

Digital Education Revolution

NSW



One-to-One Computers in Schools

2010 Literature Review



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One-to-One Computers in Schools: 2010 Literature Review

State of NSW, Department of Education and Training, Digital Education Revolution NSW

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Introduction

In late 2008, when the NSW Department of Education and Training was commencing to plan the implementation of the Australian Government's Digital Education Revolution in this state, a review of the available literature (DETNSW, 2009b) was commissioned to inform that planning.

The [2009 literature review](#) outlined the goals of one-to-one laptop programs as follows:

- improving student learning and academic achievement
- facilitating a differentiated, problem-based learning environment demanding higher-order thinking skills
- fostering more collaborative, inquiry-based learning
- providing timely, more equitable access to a broader range of digital educational resources
- enabling the development of computer literacy skills, especially where students are reluctant to use technology or do not have immediate access to a computer
- preparing students to better compete in technology-rich workplaces
- increasing economic competitiveness of local regions in the global marketplace.
(DETNSW, 2009b, p. 4)

The 2009 review was divided into the following sections:

- The one-to-one laptop environment
- Classroom use of laptops
- Factors influencing implementation
- Support for teachers

Since the publication of the literature review in March 2009, a large number of papers have been published reporting on research in this area. This literature review sets out to report on the recent research as well as related studies from previous years unreported in the 2009 review.

Not all of the above goals or topics will be commented on in this review. The recent research has overwhelmingly confirmed the benefits of the one-to-one laptop environment reported on in 2009 and, with the exception of student achievement where much new evidence is available, these will not be repeated or further detailed here. Recent studies have confirmed much of the classroom activity information reported on in the previous review and will not be further commented on.

Recent research has, however, much to say about student achievement and has highlighted the importance of student use and its relation to achievement. Research has delved further into factors influencing implementation which have significant implications for professional discourse, professional learning and school leadership. These are reported on in this review.

Student Achievement

Limitations of standardised testing

Standardised tests have been used as the yardstick for improvement in student performance, particularly in the United States. Although they are acknowledged to measure only a proportion of each curriculum area being tested, they are highly reliable (Suhr, Hernandez, Grimes, & Warschauer, 2010). However, increasingly authors are questioning whether these tests are appropriate when investigating improvements in performance associated with one-to-one laptop programs (Rutledge, Duran, & Carroll-Miranda, 2007) and whether more emphasis should be given to other factors such as information and technology skills. When reporting on the Maine Middle School Laptop Program, Silvernail (2005) is critical of this use of standardised tests, pointing out that they are "... designed to assess, at best, gateway skills and basic knowledge; skills and knowledge which may be necessary but not sufficient for the demands of the 21st century" (Silvernail, 2005, p. 3). He points out that most standardised tests used in Maine only require students to recall information and select from multiple choice answers; they do not test those 21st century skills including problem solving, locating, sorting, analysing and creating information and communicating with others.

Other authors also question whether standardised testing is capable of capturing the changes to student learning that may occur in the one-to-one laptop classroom (Lei & Zhao, 2006; Suhr et al., 2010). In a study of laptops and literacy, Warschauer (2008) reports that the writing process used with laptops, which involves the use of scaffolds and multiple re-writing, will not necessarily result in improvement in the scores in a sit-down hand-written test. Holcomb (2009) maintains that the skills that are critical to and inherent in one-to-one laptop initiatives do not align with existing standardised assessments. In their paper on the impact of one-to-one computing, Lei and Zhao (2006) include the following quote from a teacher: "I don't think we have a way to evaluate it yet" (Lei & Zhao, 2006, p. 3). Henrico County, after ten years of implementation of their laptop program, is developing an internal assessment tool to measure 21st century skills to establish a more accurate measure of achievement (Lazo, 2010).

Improved achievement in standardised test

Despite this concern about the validity of standardised testing as a measure of the success of one-to-one laptop programs, there is mounting evidence that, when the technology is used effectively, these programs do bring about improvement even in tests which seek to measure only the more basic skills.

