6. To what extent does our professional development plan address how technology can accelerate and enhance learning for special needs students (e.g., economically disadvantaged)?

In addition, districts should plan to provide teachers with opportunities for collaboration, home access to technology, a focus on the connections between the curriculum goals that teachers know and ways in which technology supports them, and a supportive environment for change.

Comfort Levels

Adults react to innovation in stages. The chart below identifies stages and how they present. For more information about these stages, read this Professional Development QuickTips on techlearning.com.

Awareness	May know or not know about the technology, but is not ready, even if has access to it
Informational	Aware of the technology, wants to learn more, and may ask lots of questions before jumping in
Personal	Uses technology for personal use and may ask WIIFM (What's In It For Me?). May have general anxiety about using technology beyond personal use
Management	Uses technology regularly but has trouble finding and organizing files, folders, and programs
Consequence	Looking for ways that technology will impact student learning
Collaboration	Interested in using technology as a collaborative tool with students and other teachers
Refocusing	Willing to share and teach other teachers how to use technology with students

Findings of a 2004 NetDay survey of teachers point to growth in capacity and attitude over the years. The major findings were:

- Teachers understand and value the impact that technology has on their professional duties, and on their students.
- Teachers' professional use of technology closely mirrors students' use of technology for schoolwork.
- Teachers are active technology users in their personal lives – just like their students.
- Teachers have distinct ideas on how the use of technology within education can be enhanced and want to be more involved with local and national discussions on technology.
- Defying conventional wisdom, older teachers are as comfortable and fluent using technology as their younger colleagues.
- Teachers that "walk the talk" have the strongest views on the value of technology within education.

Teacher Productivity

One of the biggest challenges for teachers is finding the time to complete everything they already do, let alone learn to use technology and effectively integrate in into the learning environment Teachers get excited about technology when they see the benefits of not only increasing learning in the classroom but also saving time and increasing their own efficiency. Key components of the professional development plan can include teaching them to use basic applications like word processing, databases, and spreadsheet to help them keep track of information, find specific data when they need it, and better identify and track their students' progress. This provides the foundation to teacher's comfort level with technology and basic applications.

Integrating Technology into Everyday Instruction

Teachers need the proper skills and tools to propel their knowledge and teaching through technology. Integrating technology into the classroom effectively can mean the difference between increased test scores vs. limited achievement growth. Teachers need to walk out of professional development sessions with lesson plans that help incorporate collaboration, content integration, and project-based learning. Though there are several modes to deliver this training, teachers often prefer that the initial training be provided face-to-face. It provides the environment where teachers can ask questions, collaborate with their peers, and learn from others.

Tips for Professional Developers

In many districts, there is a cadre of trainers whose job it is to help teachers learn to use and integrate technology. Below is advice from Technology & Learning magazine on doing the job effectively. For more tips, check out tech-learning.com's Professional Development QuickTips.

1. **Be aware of your reluctant learners.**
   Be sensitive to each learner's beliefs and needs without being judgmental.

2. **Keep it real.**
   Develop all learning opportunities around projects, standards, and goals that are part of their curriculum.

3. **Get your administrators on board.**
   Successful programs have supportive administrators; include them in professional growth opportunities

4. **Don't touch the mouse.**
   Explain the processes and step back; resist the temptation to step in and show them how to do it.

5. **Form study groups.**
   Follow up professional development sessions with study groups for educators that meet ongoing needs for acquiring new knowledge and skills.

6. **Provide other opportunities for teamwork.**
   Teachers tend to be isolated. Encourage those who teach the same grade level or subject area to develop curriculum collaboratively.

7. **Establish mentors.**
   Identify those who can mentor teachers, model good technology-supported instruction, and provide practical advice.

8. **Support the mentors.**
   Provide each mentor with a coach or support system.

9. **Use technology to nurture the learning community.**
   Use online discussions to encourage ongoing conversation about issues raised during professional development sessions.

10. **Vary the tools for online professional development.**
    Use threaded discussions, e-mail forums, and Web archives as well as online chat, instant messaging, videoconferencing, and collaborative workspaces as appropriate.

11. **Don't rush online learning.**
    Combine online with face-to-face learning until people get to know one another and build a mutual set of goals for a learning community.

12. **Market your professional development.**
    Promote upcoming events and do follow up to be sure teachers know what is available and why they need it.

13. **Say cheese.**
    Videotape all staff development activities for assessment and feedback.

14. **Show what's available.**
    Make sure teachers are aware of available and emerging technologies that could support them in the classroom or for personal productivity.

15. **Build a library of resources.**
    Develop a technology binder, Web site, or video collection with sample lessons, support materials, tips, and practical ideas.

16. **Offer just-in-time tutorials.**
    Create or use existing step-by-step how-to tutorials in print, videotape, or online so that teachers can get the information they need when they need it,

17. **Make yourself available.**
    Use e-mail and personal visits to check in with the educators you coach or mentor.

18. **Create summer learning experiences.**
    Provide summer institutes when teachers have the time for hands-on experiences, and encourage sharing, playing, experimenting, and learning.

19. **Aim for the right ratios.**
    The smaller the group, the easier it is for the mentor or coach to focus in on individual learner needs. Workshops: 12-15 learners per trainer. Coaching: 1-3.

20. **Share what works.**
    Have teachers create electronic portfolios of work, ideas, and reflections to share in study groups and online.

The first step is to assess participants on technology skills and comfort level, level of classroom integration, and teaching and learning styles by using direct observation and surveys. Some online survey services are at Quia and Zoomerang.

Identifying teacher skills will lead to grouping for specific objectives. These groups would fall into the following stages and objectives.

Stage 1 Users will:
- Probably not use technology
- Send students to outside sources such as a computer lab for technology instruction
- Use classroom computers for stand-alone drills

Objectives are to overcome their fear of computers and learn basic computer and Internet skills.

Face to face sessions could include:
- Orientation to their operating system
- Basic file management
- Basic application training

Stage 2 Users will:
- Probably use technology in limited ways
- Use basic applications such as word processors with their students

Objectives are to master basic applications as needed to teach content and complete tasks and to use the Internet for lesson planning. Face to face sessions could include:
- Bringing application skills up to an intermediate level
- Introduction to online lesson plans, teacher tools, and curriculum sites such as
    - TeacherVision.com
    - Teach-nology
    - AOL@School

Stage 3 Users will:
- Probably have begun to connect technology to curriculum
- Use technology to create materials and present content
- Set up learning environments for students to complete

Objectives are to recognize and understand the role technology plays in transforming classroom-learning environments.

