ONE-TO-ONE COMPUTING INITIATIVES:

Ten Considerations for Funding or Implementing Programs

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Whether funding or considering implementation of one-to-one computing initiatives, there are numerous questions to be answered such as: What will be gained from the implementation? How will the project innovate learning for students? Will student achievement improve? What will be the impact to teachers, to school culture and to school administration? What infrastructure is needed? Which technologies should be used? What is the financial impact to the school? Do the benefits support the costs? The list of questions can become overwhelming. Decision-makers need a broad understanding of the many factors involved in one-to-one computing initiatives and suggested resources to help get them started. Supported by research, this article presents ten key considerations for decision-makers starting out with one-to-one computing and suggests web-based tools to help. While not intended as a step-by-step guide, the issues presented do generally coincide with the development process.

With any technological innovation there are benefits and consequences. Research and planning are central to achieving maximum benefit and minimizing unintended consequences. Studying projects that have come before and learning from pioneers in the field facilitates effective decision-making. This article incorporates a wide range of scholarly research and case-based reporting in order to provide the broad perspective on current one-to-one computing practices and findings (2000 to present) that is needed. As with any decision-making, informed decisions are best. Further, decisions should not be made in isolation. It is important to include the voices of all stakeholder groups from the beginning by establishing a research and planning team.

One-to-one computing initiatives, for the purposes of this article, are defined as any initiative that provides a mobile computing device (i.e., laptop, tablet computer) for each student in a class, grade level, school or district. A review of research finds a range of one-to-one computing programs including many large scale state implemented programs (e.g., Maine's Learning Technology Initiative; South Dakota's Classroom Connections; Pennsylvania's Classrooms for the Future) to smaller district level initiatives (e.g., Henrico County Public Schools, Virginia; San Diego Unified School District's Always-On Learning Initiative) to both public and private school and classroom level implementations (e.g., Cincinnati Country Day School, Project Hiller). The majority of the research reviewed focused on utilization of laptop computers in one-to-one ratios; however, more current research also considered the use of iPod, iPad, and smartphone technologies. Research on smartphone technologies was, for the most part, excluded from this article because these tools are typically not considered for school purchase and lend more to research on "Bring Your Own Device" policies (which are also gaining popularity in schools). It is worth noting that initial research on iPod and iPad implementations have documented many similar findings as those of laptop initiatives, with the exception of affordances and drawbacks associated with their distinct technical features.

TEN CONSIDERATIONS

1. Assess the BENEFITS
2. Articulate realistic EDUCATIONAL GOALS
3. Identify stages of STUDENT USE
4. Weigh the options for SELECTION OF TECHNOLOGY
5. Value the ROLE OF TEACHER
6. Offer ongoing PROFESSIONAL DEVELOPMENT
7. Plan for initial and ongoing TECHNICAL SUPPORT
8. Establish school-wide support with visionary ADMINISTRATIVE LEADERSHIP
9. Set clear benchmarks for ASSESSMENT
10. Balance the changing environment with SUSTAINABILITY

CONSIDERATION 1
Benefits of One-to-one Computing

Benefits of one-to-one computing have been documented for over two decades and have increased with the expanded availability and portability of mobile devices such as laptops and iPads. For example, in Henrico County, Virginia over 25,000 laptops were provided to students in grades 6-12. Research findings indicated that teachers, students, and parents found the laptops a valuable addition to the educational program, noting increased student motivation, improved student-to-teacher and school-to-home interaction, and increased student directed learning as benefits (Zucker & McGhee, 2005). In their three year study on the New Mexico Laptop Learning Initiative, Rutledge, Duran, and Carroll-Miranda (2007) found that students were more involved in their learning, their lessons were more in-depth, uses of technology increased, student creativity, collaboration, and communication increased, and parental involvement increased in the one-to-one initiative. Further, O'Hanlon (2007) found increased student passion and both O'Hanlon (2007) and VanHoover, Berson, Bolick, and Swan (2006) emphasized the affordance of learning beyond the classroom. With extensive access to Internet resources students were able to connect globally.

Much research noted increases in student motivation and engagement as a result of one-to-one computing (Chou, Block, & Jesness, 2012; Dawson, et al., 2007; Swan, et al., 2005; O'Hanlon, 2007; Mouza, 2008; Peng, Chuang, Hwang, Chu, Wu, Huang, 2009; Maninger & Holden, 2009; Couse & Chen, 2010; Lowther, et al., 2012; Bebell & Kay, 2010; Harmon, n.d.). Prior research documents a strong correlation between motivation to learn and student achievement (Fredricks, Blumenfeld, & Paris, 2004) so the finding that one-to-one computing initiatives foster increased student motivation is significant. However, Lei (2010) also noted that excitement over one-to-one devices may decline with increased use.