Suhr, Hernandez, Grimes, and Warschauer (2010) conducted a study in which they compared the scores of one-to-one laptop students with an equivalent group without laptops in the English Language Arts (ELA) assessment that forms part of the California Standards Test. They found that the laptops did increase the scores of the laptop students over the non-laptop students, particularly in the areas of literacy response and analysis and in writing strategies. This occurred despite the fact that the tests were taken on paper, giving the laptop students a potential disadvantage. Greatest

improvement occurred in the second year, when teething problems with the laptop program were being overcome. Other case studies have shown similar patterns wherein the second year of implementation realises the greater rise in performance. For example, a case study of laptop implementation in three schools in California (Warschauer & Grimes, 2005) found the ELA results of laptop students actually declined relative to non-laptop students in the first year of implementation then climbed back up in the second year. However, the mathematics results of the same laptop students improved relative to non-laptop students over both years. This has implications for the evaluation of the DER in NSW: a significant increase in student performance may not be visible until after the second year of implementation.

A study of the Berkeley Wireless Learning Initiative (Bebell & Kay, 2010) has also found significant impacts from a one-to-one laptop program in the form of unprecedented improvement in maths, English and science results. Importantly, the level of student use of the laptops proved to be a good predictor of increased student achievement.

Holcomb (2009) analysed the results of several one-to-one laptop initiatives across the United States and came to the conclusion that “students in 1:1 programs earned significantly higher test scores and grades for writing, English–language arts and overall grade point averages than students in non 1:1 programs” (Holcomb, 2009). He did, however, find programs where no improvements were discernable.

A study of the impact of a one-to-one wireless laptop program on the performance of elementary mathematics students in seven schools in the one district (Clariana, 2009) found that the laptop students significantly outperformed non-laptop students in the district’s benchmark tests. A study of the impact of a one-to-one laptop program on science and maths standardised test scores in middle schools (Dunleavy & Heinecke, 2008) found significant improvement for laptop students over non-laptop students in science results after two years, though no significant impact for mathematics.

Lie and Zhao (2008) in their study of the first year of implementation of a one-to-one laptop program in a mid-western school, found significant improvement in technology scores but only marginal improvements in the overall grade point average.

The largest study, involving over 16,000 students in the Maine one-to-one laptop program (Silvernail & Gritter, 2007), has revealed the greatest impact of such a program. In 2000, the year the Maine one-to-one program commenced, 29.1% of their 8th grade met the Maine Educational Assessment (MEA) writing proficiency standard. In 2005, five years into the one-to-one laptop initiative, 41.4% met this standard. While this is impressive, their further analysis of the data revealed the importance of the way in which the laptops were used in teaching. These authors identified the group of laptop students who had learnt to use the laptops to draft, edit and then produce a final copy of any writing. They labelled this the “best use” group. They further identified the “non use” group – those who never used the laptop for writing. The “best use” students outperformed the “non use” students to such a degree in the MEA that the average student in the “best use” laptop group scored better than approximately 75% of the “non use” group. There was no statistical difference between those who took the test online and those who hand–wrote their answers.

Implications of the research

Laptop use and student achievement

Clearly, as one-to-one laptop programs mature, improvement in student results in standardised testing is becoming evident despite the concern that these tests do not measure the 21st century skills the laptop learners are acquiring. However, as can be clearly seen in the study of the Maine on-to-one laptop program (Silvernail & Gritter, 2007), the variation evident in these results indicates that it is the way the laptops are used in learning that brings about the improvements in achievement. Holcomb (2009) suggests that “it is therefore critical for schools to understand that simply providing each student with a laptop is not enough. How teachers choose to use the laptops is very important.” How teachers choose to use the laptops, in turn, depends on teacher professional learning and support (Holcomb, 2009).