Face to face sessions could include:
- Advanced searching techniques
- WebQuest development
- Managing collaborative and cooperative technology based projects

Stage 4 Users will:
- Design opportunities for student inquiry
- Probably manage collaborative and cooperative technology group projects
- Use non-traditional assessment tools effectively

Objectives are to create their own technology-based, learning environment.

Face to face sessions could include:
- Problem-based learning
- Online Learning Portal

Focusing teachers time on those skills that they as individuals haven't mastered completely, and providing just-in-time access to classroom-ready resources, can have immediate impact on classroom practices.

In developing local or state professional development plans, it is useful to examine other professional development plans.

Real change can take a few years in schools rich with technology, and even longer in schools with less. Professional development can shorten the learning curve and return on investment. The important thing to consider is that professional development lies along a continuum—from learning discrete skills, to developing fully integrated lessons, to transferring those skills to new technologies and new methodologies like project-based learning. It is an on-going need that will reap many rewards.

Professional Development Strategies

People learn in different ways. Some will want ongoing face-to-face workshops and sessions while others will prefer using online resources in the privacy of their own homes. Since the ultimate goal is to improve teaching and learning through technology-enhanced lesson plans, the key is in supporting the teachers that need the continued support some ways to do this include:
- Schedule time to meet with teachers in their classrooms.
- Observe classroom setup and teaching practice.
- Discuss curriculum plans with teachers.
- Create a lesson using technology and model it.
- Observe them teaching the lesson.
- Provide feedback and design another lesson with them.
- Establish a mentor program where teachers can help and learn from each other.

8. Financial Issues and Funding Sources

School districts are challenged to meet higher academic achievement goals and provide technology for student improvement and to increase administrative efficiency with funding sources that are less predictable, stable, and recurring than in the past. In general, school budgets are earmarked for fixed expenses and a mere 10-20% of general operating funds remain to pay for supplies, outside services, and technology. Schools and districts have had to be more creative than in the past to keep their initiatives going. Some of these strategies are below.

Once the decision makers in a district decide on a plan to implement 1:1 computing, they have to look closely at how they will pay for and sustain it. School districts prefer funding sources that are predictable, recurring, and without risk of reduction or deletion. With today's tight budgets, most funding beyond basic operating dollars is soft money. This chapter's mission is to help you identify and leverage funding sources for technology. Schools receive money for technology is the following areas: Federal funds, state funds, and local bonds.

Federal funds reach school districts in the form of block grants through State educational agencies (SEAs) to local educational agencies (LEAs) and public schools with high numbers or percentages of low-income children. Under No Child Left Behind, states and school districts have flexibility in how they use federal education funds. For example, it is possible for most school districts to transfer up to 50 percent of the federal formula grant funds they receive under the Improving Teacher Quality State Grants, Educational Technology, Innovative Programs, and Safe and Drug-Free Schools programs to any one of these programs, or to their Title I program, without separate approval. This allows districts to use funds for their particular needs, such as assessment, improving teacher quality, and technology.

One of the major sources of technology funding in the last few years has been Title II, Part D: Enhancing Education Through Technology Program (EETT). Its primary goal is to improve student academic achievement through the use of technology in schools. It is also designed to assist students in crossing the digital divide by ensuring that every student is technologically literate by the end of eighth grade, and to encourage the effective integration of technology with teacher training and curriculum development to establish successful research-based instructional methods. Under EETT, the U.S. Department of Education provides grants to State Education Agencies (SEAs) proportionally based on their share of funding under Title I, Part A.

Districts can use other Department of Education funds for technology by showing how technology addresses NCLB mandates. For example, the various titles in the law focus on specific areas such as improving instruction in high-poverty schools and ensuring that poor and minority children meet challenging state standards (Title I, Part A), K-3 reading assessment and instruction (Title I, Part B), improving teacher quality (Title II, Part A), technology integration (Title II, Part D), innovation (Title V), and formula-based state grants for assessment (Title VI, Part A).

Flexibility written into the law provides districts with the option of allocating and combining funds from various Titles to address priorities. Approval for technology expenditures is most likely when the technology is tied to NCLB goals. For example, you can use NCLB funds for technology if your goal is to develop assessments linked to state standards, especially in reading and math, for disadvantaged students, to improve teacher quality, to enhance technology integration, or to develop innovative programs that will improve student achievement.

Other federal funds are available for technology, both from the Department of Education and other agencies.

- The Individuals with Disabilities Education Act (IDEA) provides funds for the educational success of children with disabilities.
- The Guide to U.S. Department of Education Programs and Resources provides an overview of all Department of Education programs authorized and funded under federal law.
- For potential Education Department grant programs

and new awards, read the Forecast Of Funding Opportunities.

- Other agencies offer grants for educational programs in their target area and many allow technology purchases. The Grants.gov Web Site provides information about programs that give federal funds to education from agencies other than the Department of Education.

State Technology Funds

The U.S. Department of Education provides EETT grants to SEAs. States may retain up to 5 percent of their allocations for State-level activities, and must distribute one-half of the remainder by formula to eligible local educational agencies and the other one-half competitively to eligible local entities. To help schools fund technology programs, most states have either re-directed Title II Part D funds to specific statewide or regional projects (Eg. Michigan and Texas) or have simply transferred the competitive part of the Title II Part D funds to eligible school districts on a competitive basis.

Local Bond Levies

Issuing a bond means that a locality is going to sell shares in a particular project to raise money for the project. People or organizations that buy the bond expect to be paid back for their investment through dividends as well as, after a time, cashing in the bond. A bond is a written promise that the borrower will pay back a specified amount with interest at a fixed-rate to the lender at a certain time in the future. The interest is usually paid in equal time frames, which are described on the bond. For school districts, interest payments are generally paid twice a year with some of the principal, or the base amount borrowed, paid annually. Issuing bonds enables a school district to:

- Borrow large amounts of funds usually at a relative low interest rate compared with borrowing from a bank
- Specify the time frame for the borrowing (usually for a long period - legally up to 40 years)
- Determine within limits the amount of annual payments
- Design other factors to tailor the bond issue to the district's needs

When voters say yes to a bond issue, they are agreeing to underwrite that bond. Districts levy local taxes to repay the principal and interest on the bonds.