Student attendance has been documented to increase after the implementation of a one-to-one computing initiative (Rosen & Hill, 2012; Molstad & Gorder, 2007; Harmon, n.d.; Uxbridge, n.d.). O'Hanlon (2007) also found reduced "downtime" during classroom instruction when one-to-one access to devices was provided. Decreased disciplinary actions have also been observed in one-to-one learning environments (Rosen & Hill, 2012; O'Hanlon, 2007; Uxbridge, n.d.; Swanson, 2013). However, teacher classroom management may be more challenging as off-task behavior may become more difficult to observe when students have individual access to computing devices (Swanson, 2013; Peng, et al., 2009). Chou, et al. (2012) also found that applications and websites have the potential to distract students from their learning.

One-to-one computing initiatives have been shown to support differentiation of instruction (Rosen & Hill, 2012) and to provide learning benefits to students of varied abilities (Swanson, 2013). Crompton and Keane (2012) described the use of an iPod Touch in a middle school. The iPods were used for Internet research activities, formative assessments, and for remediation in mathematics. Students were provided math games and used state-based software with self-pacing practice exercises to prepare students for state assessment tests. Though a one-to-one computing initiative will not erase the achievement gap (Warshauer, 2005), the inclusion of technology in the educational setting often equalizes opportunity (van Hoover, et al., 2006).

Mouza (2008) found that a well prepared teacher using one-to-one laptops was able to provide powerful learning opportunities for low income, minority students. As with any innovation there are shortcomings. Turgut (2012) studied the use of one-to-one laptops to assist students learning English as a Second Language (ESL). Findings supported the ability of the laptops to enhance learning for ESL students, but also identified concerns about the limited selection of ESL software and student over-reliance on laptops.

Research on the relationship between gender and one-to-one computing use is mixed. Dunleavy and Heinecke (2007) found in their empirical, comparative study on middle school student mathematics and science achievement in a one-to-one laptop program that "one-to-one laptop instruction was more effective in increasing science achievement for male students than it [was] for female students" (p. 15). Non-statistically significant findings were observed in English and writing posttests where one-to-one laptop use was again more effective for males than females. The gender differences were not noted in mathematics. However, in Murphy, King, and Brown's (2007) research using pre/post surveys no gender differences were observed with high school students using laptops in one-to-one settings in the areas of software task competence, attitudes toward technology, use of Internet to complete tasks, or general technology task competence. Additional research is needed in regard to one-to-

one computing initiatives and their impact to male and female students. Dunleavy and Heinecke (2007) also suggested that further research is needed to determine whether certain content areas lend themselves to one-to-one computing formats.

Age also appears to play a role with use (Mouza, 2008). Younger children tend to prefer drawing applications while older children engage more in a variety of activities. Couse and Chen (2010) noted increased engagement with the age of the child, in their study of preschoolers' use of tablets in one-to-one settings. Similarly, Compton and Keane (2012) noted differences in middle school students' enthusiasm for laptops. They found that 6th graders were more enthusiastic about the devices while 8th graders were negative about the experience. A plausible explanation for the results of this study included the differences in the types of uses by the teachers. Nonetheless younger children seem to hold greater interest in having the devices.

CONSIDERATION 2
Educational Goals

In our digital age there are numerous societal influences on schools to increasingly integrate technology into instruction. The Partnership for 21st Century Skills (P21), for example, is a coalition advocating increased 21st century workplace readiness. P21 has developed a framework to support educators in identifying the components of education that integrate 21st century competencies including digital skills that will be required of students in their future (i.e., college, career). Further, the increasing growth of one-to-one initiatives places a demand on schools to keep current and parental pressures also influence technology decision-making. Aside from these pressures, decision-makers need to focus their efforts on defining their educational goals (Warshauer, 2005). What do you hope to achieve for your class/school/district by initiating a one-to-one computing project?

Common educational goals for one-to-one computing initiatives include increase student achievement, increase technological literacy and 21st century career readiness, enhance or transform quality of instruction, increase equity of access, and increase economic competitiveness. Selecting your educational goals and priorities can be difficult and research findings often show mixed results. For example, in their study of Michigan's Freedom to Learn (FTL) one-to-one laptop initiative, Lowther, Inan, Ross, and Strahl (2012) analyzed 258 hours of observation data collected during random visits to almost 600 classrooms in 82 schools, and they administered teacher and student surveys to those in both FTL and non-FTL classrooms. Study data showed that FTL students performed equally as well as their non-FTL classroom peers; however, FTL students did show increases in 21st century knowledge and skills not observed with students in the traditional classroom.