Importance of professional learning

“The biggest challenge, however, is helping teachers develop the expertise required to harness the power of the technology” (Mouza, 2008, p. 3)

This review will not concentrate on teacher training in the use of software. While needs for training in the use of software and the laptops are important and must be catered for, the recent research takes another direction. “Teachers simply cannot learn technology skills in isolation of their teaching” (Holcomb, 2009).

One-to-one technology access does not necessarily lead to better technology use in learning and the technology can be under used or sometimes not used at all (Lei, 2010). Research is revealing that it is the way the laptops are used in learning that makes the difference (Holcomb, 2009; Silvernail & Gritter, 2007). In turn, the way the laptops are used is dependent to a large degree upon professional learning. According to Bebell and O’Dwyer (2010) the quality of the implementation of one-to-one laptop initiatives can be predicted from the quality and depth of the professional learning that teachers receive. In a study of one-to-one laptop programs running in three technology high schools (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010) it was found that the lack of time for professional development, especially for teacher collaboration, was a barrier to effective integration of computers into learning. However, even when given the same professional learning, teachers integrated technology into their teaching to different degrees and in different ways. These variations that are found to exist in integration within one-to-one laptop schools are often due to variations in teacher practice (Drayton et al., 2010).

Laptop integrations and teacher pedagogical beliefs

Teachers make their choices about how they utilise the technology at hand based on many factors, including their beliefs about pedagogy, and tend to use technology within their existing practice (Mouza, 2008). Miller (2008) found that the laptops did not necessarily bring about change where practices were entrenched in the teachers’ belief systems. Drayton et al. (2010) give the example in one high school in which one science teacher believed that focusing on information transfer was the primary focus of teaching while another in the same school believed that discovery was the focus. They found that “inquiry oriented teachers deployed technology to support and expand enquiry; more traditional teachers likewise used the technology according to their values, in conducting a teacher centred classroom” (Drayton et al., 2010, p. 48). Despite the same professional learning, teachers with such different pedagogical beliefs integrated the laptops into their teaching in very different ways and at different levels.

Table 1 outlines the Levels of Technology Implementation (LoTi) scale (Moersch, 1995, 2001, 2002, 2010) initially developed to benchmark the stages of a teacher’s classroom technology implementation. This scale has been utilised in many studies of technology implementation (Barron, Kemker, Harmes, & Kalaydjian, 2003; Flowers & Algozzine, 2000; Keller, Bonk, & Khe, 2005; Moersch, 2001, 2002, 2010; Oliver, Corn, & Osborne, 2009). Level 1, the lowest level of implementation above non-use, reflects the use by

teachers who practice teacher-centred information dissemination pedagogy. Tools such as PowerPoint are used by these teachers in a way that fits with their pedagogical practice. At higher levels of integration, students are seen collaborating with those in and outside the school on authentic tasks of their own choosing. The study by Drayton et al. (2010) found that teachers who believed in a teacher-centred style of pedagogy use technology in ways which can be seen to be equivalent to the lowest levels of the LoTi scale while those who believed in an inquiry approach utilised the technology to expand inquiry in ways equivalent to higher levels.