Issuing bonds is a complex procedure that requires using financial advisors, underwriters, school district's counsel, and bond counsel (attorneys versed in tax and other implications of bond financing). A series of financial documents including a Preliminary Official Statement (POS), similar to a prospectus in the private sector, are prepared and circulated to the potential buyers. The state also needs to approve the bond sale. Ultimately, the school board is responsible for incurring either bank or bonded debt. The voters must be convinced that this is a wise investment.

Local communities often get technology funds through issuing long-term debt such as bonds; winning grants and, less often, financing hardware, software, and networks with operating dollars from local and state property, sales, and income taxes. Federal initiatives such as the eRate help districts establish local area networks and Internet connections.

Technology Financing

Technology financing, or leasing, has become popular, and districts have a choice of two options. With a straight lease, a district pays for equipment for a specified time and then returns it. With a lease/purchase, the district either owns the technology or purchases it for a very small residual amount at the end of the contract. Financing imposes fiscal restraint as it limits expenditures to agreed-upon amounts and maintains a three to five year refresh cycle. Banks, local and state government pools, computer hardware/software manufacturers, and underwriters are sources of lease financing opportunities.

The advantage of financing is being able to acquire the technology without paying the full purchase price at one time. For districts not issuing long-term debt, financing allows them to make payments from the general operating budget over periods generally extending from 36 to 60 months. At the end, they either own the equipment or begin a new cycle with new program for new equipment. Administrators and boards often find these regular, periodic payments allow for better cash flow planning, a predetermined technology refresh cycle, and are easier to approve on an annual budget cycle. Given the pressures on district budgets, financing is a viable option unless the interest rate imputed in the periodic payment is substantially higher than

the interest rate the district can earn on its operating funds. This option also provides an effective approach to having upgraded equipment refresh as old leases expire and new leases are established.

Philanthropic Grants

Foundations, corporations, and non-profit organizations may also be a good source of financial assistance for technology in schools and districts, especially in the form of grant programs. While each organization has unique priorities, districts should write proposals that address those priorities specifically. In general, philanthropic entities are interested in providing start up funds for initiatives that are clearly focused, internally supported and financially sustainable. A good place to start investigating this source of funding is the Foundation Center.

Parental Purchases

In many districts, school leaders are turning to parents for support and funding. While fund-raising for special projects for a school or district as a whole has always existed, a new model is to ask parents to purchase technology for their children. Since many children have their own or have access to stereos, televisions, DVD, CD, MP3, and game hardware and software, the thinking is that some parents can purchase computers and related student edition software for student learning which lower technology costs to the school. There are trade offs to this option. If parents purchase different devices, the school is left supporting multiple platforms. Schools can minimize this exposure guiding the parents to purchase a specific brand and model. Some schools work with manufacturers to secure a group price that the parents can take advantage of.

Creative Strategies

School districts have to think strategically and look for creative ways to fund their priorities. Many find that money is out there if they know how to look for it, create it, or borrow it.

CURRENT BUDGET

Districts are beginning to look at technology costs as part of ongoing budgets. While in the past, the initial start-up costs were funded from grants or special funds; districts then have to plan for ongoing expenses. District leaders should make sure that technology costs become a line item in the general operating budget. This should include costs for:

- Repair and replacement of equipment such as laptops, printers, servers, access points, and other hardware.
- Replacement of supplies such as paper and print cartridges.
- Provision to add new software for instructional, business and technical uses.
- Staff development for trainers, release time, and materials.
- Technical support staff.

Including technology as a line item is both practical and symbolic. From a symbolic point of view it conveys a commitment to technology and affords it the same status as athletics, band, and transportation. From a practical standpoint it allows for long term planning.

COMBINING FUNDS

In the past, technology and curriculum directors didn't often have discussions about curriculum, but because they now need to leverage funds, they talk about technology in terms of meeting academic priorities. District plans for the No Child Left Behind law must align technology with curriculum, and funds can be combined as well. For example, districts can create a 1:1 program purchased through funds for reading improvement so that each child can receive individualized reading instruction.

PARTNER WITH BUSINESS

Asking businesses to help schools is fairly common practice, but some districts have honed their skills to a very profitable result. Some manufacturers having programs where they will match equipment or money donated to the school. These type of programs help provide additional dollars that stretch the technology budget.

Building trust over time with both local businesses and the vendor community can solve challenges for both. For example, employers need a workforce that has 21st century skills. Forming a partnership to provide technology to local schools helps students prepare to become effective employees. Results can include businesses providing donations of money

or equipment, hiring student interns, and provide technical experts to install, troubleshoot, or assist in other ways.

FORMING CONSORTIA

Large school districts have an advantage in dealing with vendors: because they buy so much, they can demand the best price. A strategy for small districts is to form consortia that can negotiate as one entity for better prices and services or even serve as a purchasing cooperative. A consortium can also manage network services and technology training for small school districts. For those looking to create a consortium, information from existing ones will help. In Minnesota, TIES offers technical services, student information and administration, systems software support, transportation, and learning and technology. For some districts, the Washington School Information Processing Cooperative serves as the districts' applications service provider and runs the student information, financial data, and Human Resources systems.

LOCAL FOUNDATIONS

Competition for grants is fierce and often limited by conditions such as location, economics, or purpose. Another way to acquire funds for technology is to connect with a foundation that's more closely tied to local priorities. For example, some districts meet with local company foundations to discuss targeting their giving efforts to educational technology. Districts can also create a nonprofit foundation that can do major cohesive fund-raising for large-scale initiatives such as 1:1 programs.

Other districts find other strategies to add technology for students. Some additional ideas are engaging in entrepreneurial activities like cell tower rentals, facility naming rights, and beverage contracts to reduce reliance on their general fund budgets. These strategies often result in additional resources to pay for technology.