Penuel (2006) conducted a comprehensive review of research literature on one-to-one laptop initiatives and determined that the impact of such initiatives to student achievement was inconclusive. Penuel (2006) cited limited empirical research as a hindrance to conclusive findings. However, of the rigorous designs that were analyzed, positive outcomes were observed in the areas of technology use, technology literacy, and writing (Penuel, 2006). Others have also identified certain conditions where one-to-one computing programs can improve student achievement (Dunleavy & Heinecke, 2007). Rosen and Hill (2012) found increases in math and reading scores and numerous studies highlighted expanded 21st century skills (Warshauer, 2005; O'Hanlon, 2007; Molstad & Gorder, 2010; Lowther, et al., 2012). Still other

DOCUMENTED BENEFITS AND CHALLENGES OF ONE-TO-ONE COMPUTING

Benefits

- Increased student motivation and engagement
- Improved student-to-teacher and school-to-home interaction
- Increased student-centered learning
- Supports differation of instruction
- Better student attendance
- Less "downtime" during classroom instruction
- Fewer disciplinary actions
- Enhanced 21st century skills
- Supports learning beyond the classroom

Challenges

- Time constraints and cost of training teachers to use technology
- Increased difficulty observing off-task behavior
- Increased potential for student distraction from learning
- Decline in enthusiasm for the devices over time

research emphasized that having the devices doesn't automatically make for learning (Peluso, 2012).

Articulating overall learning goals will provide focus for decision-makers as they review research and learn from the experiences of others. In this way they may adopt the practices of successful implementations in programs with similar demographics as their own, avoid pitfalls experienced by others, and modify procedures to meet their distinctive needs. Further, program assessment is facilitated with clearly defined educational goals.

CONSIDERATION 3
Student Use

Decision-makers need a vision for typical student uses of one-to-one computing devices in order to select the appropriate technologies for learning and to adequately prepare teachers for instructional use. How will the devices be used on a daily or weekly basis? Research identifies note-taking, writing (Penuel, 2006; Swan, van't Hooft, & Kratcoski, 2005), communication (Swanson, 2013; Penuel, 2006; Swan, et al., 2005), and organization (Penuel, 2006; Swan, et al., 2005) as common uses of these devices. Completing homework, Internet research (Penuel, 2006; Lei, 2010), journaling, and drawing (Swan, et al., 2005) are also typical student activities. Van Hoover, Berson, Bolick, and Swan (2006) noted that one-to-one initiatives provide greater access to primary source documents than commonly found in traditional classroom settings.

To achieve a level of proficiency with use takes time for both students and teachers. It is reasonable to plan for an implementation curve as students begin with more simplistic activities and progress to more advanced applications. Identifying stages of use will further facilitate later assessment of educational goals.

"To achieve a level of proficiency with use takes time for both students and teachers."

CONSIDERATION 4
Selection of Technology

Selecting the technology to be used involves various considerations including evaluation of the existing infrastructure of a school or district, financial analysis, technical specifications, and survey of personnel resources, but also includes identification of the affordances and limitations of the devices for instructional purposes.

LAPTOPS.

Benefits to using laptops include immediate and increased access for teachers and students to Internet resources (Maninger & Holden, 2009; Spires, et al., 2012). Teachers have highly developed understandings of the functional use of laptops, given the similarity to a traditional desktop computer, therefore minimal start-up assistance is needed. Learning is also easily personalized using a laptop. Further, laptops support flexibility, spontaneity, and student creativity and production (Garthwait & Weller, 2005). In their year-long study of 11 schools in Florida's Leveraging Laptops Initiative, Dawson, Cavanaugh, and Ritzhaupt (2006) collected over 400 hours of direct classroom observation data and found that a one-to-one laptop program with appropriate teacher professional development could increase student-centered learning and reduce independent seatwork. Limitations observed in using laptops include short battery life and difficulty in providing power outlets for classes of student users.

TABLETS.