Table 1. *Levels of Technology Implementation (LoTi) (after Moersch, 2010)*

| Level | Category | Description |
|-------|--------------------------|---|
| 0 | Non-use | Instructional focus ranges from a direct instruction approach to a collaborative, student-centred learning environment. The use of research-based best practices may or may not be evident, but those practices do not involve the use of digital tools and resources. |
| 1 | Awareness | Instructional focus emphasizes information dissemination to students using lectures or teacher-created multimedia presentations. Teacher questioning and student learning typically focus on lower cognitive skill development. Digital tools and resources are used for curriculum management tasks, to enhance lectures, or as a reward for students who complete class work. |
| 2 | Exploration | Instructional focus emphasizes content understanding and supports mastery learning and direct instruction. Teacher questioning and student learning focus on lower levels of student cognitive processing. Students use digital tools for extension activities, enrichment exercises, or information-gathering assignments that generally reinforce lower cognitive skill development. Students create multimedia products to demonstrate content understanding in a digital format that may or may not reach beyond the classroom. |
| 3 | Infusion | Instructional focus emphasizes higher-order thinking (application, analysis, synthesis, evaluation) and engaged learning. Teacher-centered strategies include concept attainment, inductive thinking, and scientific inquiry models and guide the types of products the students generated. Students use digital tools and resources to carry out teacher-directed tasks that emphasize higher levels of student cognitive processing. |
| 4A | Integration (Mechanical) | Students are engaged in exploring real-world issues and solving authentic problems using digital tools and resources, but the teacher may experience classroom management or school climate issues, such as lack of support from colleagues, that restrict full-scale integration. Teachers rely on prepackaged materials, assistance from other colleagues, or professional development workshops. Emphasis is on applied learning and the constructivist, problem-based models of teaching that require higher levels of student cognitive processing and in-depth examination of the content. Students use digital tools and resources to investigate student-generated questions that dictate the content, process, and products embedded in the learning experience. |
| 4B | Integration (routine) | Students are fully engaged in exploring real-world issues and solving authentic problems using digital tools and resources. Teachers are within their comfort levels promoting inquiry-based models of teaching that involve students applying their learning to the real world. Emphasis is on learner-centered strategies that promote personal goal setting and self-monitoring, student action, and issues resolution that require higher levels of student cognitive processing and in-depth examination of the content. Students use digital tools and resources to investigate student-generated questions that dictate the content, process, and products embedded in the learning experience. |
| 5 | Expansion | Students collaborate beyond the classroom to solve problems and resolve issues. Emphasis is on learner-centered strategies that promote personal goal |

| | | |
|---|------------|--|
| | | setting and self-monitoring, student action, and collaborations with other diverse groups, such as people from another school, another culture, a business, or a governmental agency. Students use digital tools and resources to answer student-generated questions that dictate the content, process, and products embedded in the learning experience. The complexity and sophistication of the digital resources and collaboration tools used in the learning environment are now commensurate with the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and the students' level of complex thinking (analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom. |
| 6 | Refinement | Students regularly collaborate beyond the classroom to solve problems and resolve issues. The instructional curriculum is entirely learner based. The content emerges based on the needs of the learners according to their interests, needs, and aspirations and is supported by unlimited access to the most current digital applications and infrastructure available. There is no longer a division between instruction and digital tools and resources. The pervasive use of, and access to, advanced digital tools and resources provides a seamless medium for information queries, creative problem solving, student reflection, and product development. Students have ready access to, and a complete understanding of, an array of collaboration tools and related resources. |

Several studies (Miller, 2008; Newhouse, 2008) report the teacher shift predicted by Moersch (1995) from more teacher-led pedagogy to more student-centred due to one-to-one laptop programs. While most teachers (81%) in the study by Miller (2008) reported they changed their teaching, 26% of teachers reported that the laptops had "changed their belief systems in how they viewed teaching and learning" (Miller, 2008, p. 3). Newhouse (2008) reported that in the third year of a one-to-one project there was a substantially greater focus on student independence, knowledge-building and collaboration. Lei (2010), in a longitudinal study, found a corresponding shift in the thrust of professional learning from technology proficiency to helping teachers integrate the technology into their teaching in more meaningful ways.

Implications for professional learning

These factors have implications for the design of professional learning. The research indicates that a shift from a focus on technology proficiency to laptop pedagogy needs to take place. The level of use and the type of use the laptops are put to has been shown to be a significant predictor of improvement in standardised testing. As pedagogical beliefs can determine the level to which the one-to-one laptops are integrated into learning in the classroom, professional learning must include processes by which teachers regularly discuss their pedagogical and educational values (Drayton et al., 2010). In a recent study of technology implementation (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010) it was found that, where teachers share their understanding of the use of technology in learning and were supportive, there was a greater degree of implementation.