Total Cost of Ownership

Understanding the finances of a district and the funds likely to be available for funding a 1:1 program is the first step. Before allocating amounts for specific parts of the program, districts must analyze the total cost of technology ownership – for that year and well into the future. While evaluation the Total Cost of Ownership (TCO) has been a business strategy, school districts are now undergoing the same process.

Districts use TCO to determine the costs of implementing and maintaining computers and networks. These costs include hardware/software technology costs, direct labor provided to support a computer network infrastructure and the more elusive soft costs incurred by computer users in training and dealing with system issues, downtime and other technology overhead issues.

A TCO analysis can become an important part of ongoing technology and budget planning. Determining overall technology cost can help education leaders conduct the most comprehensive assessment possible to determine how well they are managing their technology infrastructure. This analysis will help school leaders understand how to budget more wisely to manage their networks and technology initiatives for the long term.

In addition, because of No Child Left Behind Act mandates, school districts are now in the process of reviewing their technology plans with an eye to demonstrating the impact that technology improvements have on academic achievement. The TCO Tool can help school leaders make the case that the dollars they are spending on education technology are well spent. This kind of analysis is likely to gain credence with education policy-makers, whether they are members of local school boards or members of legislative bodies.

While gathering and analyzing the computers, network and other cost elements may seem straight forward to the casual observer, technology industry research and advisory firm Gartner, Inc. has identified about 1,900 cost elements throughout an enterprise that make up these cost elements. Fortunately there is some relief for school leaders when it comes to collecting and analyzing all of this data.

The Consortium for School Networking (CoSN) and Gartner, supported by funding from the US Department of Education have developed a web-based K-12-specific TCO tool, in which the number of data elements have been consolidated to about 150 input data fields. While the data collection effort still requires a focused effort, most users feel that the

learning and discovery is well worth the effort. This online TCO Tool is a vendor-neutral, free resource available to help schools and districts manage their computer networks in a cost-effective way. When school leaders input their data, the TCO Tool automatically calculates metrics that can then be evaluated in comparison to the high and low numbers that were calculated for eight case study districts. This web-based tool, along with full documentation and eight TCO case studies, is available online at www.classroomtco.org.

The Value of Technology Investments

Understanding the full range of costs associate with technology assists school leaders in budgeting for the future. Measuring the potential benefits of proposed projects against these costs provides a comparative financial Return on Investment (ROI). Adding likely student achievement measures and risk assessment processes provide the most comprehensive measure of evaluating proposed projects.

The ROI focuses on the value compared to the cost of proposed projects. For example, for projects that are intended to reduce school or district costs, ROI is a way to prioritize. Both initial and ongoing costs are measured against the benefits over the useful life of the project. However, ROI is only a partial solution. Since the "business" of schools is to education, the bottom line for school districts is student academic success. There are some measures such as time-on-task, attendance and test scores that districts can review for the impact of technology investments.

Armed with a real understanding of the technology costs, school leaders are better equipped to determine what direction their technology plan should take them and to budget accordingly.

Factors

The concept of the Value of Investment (VOI), takes into account both ROI factors (including staff productivity) and qualitative factors in comparing the relative value of proposed technology projects. These factors can include:

- Operational Efficiency – effect on TCO, including indirect labor costs
- Project Risk – Probability of the project meeting educational or financial expectations
- Educational Fit – The relationship between curriculum and technology
- Technology Emphasis – Alignment with the school's objectives
- Equity – helping to provide equal access to learning for all
- Time on task, absenteeism, standardized testing, graduation and college entry percentages
- User Satisfaction and Staff Retention
- Teacher Proficiency
- Impact - percent of total population affected
- Scalability – fit with district long range plan
- Providing 21st Century Skills
- Solution Quality and Vendor Support

9. Technology Infrastructure

GETTING THE RIGHT INFRASTRUCTURE IN PLACE TO SUPPORT THE NEW LEARNING ENVIRONMENT IS ESSENTIAL.

As districts develop their 1:1 computing programs, they have to plan for the technological infrastructure needed to support the initiative. For our purposes, the infrastructure is defined as the tangible "stuff" for the 1:1 program. It's the laptop or Tablet PC, the software, the wired and wireless networks, the servers and all the things that are needed in the data center. It is the infrastructure that will consume the largest portion of the project budget, though as you will discover that it can be as little as 20% of the Total Cost of Ownership (TCO).

Wireless Connectivity

MAKING THE CONNECTION

A major component in nearly all 1:1 programs, after the notebook computer itself, is the wireless network. The freedom and mobility of wireless networking is what gives students the opportunity to take their learning anywhere. Decide up front how you will want your wireless network to perform. Are you looking for just a few hotspots in the school building or do you need wall-to-wall coverage, or even, an entire campus? If you just need classrooms to have wireless accessibility, it is relatively simple to purchase a commercial grade wireless access point for each and plug them into your existing wired network. A whole-building or whole-campus network will require more planning and technical skill. Bring in a qualified contractor to provide you with a wireless assessment plan, a diagram of the building with proposed placement for each access point, and radio channel selection to address overlapping coverage areas.

PERSONAL AREA NETWORKING (PAN)

Almost all laptops today have multiple types of wireless connections. Infrared (IR), and the more recent development, BlueTooth®, are for short distance connections, often referred to Personal Area Networks (PAN's). These are limited to a relatively slow connection between a notebook and one other device. Don't be misled in to believing this is a solution for classrooms full of devices. These two technologies are meant primarily to replace peripheral cables. While both, meet the definition for wireless connectivity, it is not the high speed, high bandwidth, wireless networking that education needs.

Wireless Local Area Networking (Wireless LAN)

WiFi is the wireless LAN networking that is changing how the world works and it is the technology that many schools want to implement. WiFi is a trademarked name for a standardized set of wireless networking protocols. The Institute of Electrical and Electronics

Engineers established what is known as the IEEE 802.11 standards. The first widely implemented wireless Local Area Network (WLAN) standard was 802.11b. The faster versions of WLAN's 802.11a and 802.11g followed. Most schools today use 802.11g, which has a maximum throughput of 54 MBit/s, and is backwards compatible (will also work) with the original 802.11b that moves data at 11MBit/s. By choosing to implement the 802.11b/g standard that is widely used elsewhere, schools allow their students the possibility of connecting wirelessly at locations such as local libraries, book stores, home, as well as their nearby Starbucks® and McDonald's®.