Benefits to using tablet computers are similar to those of laptops in their portability, ability to provide Internet access, ease in personalization, flexibility, spontaneity, and ability to foster student creativity and increase production (Garthwait & Weller, 2005). Further, use of tablet computers has also been shown to increase student-centered learning. In addition to these features, Sloan (2012) found handiness, reduced weight, and availability of useful applications as benefits noted by students in her university classroom using iPads and etextbooks. In their study of 41 three- to six-year old children using tablet computers, Couse and Chen (2010) found tablets to be easy to learn how to use and noted that as students became more familiar with their use, student independence increased. Couse and Chen (2010) also noted students' ability to persist with the technology as a benefit. Functionally, tablets and especially iDevices have a longer battery life, are smaller in size, easy to learn to use, and are less expensive than most laptops (Crichton, Pegler, & White, 2012). Shortcomings include inability to run Flashplayer, lack of printing capability (Sloan, 2012), and challenges in submitting work electronically (Crichton, et al., 2012).

Sloan (2012) also considered functionality of etextbooks used with iPads. Students in her study enjoyed using the etextbook and found it useful, as well as, easy to use. Features that supported learning included annotation tools, note-taking applications, and search features. The students noted glitches, lack of interactivity, and slower speeds as shortcomings of the etextbook. In addition to the availability of etextbooks for both laptop and tablet computers, both iPads and iPods provide ready access to thousands of applications for learning, many of which are free to download. However, through extensive review of features found on iPad apps, Murray and Olcese (2011) found few that innovated teaching and learning. Instead they noted that the hardware and operating system played a larger role in influencing effective teaching and learning.

DEVICE RATIO.

It should be noted that there remains debate on the most appropriate ratio for computing device to student. Spires, Wiebe, Young, Hollenbrands, and Lee (2012) argued for the value of one-to-one laptop environments, stating that these environments place the "learner forward" (p. 234). They emphasized the increased levels of student responsibility and commitment that develops in these environments. Students become more critical consumers of information and self-directed in their learning. Other studies confirm these findings. However, Larkin (2011) found that for primary school students (Larkin is from Queensland, Australia where primary school encompasses grades through 8th grade) 2:1 ratios supported learning needs and fostered student achievement. In his study, Larkin provided four levels of netbook access to 7th grade students including 1:1 five days/week, 1:2 three days/week, 1:2 five days per week, and 1:1 three days/week. Through classroom observations, student surveys and interviews, and tracking of data and software usage, Larkin found that students in shared access classrooms used the netbooks 30% longer, classes with access three days/week were more consistent in their usage, and classrooms that shared netbooks fostered greater collaboration among students.

Understanding the affordances and limitations of the technologies to be used is crucial not only to the selection process, but also to program implementation including instructional pedagogy, teacher professional development, technology support and maintenance, program evaluation, and sustainability.

CONSIDERATION 5
Role of the Teacher

Teachers hold a prominent role in the success or failure of one-to-one computing initiatives (Bebell & Kay, 2010; Penuel, 2006; Peng, et al., 2009). Therefore it is critical that decision-makers analyze the impact of a one-to-one computing initiative on teachers. How will implementation change their daily lives? What new expectations will be required of teachers? Have their voices been included in the planning process? Teacher attitude and pedagogical approach impact classroom use of technology and student attitudes about use (Crompton & Keane, 2012).

One-to-one computing initiatives tend to increase demands on teachers (Swanson, 2013). Often, teachers must assume administrative roles in managing applications (Crichton, et al., 2012). Donovan, Hartley and Strudler (2007) and Chou, et al. (2012) expressed concerns for teachers personally, noting additional time required in planning for lessons and integrating new instructional practices. Technology-enabled practices in one-to-one settings are often more student-centered (Chou, et al., 2012) and may require a shift in pedagogical approach. In the one-to-one setting, Dawson, et al. (2007) found increases in the use of project-based and collaborative learning. Further, teachers acted as facilitators and decreased their use of direct instruction. Lei (2010) found that even though teachers valued the benefits of one-to-one computing, they still felt pressured into the programs.

Changes in teacher pedagogy were also observed by Swan (2013) who found increases in both student group and individual work as a result of a one-to-one initiative. Teachers used the devices as instructional tools. This is important as the real value in use is to not teach the technology, but to use the technology for content learning (Garthwait & Weller, 2005). Lowther, et al. (2012) found increases in research-based best practices and increased teacher technology confidence. Collaboration (O'Hanlon, 2007) and teacher/student relationships (Molstad & Gorder, 2007) are also enhanced when teacher pedagogy shifted toward student-centered approaches.

"One-to-one computing initiatives tend to increase demands on teachers."