Shapley et al. (2010) also found that teacher buy-in and a shared commitment to transforming student learning led to successful implementation. However, this required leadership.

Leadership and technology integration

“Perhaps the most important finding from our analysis is that technology leadership has greater leverage on desired outcomes than does technology infrastructure and expenditures” (Anderson & Dexter, 2005, p. 73).

The above study, based on a sample of 488 schools and 464 school principals, found that only technology leadership and the students per computer ratio were statistically significant predictors of technology integration across all of the variables they studied, with technology leadership being the better predictor. Clearly such findings imply that, for the success of one-to-one laptop programs where the students to computer ratio is fixed at 1:1, leadership is the crucial ingredient for success.

Others have also found leadership to be crucial to the successful integration of technology in the classroom (Anderson & Dexter, 2005; Battle & Smith, 2005; Bebell & Kay, 2010; Gibson, 2004; Kim & Marshall, 2009; Lin, Lin, & Huang, 2009; Moyle, 2006). In Moyle’s (2006) study the role of the school principal was seen as critical by participants, as it was in the study by Lin, Lin and Huang (2009) who concluded that the difference in the leadership styles of the principals in the study was the decisive factor in differences in the integration of ICT in their schools. Kim and Marshall (2009) cite many studies that have shown that “technology leadership can have a significant impact on the successful integration of technology” (Kim & Marshall, 2009, p. 1). Bebell and Kaye (2010) in their study of the Berkeley Wireless Initiative found that when there was no clear leadership of the program in a school, student and teacher use of the laptops was regularly the lowest.

Shared vision

One role that the research finds necessary for success is establishing a shared vision and expectations. “Schools setting ambitious goals and aiming for excellence seem more likely to use laptops well than ones without ambitious goals and a supportive school culture” (Zucker & Hug, 2007). Others report that “trends for technology immersion are generally consistent with other research on whole school change” (Shapley et al., 2010). These researchers found that higher levels of technology integration were found in schools where leaders set the directions for change and developed supportive policies and collaborative cultures. These researchers also found that another important role of the leader is to foster a culture within the school that is supportive of the integration of technology in the classroom. Other studies (ChanLin, 2005; Drayton et al., 2010) have found this to be a determinant of the level of integration of technology.

School culture

School culture can either foster collaboration and innovation or stifle them. Where a school culture emphasises accountability and security over taking risks, teachers are driven away from innovation (Drayton et al., 2010). Howard (2009) found a relationship between teachers’ attitudes to risk and technology implementation. The researcher discovered that the primary area of concern in teachers’ perceptions of risk was the risk change may pose to student achievement. Those who were willing to take more risks were found to be more willing to integrate technology and saw student achievement in

terms of their more intrinsic motivation and engagement in learning (Howard, 2009). Those less willing to take risks saw achievement in terms of quantifiable results such as test scores and were less willing to integrate technology into their teaching.

This has clear implications for the leaders of schools implementing one-to-one laptop programs. To assist those teachers who are concerned about risk to student achievement and allow these teachers to be innovative in their pedagogy and take more student-centred approaches, school leaders need to open the discussion of the emerging evidence of improvement to student achievement from studies of one-to-one laptop programs and the relationship this research is revealing between improved achievement and both increased student use of the laptops and the way students use the laptops in learning. School leaders also need to encourage discussion of the value of 21st century learning with teachers and the school community.

The other important feature of a school culture successfully implementing laptop programs is collaboration and collegiality. One teacher in the study by Shapley et al. (2010) stated “We were all in this together” (Shapley et al., 2010, p. 46). Teachers’ collective support for integration proved a crucial element for success. In the study by Drayton et al. (2010), where implementation was left in the hands of the individual teachers in one school, integration was at a lower level than in another school where innovations were tested and shared among teachers.