WiFi is used for the last link in the network connection. Instead of an Ethernet cable from the laptop to the wall, the WiFi connection is made from the laptop's internal antenna to a base station, or Wireless Access Point, that is plugged into the school's wired Ethernet network. A single Wireless Access Point (WAP) has the capacity to make a connection to 15 to 60 laptops depending on the expected bandwidth requirements of the laptops and the capabilities of the access point. For anything more then the simplest wireless networking, a school needs to engage a qualified wireless network designer to ensure adequate building coverage and sufficient bandwidth for the expected uses. The designer also needs to work though the pro's and con's with the school as to whether students are able to move seamlessly from one access point to another as they move though the building or are student's restricted as to where they may access the network from.

These standards have a maximum radius of about 300ft in the best conditions. The actual usable range may be reduced depending on construction materials and other appliances in use in the building. The 802.11b/g standard operates in the unlicensed 2.4 GHz frequency, the same as microwave ovens and some wireless telephone handsets – both of which have been discovered to be the unexpected source of interference. You'll need to know if you have these in your buildings if you want to avoid possible problems.

Do you need something faster then what these standards provide? Perhaps you are planning on delivering lots of video streaming to large numbers of students, if so you may need to wait for the next advance. Wireless technology is continuing to move forward. The IEEE is currently working on the next WiFi standard, 802.11n, which is expected to be ten times faster than 802.11g and forty times faster than the original 802.11b. There are competing versions of 802.11n today but the standardization process should be completed by April 2007.

Metropolitan Area Networking (MAN)

While PAN's reach up to 30 feet, and a WiFi WLAN reaches 300 feet, WiMAX has a theoretical maximum radius of 30 miles from a fixed base station with a speed potential of 75MBit. Intel and a consortium of 67 others back this wireless Metropolitan Area Network (MAN) evolving protocol standard. It could connect school buildings together with WiMAX base stations (backhaul), and then these base stations are tied to the district's wired network and Internet connection. The set-top, box-like device will then connect to the base station from as far as 3 miles and at speeds of up to 15MBit. These devices could be in smaller school buildings or even in a student's home. Intel has announced its intent to include WiMAX capability in laptop processors in the future, possibly by 2008.

Wide Area Network (WAN)

There is another emerging wireless technology. Verizon has recently announced EvDO (Evolution Data Only) services they have branded as BroadbandAccess and that many refer to as wireless broadband. HP, IBM and Dell have introduced laptops with the ability to connect to the Internet using this service at speeds that average between 400kbps and 700 kbps, which is comparable to some wired DSL services. Unlike WiFi, which requires an access point within a couple of hundred feet, this coverage is wider and is similar to that of a cell phone. It is expected to be available in the sixty largest markets that they serve. This would be an appropriate technology for staff access from outside the school buildings, such as off-site teachers, mobile administrators, and in some cases, could also be for student use. The challenge to this wide roaming network connection scenario would be the monthly fees, which is currently being advertised at about $60/month.

Wireless Security

How secure you want to make the school's WLAN will be determined, in part, by how you view the situation. One school IT Director who, once the WLAN was isolated from the sensitive data and applications, said, "It's the community's WLAN. Why shouldn't I leave it wide open, and if a student wants to sit outside the building after school and surf the net, there's nothing wrong with that." Others will take the opposite view and want to lock it down as tight as possible and make it invisible to the outside world.

There are a number of security technologies that encrypt the transmitting signal such as WPA (WiFi Protected Access). In addition, you can encrypt the data itself with SSL (Secured Sockets Layer). There are multiple standards-based approaches to network access security can be applied and co-exist, including 802.1X, Web-based authentication and wireless data privacy with VPNs. In addition, enterprise-class network switches can recognize who a user is and the types of services and access they are authorized to have. This means that any unauthorized traffic is stopped before it can cause harm.

The most secure methodology is to limit access to just those who require it, and lock out all others. The Wireless Access Points (WAP) should be outside your firewall and require VPN to get in. If that's outside the capabilities of your school, at least implement the WPA encryption and watch for "rogue" WAP's being attached to your wired network.

All of these wireless technologies, combined by a skilled designer and guided by a 1:1 educational leader, can create an environment where students and staff are not bound by time or geography. This is a key goal and the primary objective of any 1:1 computing initiative.

Software Applications

Foundational applications are those needed for the operation, maintenance and manageability of the laptop as a device. These are the applications that an Information Technology (IT) staff will require. Districts naturally establish these standards when they own the laptops in their 1:1 program. However, even when students and parents are the ones purchasing the devices, it is still important to establish single set of mandated titles. A lack of consistency will drive up support costs, make it impossible to restore a hard drive image and make it difficult for the teacher, who will not be able to plan on students all having the same software tools. While we only address the Foundational applications here, the school will also need to standardize the Productivity Applications (Office suite, reference tools, etc.), and the set of Instructional Applications.

CLIENT MANAGEMENT SOFTWARE

All too often 1:1 programs are initiated without additional staffing to assist with the hundreds, or even thousands of new computers being added to the school environment. Client Management software enables the IT department to more effectively manage the influx of new devices and can be an important part of reducing the labor costs of supporting a 1:1 initiative. Be sure to select a comprehensive client management tool that automates the five key functions for desktop management support: software distribution, IT asset management, remote control, PC backup, and settings and configuration management.

ANTI-VIRUS SOFTWARE

It is important to protect the district from outside viruses, worms and Trojan horses when students take laptops home. Establish an anti-virus package standard and be sure to include updates for the life of your 1:1 program. The virus definitions and updates should be able to be pushed to the laptop without student intervention and if possible, without intervention from the school technology staff. Don't depend on students to update their virus definitions.

PERSONAL FIREWALL

Laptops should also have a personal firewall, whether it is the one that is included in Microsoft Windows XP Service Pack 2, or a standalone product from ZoneAlarm, Sygate, Norton or McAfee. These applications are intended to protect the laptop from Internet hackers and shield student identity and privacy. Anti-spyware is another product to consider and like a personal firewall, it protects you from external threats. Spyware can secretly capture and transmit personal information, make unwanted changes to system settings, and be the source of unwelcome pop-up ads, Anti-

spyware has the ability to block, and to reverse the effects of these types of intrusions.