Decision-makers must attend to the needs of teachers. It is important for the role of the teacher to be valued during the planning, implementation, and evaluation process. This can be achieved through frequent and continuous dialogue at each stage of the initiative and through support of teacher needs for additional time and professional development.

CONSIDERATION 6
Professional Development

Changes in instructional practices and teaching pedagogy do not happen in isolation. Formal professional development is critical to the success of one-to-one computing programs (Penuel, 2006; Molstad & Gorder, 2007; Swanson, 2013; Fajebe, Best, & Smyth, 2013; Chou, et al., 2012). Teachers benefit from training that is ongoing and situated within authentic contexts of practice (Rutledge, et al. 2007; Spires, Wiebe, Young, Hollenbrands, & Lee, 2012). Interaction with peers is also important (Penuel, 2006) so that teachers may learn from one another and solve problems together. Providing teachers the opportunity to be a part of the planning for professional development is also vital (Maninger & Holden, 2009; Donovan, et al., 2007). When teachers have a voice in influencing the type and format of professional development offered, their learning needs and prior experiences are honored.

Many K12 schools have established partnerships with local universities. Consider tapping into faculty expertise at the university, as well as using commercial vendors and state and national technology organizations as sources for your teacher development needs. Train-the-trainer models are also effective methods to diffuse pedagogical innovation in schools. Professional development in a one-to-one initiative does not end after an initial implementation period.

"A common misconception is that the need for technical support decreases over time. This is not the case. In fact, the need for technical support may even increase because of wear and tear on the devices and age of infrastructure."

WEB RESOURCES

Additional resources to learn more about one-to-one computing initiatives and how to start one:

http://www.commonsensemedia.org/videos/introducing-1-to-1-essentials
Common Sense Media provides a series of short videos for those starting one-to-one initiatives.

http://www.projectred.org/
Project RED (Revolutionizing Education) has established a community to connect research to current practices. This site offers step-by-step guides for one-to-one computing initiatives from education and industry professionals.

http://www.k12blueprint.com/content/about
K-12 Blueprint (sponsored by Intel and Tech & Learning magazine) provides resources for those beginning technology initiatives including one-to-one computing, Bring Your Own Device and much more.

http://www.kent.k12.wa.us/Domain/567
The Kent School District (WA) developed a website to trace the development and implementation of their laptop initiative. The site includes useful information for those starting their own initiative including policies, training, infrastructure, home connections, and more.

http://www.one-to-oneinstitute.org/index.php?/becoming-a-one-to-one/showcase-sites/
One-to-one Institute is a non-profit dedicated to advancing technology in education through one-to-one applications. This site showcases successful implementations of one-to-one computing initiatives.

CONSIDERATION 7
Technological Support

Without technical support, a one-to-one computing initiative is "doomed to fail" (Maninger & Holden, 2009). Technical support includes, but is not limited to, initial installation of hardware and software, troubleshooting malfunctions, managing devices, facilitating access, and technical training. A common misconception is that the need for technical support decreases over time. This is not the case. In fact, the need for technical support may even increase because of wear and tear on the devices and age of infrastructure (Lei, 2010). When teachers feel they have been provided with adequate technical support their self-confidence with technology and self-efficacy for the initiative grow. Therefore, it is important to plan for initial and on-going technical support and integrate these costs into short and long term budgets. Regular access to technical support is crucial. Consider hiring a technology specialist or providing release time to an experienced teacher to meet the needs of your teaching staff.

"Research discourages top-down leadership in one-to-one computing initiatives and reinforces the need to build school-wide support for the innovation."

CONSIDERATION 8
Administrative Leadership

Though planning and continuous monitoring and evaluation of an implementation project should be completed as a team of stakeholders, identification of the inspirational leader for the initiative is also important. This is the individual who advocates for the initiative and who holds decision-making authority on initiative needs. Most commonly this is the school principal or other district level administrator. Understanding leader roles and responsibilities for the one-to-one initiative is important during implementation (including policy decisions, budgeting, managing cost/benefit, educating parents and the school community), evaluation, and sustainability.

There are numerous details for the administrative leader to attend to during the development and implementation of a one-to-one computing program, not the least of which includes selection of the device. Additional areas for decision-making include: establishment of use policies, providing adequate technical support, identification of infrastructure needs, security considerations, levels of teacher and student access to a school network, insurance, capital funding (base infrastructure and computing equipment), annual budgeting, and teacher professional development (Uxbridge, n.d.). Additionally, for iDevices, a digital commons must be established and an iTunes account will need to be managed (Creighton, et al., 2012).