The style of leadership is, as ever, also important. One teacher explained: “We had the right combination of encouragement and push Leadership, encouragement, and push. It wasn’t punitive, it was positive.. but they kept up the pressure.. That constant positive pressure moved me forward” (Shapley et al., 2010).

Distributed leadership and planning

Many authors included the leadership of planning as an element necessary for success. For example, Chang, Chin and Hsu (2008) included planning in their dimensions of technical leadership. This is unsurprising, but who should be involved in technology planning? Flanagan and Jacobsen (2003) stated that “very few principals have themselves used computers in any meaningful way with children”(Flanagan & Jacobsen, 2003, p. 127). This led these authors to point strongly to the necessity for distributed leadership of planning for success to occur. Lin, Lin and Huang (2009) found distributed leadership to be one key difference between the two schools in their study. In school A, which was very successful in its endeavours, the principal shared the leadership of the initiative in a school culture that was both warm and supportive. In school B, which was considerably less successful, the principal was more authoritative in her approach. Anderson and Dexter (2005) included, as their first indicator of technology leadership, the establishment of a technology committee as a mechanism for distributing the leadership of technological change. Chang, Chin and Hsu (2008) included the empowerment of a “diverse and inclusive technology planning team” (Chang, Chin, & Hsu, 2008, p. 237) as a performance indicator to help determine a principal’s technology leadership. Similarly, Rodriguez and Kendrick (2005) advocated using a “team based approach to planning” (Rodriguez & Kendrick, 2005, p. 1856). Kim and Marshall (2009) stated that a principal’s leadership should “empower the principal’s team members (e.g. teachers, staff members)” (Kim & Marshall, 2009, p. 2). The study conducted by Moyle (2006) also supported this view. While participants in the focus groups conducted

during this study identified many desirable styles of leadership to bring about technological change in the classroom, they also recognised that there were “limitations to what one leader or school principal can achieve by him or herself” (Moyle, 2006, p. 17) and recognised that a team-based approach was a useful strategy. In her paper, Moyle (2006) detailed the membership and the roles of members of such a team. The “Digital Education – making change happen” framework devoted an entire section, “Element 2: Enabling Leadership” (MCEETYA, 2009, p. 8) to the discussion of distributed leadership and a whole school approach. Moulton (2006) sums this up well: “One key component of a successful implementation of one-to-one laptop computers is leadership in many forms, one of the most important being a Leadership Team” (Moulton, 2006, p. 1).

Implications of the research

If these research findings are correct and distributed leadership is essential, the actions of the leader and the leadership team then become extremely important for success. While professional learning, technology infrastructure and technology support will clearly be important elements of any successful plan, Moyle (2006) found that the areas of focus brought about by an effective leadership team are crucial. In her study, participants asserted that learning must come before technology. She quotes one participant as saying: “senior staff and leaders need to focus on learning – this drives decisions about procurement, technical support and professional learning” (Moyle, 2006, p. 5). In the case of initiatives such as the NSW one-to-one laptop program, while the choice of technology, software and technology support has been made, it will be up to school leaders to make time and learning opportunities available to teachers and to keep the focus on teaching and learning.

To sum up, leaders need to be enthusiastic, build a shared vision, keep the focus on that vision, distribute the leadership of the initiative and lead the leadership team, lead the planning, foster a collaborative school culture in which teachers are comfortable to innovate, provide time for collaboration and discussion and provide appropriate and timely professional learning for teachers.

There is another implication from this research. Leadership of an innovation as complex as the one-to-one laptop program is itself very complex. “Overall, the studies presented here point to the need for preparing school leaders and leadership teams for the implementation of 1:1 initiatives” (D. Bebell & O’Dwyer, 2010, p. 10). Professional development for leaders and their teams is essential for success.

Technical problems and support

This section examines some of the technical problems that have been reported in one-to-one laptop programs and the key lessons from these programs. It is important to note that the research papers reported on below were positive in their evaluations of the one-to-one initiatives while uncovering important lessons.