FILTERING SOFTWARE

Many districts install web-filtering software that limits the sites that a student can visit. These applications must keep a district in compliance with Children's Internet Protection Act (CIPA) requirements. There are several products and they approach the issue differently. Almost all have provoked controversy, basically pitting those who want to protect students from the wild web to those who stress personal responsibility and teaching appropriate use. These products often impose additional technical burdens on the IT staff when the software interferes with other applications or teachers want to override it for specific uses or to reach specific sites. Other issues include product updates and maintenance costs. Examples are CYPERsitter, Cyber Patrol, and Net Nanny.

LAPTOPS

CURRENT VS. FUTURE USES

The selection of which notebook to purchase is often driven by student use and the software applications being used. Decisions should include choosing hardware that can meet the requirements of the most demanding software application on hand today and give consideration to the applications that might reasonably be used in the future such as video production.

One of the newest categories of notebook computer is the Tablet PC, which lets the user input text not only using the keyboard but also using a pen or stylus. It's a portable computer that has all the capabilities of a traditional laptop but with added functionality that appeals to schools. The Tablet PC has the ability to save these notes and in their native handwritten form, as well as, translating those notes to text. The ability to use a pen rather than a keyboard is more natural for many people and provides added flexibility.

LIFE CYCLE CONSIDERATIONS

Technology is continually evolving which creates a revolving door for computer life cycles. Because of the evolution of mobile technology, laptops and tablets, tend to have a shorter life cycle in terms of a particular model's availability. This can be a benefit to you as newer models generally offer increased features at lower costs. Don't let this constant change prevent you from jumping in. A school can wait forever for the "perfect laptop' to come along, and there always seems to be something better-faster-cheaper just around the corner. You can take comfort in knowing that even after a particular laptop or Tablet PC is no longer being manufactured, it is simple to add functionality with external USB devices, such as DVD burners, additional hard drives, and other peripheral devices and options. Parts for repair are generally on hand for a long time and getting extended warranties can mean avoiding any such problems all together.

BATTERY TECHNOLOGY

Today's current laptops are using Lithium-Ion based batteries, replacing the nickel-metal hydride and NiCad to batteries that had "memory" problems. Benefits of Lithium-Ion batteries include: less weight, stores more energy, and runs longer than the older nickel technology

BATTERY RUN TIME

There has been a great deal of debate over the true life of a battery charge. Several factors can influence a batteries single charge. A twelve-cell battery will last longer than the eight-cell, which lasts longer than a six-cell, if all other conditions remain equal. Of course, there are trade-offs: more cells increase weight and cost.

The speed at which the processor runs will also affect running time. A faster processor cycles through more instructions in the same period of time than a slow processor does, thereby using more energy. Other aspects that affect how long a battery can power a laptop include screen brightness and hard drive speed. A 5400 RPM hard drive requires more energy than does a 4200 RPM drive. Having both WiFi and BlueTooth transmission will cut down on time. Temperature can affect the life of the batteries: the higher the temperature, the less time the battery will be able to hold its charge. In addition, the applications that you use will affect how long the laptop can run. Running intensive applications such as CAD, gaming, and DVD movies will drain the batteries faster then would word processing or e-mail.

There are industry-accepted tests that are standard-

ized and used among the various manufacturers. One standardized test to use to compare the runtime of portable computers is the Ziff Davis Battery Mark test also known as BWS BatteryMark.

BATTERY LONGIVITY

The life expectancy of a battery is measured by its cycle life, the number of times that it can be charged and discharged. A Li-Ion is expected to have the useful life of 300 to 500 cycles. With batteries being a consumable item, it will be important to plan for additional budget to replace laptop batteries as the years go by. Some notebooks and TabletPC run the entire day with just their primary batteries. However, this may limit the number choice of portables you have to select from. It may also increase the weight of the portable computer to more than what your school finds acceptable. Whether students carry a second battery or simply charge their one and only primary battery in school, a district can benefit from having a charging device that can charge multiple batteries at once. Another solution is to have plug strips strategically located around the classroom. While this is not elegant, and some might even consider it unsafe, we have seen plenty of schools using this technique.

LAPTOP DURABILITY

The leading portable computer makers have a number of product features designed to improve the durability of a notebook. Look for manufacturers that are using the most optimal materials to ensure durability and light weight: magnesium alloy frames and display enclosures.

Another feature to ask about is the hard drive mounting solution, how it passes the transmission of shock away from the hard drive into the notebook's structure, protecting student data from the effects of everyday bangs and drops. A third-party test lab should independently verify this solution.

Look for In-Mold Lamination (IML) to provide a finish that is more durable when compared to paint. The process embeds the finish, incorporating an accent or body color beneath a layer of polycarbonate film, and then bonding it to the notebook's enclosure. The resulting scratch-resistant surface can protect the keyboard deck from normal wear and tear.

Another feature to consider is a spill-resistant keyboard with Mylar film helps reduce the risk of damage to sensitive, critical components underneath the keyboard.

Choose a manufacturer with an extensive testing process that is the basis for industry leading high-quality equipment and reliable computing solutions. Their test strategy should include:

- User-scenario testing
- Mobile specific testing: wireless, power management and docking
- Third-party hardware & software compatibility testing
- Interoperability testing
- Qualification of new components, BIOS, software deliverable updates (sustaining)
- Human Factors Testing – Developing customer-centric products using Human Factors Engineers through simulated environments and product usage observations

While every laptop company will claim to make a durable computer, these are some features and attributes you should ask about in order to sort out the differences between manufacturers.

PRICE

Obviously, a factor to consider is the purchase price itself. While this is important, don't let it overshadow other critical items. Consider having a TCO analysis done by a qualified consultant to get a better understanding of all the costs that will need to be addressed. (See chapter 8 for more information.) Have a weighted decision criteria scale in which purchase price is just one element in the overall evaluation. Remember, the purchase price is almost never the determining success factor of a 1:1 program.

The Backend Systems

EDUCATIONAL PORTAL

An educational portal can remove many obstacles that exist today, hampering the successful delivery of instruction. It can be a tool to improve communication and collaboration among teachers, administrators, students, parents and community. While a portal uses web technology to deliver information to a browser, it is not the same as a school's web page. With a portal, the information displayed by the browser is specific to that user; a parent's site will appear different than

their student's site, which will be different still from the teachers or the administrators view.