Policy-decisions are also crucial to the success of one-to-one programs. Crichton, et al. (2012) found the ability to use the mobile devices in school and at home as key factors to effective use, while Crompton and Keane (2012) described a successful project where students were only permitted to carry their devices throughout the school day. Regardless of approach, setting clear policies on use and integration practices and delineating consequences for misuse can go a long way to fostering effective use in a school (Garthwait & Weller, 2005).

Often, administrative leaders are also the instructional leaders of a school or district. Spires, et al., (2012) highlighted the importance of having a pedagogical philosophy in place and suggested the use of the Technological Pedagogical and Content Knowledge framework (Mishra & Koehler, 2006) in curricular decisions. Further, Spires encouraged use of project-based learning, performance assessment, and global literacy in one-to-one computing classrooms. Again, creating opportunities for communities of teachers and technological professionals to interact supports pedagogical and technological development. Communication and collaboration are essential components to leadership in the one-to-one initiative (Maninger & Holden, 2009). In fact, research discourages top-down leadership in one-to-one computing initiatives and reinforces the need to build school-wide support for the innovation (Rutledge, et al., 2007). Peluso (2012) also advocated for student involvement in the development process.

Certainly, the total cost of ownership is of critical concern to administrators. Some research questions whether student gains warrant the high costs (Larkin, 2011; Lei & Zhao, 2005), while others note how use of mobile devices and applications can save schools on material costs (Murray & Olcese, 2011; Rutledge, et al., 2007). Assessment protocols should integrate methods to evaluate teacher and student use of devices as no one wants to have purchased equipment and have it not be used (Lei, 2010; Bahramour, 2006). Administrators must also balance short and long term costs and recognize that one-to-one computing programs are expensive to start and to maintain (Lei, 2010), but costs often can be offset using Title 1 funds, seeking grants, or through other financial means such as seeking bonds (O'Hanlon, 2007) or other partnership funding.

CONSIDERATION 9
Assessment

All stakeholder groups will want to know if the one-to-one implementation met its learning objectives. It is important to determine program evaluation measures that will document achievement of educational learning goals for students, analyze impact to teachers and school community, and trace use patterns of various applications and practices Again, evaluation is an area of opportunity for collaboration with a local university, where research faculty may be able to support assessment needs.

Having clearly defined benchmarks to guide implementation efforts and determine effectiveness is vitally important in determining the "success" of an implementation. Tiered evaluation criteria may also be most appropriate in determining what is reasonable to achieve in each of the first three years of an initiative. It will take time for teachers and students to development familiarity and comfort with the technologies, and for stumbling points to be identified and revised. It takes time for a program to develop and for the full impact of an initiative to be observable. In describing a longitudinal study of a one-to-one laptop initiative over four years, Lei (2010) noted that the "project changed from bold innovation to an integral component of everyday teaching and learning" (p. 35). Planning for assessment necessarily needs to acknowledge the likelihood of an implementation dip.

"It takes time for a program to develop and for the full impact to be observable."

CONSIDERATION 10
Sustainability

Clear evaluation methods contribute to effective sustainability planning (Villano, 2006; Warshauer, 2005). Therefore, sustainability planning should be included in project planning (O'Hanlon, 2007). Technology has a short shelf-life and planning for the continuation of existing technologies while also being realistic about future needs is important. Further, innovations commonly disrupt systems. For example, Lei (2010) described changes in the school library as a result of a one-to-one laptop initiative. Because students had ready access, using their laptops, to resources via Internet, the role of the library necessarily changed. Therefore, administrators must anticipate unintended consequences of implementation and be flexible in determining solutions.

Continuing research is needed on one-to-one computing initiatives. Once your program has been established become a pioneer. Share all aspects of your program development and implementation. The field is lacking these detailed accounts of practices (Penuel, 2006). Also, continue to share your experiences over time, not just the initial phases of getting a program going (Swanson, 2013).

CONCLUSION

If you are considering funding a one-to-one computing initiative, the above aspects of development are integral components to any plan. One-to-one computing initiatives have been shown to positively impact student learning when well-planned to support the needs of all involved and when flexible enough to respond to the unexpected. If you are seeking funding for a one-to-one computing initiative, attention to the above considerations will demonstrate your broad awareness of central issues involved in deployment, implementation, and sustainability. The research shows there is not a one-size fits all solution. What works in one setting may or may not achieve the same results in another. There are a number of variables that must be considered based on the individual goals, needs, requirements, and constraints of any given institution. There are also those common stumbling areas that can be avoided through effective research and planning.

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