An educational portal can provide a single sign-on web environment serving the needs of teachers in facilitating an Anytime Anywhere Learning (AAL) classroom and work activities. Teachers are able to create their own learning resources or link to existing material found on the web or on the school's intranet. These learning resources to be used as part of classroom lessons or passed out electronically as student assignments. The teacher can do this from anywhere if he or she has a laptop or Tablet. This represents an increased proficiency in technology use and a productivity gain for most teachers.

Students can access the individualized materials, turn in their work, and the system can grade assignments, thus keeping track of student improvement. Parents can monitor their children's current work, future assignments, and view past assignments along with the teacher's comments. This ability allows parents to become more involved in their child's education and be able to do it on their own schedule. For both students and parents, having access to the Internet and the portal gives them the means to be involved at anytime and from anywhere.

Data Warehouse

Accessing actionable information can be a challenge for educators. It's been said that schools are data rich but information poor because the various systems are often incompatible in terms of their inability to talk with each other. This is the challenge: turning these massive amounts of data into information - information that can be used to the advantage of the administrators, teachers, and students. A data warehouse provides schools the ability to collect and store data from these various silos, such as, student information systems, assessment systems, food service, transportation and other educational data sources. Then, using data management tools, it creates useful, actionable reports.

In a data warehouse, source data is gathered, cleansed and filtered before being stored in an integrated data warehouse optimized for reporting and analysis. This allows educators access to standard reports, creation of ad-hoc reports, as well as, complex data analysis based on correlating information from all these various sources. The data warehouse is able to maintain multiple years of data (students' entire K-12 records) allowing for ongoing analysis. What are some examples?

- A high school principal is able to look incoming students and discover that the one of the middle schools are providing students who are out performing all others in expository writing, providing an opportunity to capture a "best practice" to be replicated.
- A eighth grade math teacher is able to see that 30% of her students from the upcoming seventh grade aren't at the grade-level reading for the text book she is planning to use and is able to adapt her classroom instruction to compensate.
- The superintendent is able to evaluate at-risk reading programs in the district for their effectives based on other assessments, the student's demographics, and look for success factors based on their involvement in other complementary programs, and better identify which children will benefit from the program in the future.
- An assistant superintendent of curriculum is able to see the a large subset of students performing below average on a portion of the state's standardized 8th grade high school test all had the same 6th grade teacher in one particular middle school.

A data warehouse could monitor day-to-day learning achievement by a class, by a grade, by a single student, or by groups of students. This can be throughout a school building, district, or an entire state. The reporting works with historical data, and so permits longitudinal analysis and can be provided by standard reports or ad-hoc report creation as well as complex data analysis. This can be the basis for the data-driven decision making as required by the NCLB legislation and is a technology that, combined with the educational portal, that makes sense to consider as part of a larger 1:1 initiative.

10. Technical Support

Technical support for a 1:1 program is a key component in starting and sustaining the initiative and should be treated as a core requirement in the overall plan. When any new technology program is introduced, there is a spike in the number of requests for help. If those requests aren't addressed quickly and accurately, the resulting anxiety in the user community can lead to resistance.

WHO HANDLES TECH SUPPORT

The consideration of who will manage and provide technical support is a major decision when designing a 1:1 program. Options include outside vendors, individual school or districts, regional/state educational agencies, or blended models in which internal school staff and a centralized help center provide support together. How do you decide? What follows are some factors to consider when weighing your choices.

ACCOUNTABILITY

Any satisfactory customer/provider relationship requires incentives to providing quality service whether providers are internal or external to the district. Questions to consider include:

- Are there established Service Level Agreements (SLA) with bonuses for excellence and penalties for sub-par performance?
- Is there a clear escalation path and maximum acceptable response time allowed for responding to problem issues?
- Is the support organization in question using established best practices, for example, the ITIL-based (Information Technology Infrastructure Library) IT Service Management reference model or other industry recognized best practice?

OPPORTUNITY COST

This economic concept gauges the cost of doing something at the exclusion of doing something else. It will affect the direction of your technical support decision. If a district's internal technical support people are expected to set up and support a new 1:1 initiative, what is it that they will stop doing? If teachers are expected to provide peer training and support for each other, what activity will that displace? On the other hand, if budgets are tight and technology support is purchased, what plans will have to be postponed?

Technical Services

PRE-ROLLOUT TECHNICAL SUPPORT

DISASTER RECOVERY

Disaster Recovery, also known as Business Continuity, is not a specific product or service, but an IT (Information Technology) practice that addresses the need of a school or agency to create a plan of action that prepares for the time when disaster strikes. It is a plan to get systems back up and running. A plan should include a continuum of risks—from day-to-day operational risks to large-scale disasters.

One factor to consider is the benefit of having a formal plan in place, as compared against the cost of the systems being down. Two key questions to be answered: what is the target recovery time and what is the maximum acceptable recovery time. Some situations require zero down time (think of NASDAQ and what their losses might be for a minute of down-time); others can survive few minutes, hours, or even in some cases, days of down time.

These issues are complex and the difference between choosing a few minutes of down time and a few hours of downtime can be extremely costly. 1:1 program planners may want to consult outside experts who specialize in Business Continuity and High Availability to assist in the planning and design. The culture of educational IT is generally not geared-up for the expectations of operating in a 7x24x365 environment. Just the thought that goes into the disaster planning process yields benefits, but there should be a run-though of the steps in the plan to test them. Inevitably issues emerge, but the testing lets you correct the plan and test again before rolling out the system.

DISASTER RECOVERY - BACKEND DATA CENTER INFRASTRUCTURE

The specific configuration for disaster tolerance of the backend infrastructure depends on what services will be provided for the 1:1 program. The infrastructure core generally includes servers, routers, and storage in the data center. Because the data center is essen-

tial to the program, it is critical that the pre-planning should include taking steps to insure that the backend infrastructure stays up and running.

The design of the supporting data center should include connecting to dual power grids, duplicate links to the Internet, and physical access security. The configuration plan should have no single-point-of-failure and designed-in redundancy in the servers, storage and software. In addition, setting up a test-bed is highly recommended. A test-bed would have a small quantity of the IT equipment that will be used to model the data center in order to test new software, patches and updates in an isolated environment. Changes should never be implemented into a production system if it hasn't been thoroughly tested first.

If the data center will be supporting a large enough population to cost justify this or if it is deemed of a critical nature, it may be appropriate to consider whole data center fail-over capabilities with another center coming on-line in the event the primary goes off.

SUPPORTING THE BUILDING-LEVEL INFRASTRUCTURE

There are smaller, cost-effective, steps that a school can take to minimize the effects of failures at the individual school building level. Planners can include additional key networking components for replacements such as access points and switches and store them at the building, district, or regional level. In addition, having spare laptops will go a long way to minimizing the lost time-on-task for student while their laptops are being repaired.

The number of spare laptops a school should have on hand can be calculated based on the expected the MTBF (mean time between failure) of your chosen device. In practice however, this number is only an educated guess based on statistical averages. Another alternative is to upgrade the manufacturers' service level with extended or upgraded warranties, which avoids having to stock and an inventory of parts. It also shifts the responsibility off of the school staff and on to the manufacturer who is much better equipped for managing parts logistics.

POST-ROLLOUT TECHNICAL SUPPORT

Device Management

DISTRIBUTION PROCESS

Rolling out the program involves performing mundane tasks such as receiving, storing, and recording serial numbers, asset tagging, and imaging or loading the school's planned software applications, even disposing of all the boxes and packing material. With large numbers of laptops to distribute, these tasks can swamp a short-staffed school IT department. The equipment manufacturer can take care of these tasks, either for a per-unit fee or possibly included in the price of a large implementation. Planners should consider what works best for their school. Is this the best use staff time? Is this something the internal staff can effectively manage or should you consider outsourcing it to manufacturers?

While the initial imaging of a laptop's hard drive (installing standard applications) happens before distribution occurs, re-imaging is needed whenever laptops' hard drives get corrupted. There are a number of ways to tackle this on-going maintenance. With one method, the staff attaches the laptop to the school's network and pulls down the correct HD image using Norton Ghost. With a second method, the management software works to keep the laptops' image at a steady state, and requires no intervention from staff (Radia). Yet another plan is to have a self-service process where the user holds down a function key on start-up and the laptop restores itself to a previously defined state (Altiris). All of these have a pros and cons. Planners should decide which would work best for the district.

Drive Restore Method	Pro	Con
Network HD re-imaging	Well known process	High staff involvement
Steady-state image mgt.	Low TCO, minimum touch	Higher licensing costs
Local restore	User self-service	Update all images difficult

Accidents Will Happen

Most districts with 1:1 initiatives report very few malicious incidents. It may be that students understand the special responsibility that comes with having their very own laptop. However, accidents happen and a district must be prepared. For example, dropped laptops are not covered under the standard manufacturer warranty, but most have some type of supplemental accidental damage coverage. This should be a standard part of

any 1:1 program if students take their laptops home.

There are also theft recovery software programs that help protect the investment of the laptops (Absolute Software). Software is installed on the laptop and a hidden token resides in the BIOS or is placed on the hard drive. When the laptop is reported stolen, the company flags it in their system, and the next time the laptop is attached to the internet, it is located. Once located, the authorities are alerted, a warrant is issued and the police recover the stolen computer. Districts can purchase other types of insurance for theft and loss, depending on their tolerance of risk.

Help Desk

It is important to have a means to respond quickly to teachers and staff issues. In a 1:1 program the technology is central to the delivery of instruction, not just an interesting add-on. It can be a high stress situation, and a point of frustration for the teacher, if they feel the curriculum goals are being obstructed by the technology. They have to be able to make this tool work and a helpdesk is one way to address this.

Decision Points

What are the choices that need to be made in establishing a help/service desk?

- Will it be a generalized helpdesk provided to a wide base or will it be program specific to your 1:1 program?
- What will be hours of operation be? A 7x24 operation will be much more expensive than one that operates during the school day. You might consider choosing a middle of the road solution with analysts available during the day, and phone operators available during off-hours.
- Who will be able to call? Is this intended to be an escalation point for the school's technical staff, or will teachers be in calling directly? What about students and families? The larger the audience, the more calls, the higher the level of service to your community of users, but at a higher cost.
- What is the number of devices and applications that this helpdesk is responsible for? Are the applications just the standard off the-shelf applications, or are their education-specific and custom applications included? Keeping these numbers down will cut your costs but may also be detrimental for your users.
- What are the metrics that you want monitored in order to ensure a good end-user experience? Average number rings before answered, or time before answered by a human? Number of callers that hang-up (abandon rate)? Percent of calls resolved on first call? Percentage of calls resolved by analyst callbacks?

These are just a few of the variables to be investigated and to have established targets for.

Help Desk Practices

Whatever the final scope of work you decide on, a 1:1 Service Desk should adopt industry best practices adhering to ITIL standards. It should consolidate all the points of contact for help to reduce complexity. Having a single point of contact puts end users in control of how and when they get support. The Service Desk should provide a seamlessly integrated continuum of levels 1–3 support to promote efficient use of analyst time, better service for teachers and staff, and an ability to measure and meet service-level agreements (SLAs).

The Levels of Support

LEVEL 1
Includes primary call response and logging of all service requests into a database, but is also designed to troubleshoot and resolve the majority of service requests in order to return the teachers and staff to productivity quickly. Requests that cannot be resolved quickly are routed to the appropriate Level 2 group to resolve. Other Level 1 actions include performing password and queue resets, delivering "how-to" support for shrink-wrapped and school "custom" applications, and managing call queues to see that no service request is overlooked or unresolved.

LEVEL 2
Addresses service requests requiring specialized or in-depth expertise. Level 2 resources possess expertise in specific problem or application areas and serve as an escalation path for Level 1 resources.

LEVEL 3
Designed to handle the most difficult service requests, this level of service typically requires changes to software code, environment, or scripts. As such, Level 3 service may not be provided directly by the Service Desk staff. They will log, track and manage such requests and will route them to the appropriate internal or external group, usually a senior systems engineer.

Conclusion

With the dramatic pedagogical changes that we are asking teachers to make with the introduction of a 1:1 program, they need technical assistance to support them so the initiative is likely to succeed.

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