Not all laptop programs bring about improvement. There are cases of schools abandoning their laptop programs due to the problems they have experienced and the costs involved (Holcomb, 2009). In a study of the implementation of a one-to-one program in five schools (Bebell & Kay, 2010), the authors found that one school struggled so much that integration was comparable to that in non one-to-one schools. One problem cited was a lack of technical support. This can bring about great difficulties for teachers when they find themselves not only working in a change paradigm but also as the computer engineer (Simpson & Payne, 2005). Lei (2010) found that extra technical support is a critically important condition for success of such projects.

Importantly, this need for support does not diminish as the laptop program matures. Newhouse (2008) reported increasing frequency of computer breakdown in the third year of implementation as well as complaints about battery life. The natural attrition rate of computers as they aged, as well as the need for updates and upgrades, were also reasons cited for the need for ongoing technical support (Lei, 2010).

A study of the implementation of a large and successful one-to-one laptop initiative in New Mexico (Rutledge et al., 2007), found that teachers, technology support staff and administrators were overwhelmed in the first year of the project due to insufficient maintenance personnel. They also found that rural areas posed infrastructure challenges and there was insufficient electrical supply to support the laptops in schools. In the second year, as use increased, insufficient wireless access points and internet access emerged as issues. The lack of sufficient technology maintenance support continued as an issue of concern.

Implications of the research

The research validates crucial technical support decisions made and implemented in the DER-NSW program. These are:

- Technology support is critical for success in one-to-one laptop programs
- Charging of laptops at home by students (DETNSW, 2009a) overcomes many electrical supply problems in schools
- Sufficient wireless access points are essential.
- Adequate internet access is essential

There is also one other clear implication for the DER-NSW one-to-one laptop program in the future:

- technology support needs do not diminish as the program matures.

Computers at home

In one study (Shapley et al., 2010) it was found that student use at home for home learning and homework was the strongest predictor of students reading and mathematics test scores. The laptops provided to students in NSW under the Digital Education Revolution are taken home by students each night (DETNSW, 2009a), providing students with the opportunity for use in their school work at home.

Conclusion and key implications

In a study of technology immersion, Shapley et al. (2010) found that “Higher implementing schools reported that committed leaders, thorough planning, teacher buy-in, preliminary professional development for teachers, and a commitment to the transformation of students learning were keys to their successful implementation and technology immersion” (Shapley et al., 2010). The research reveals that leadership is crucial. The above quote covers some of the key implications revealed in this review of recent literature. These key implications are:

- One-to-one laptop programs can bring about improvements to student learning
- Improvements in student achievement are related to laptop use
- Professional learning is essential for successful integration
- A shift from a focus on technology proficiency to laptop pedagogy needs to take place
- Teacher pedagogical beliefs largely determine the degree and type of integration that occurs in the classroom
- Professional learning must include processes by which teachers regularly discuss their pedagogical and educational values
- Teachers need time for discussion and the sharing of ideas/resources
- Leadership is crucial for successful integration
- School leaders must build a shared vision, keep the focus on that vision, lead the planning, provide time for collaboration and discussion and provide appropriate and timely professional learning for teachers
- Leaders must foster a collaborative and supportive school culture
- Distributed leadership and a whole school approach are most effective
- Sufficient technology support is crucial for the success of a one-to-one laptop program
- Technology support needs do not diminish as the program matures

The DER-NSW one-to-one laptop program has incorporated these research findings into its implementation plan. Significant funding has been allocated to the areas of professional learning and production of curriculum support materials. Technology Support Officers are based in every school to provide immediate support for teachers and students. The technical solution for the laptops has been designed to manage the fleet of laptops remotely.

“Examined collectively, it is apparent that the factors, which may influence the implementation of a 1:1 program, are quite complex.” (D. Bebell & O’Dwyer, 2010, p. 10). The research reveals the great potential benefits for student learning and achievement from one-to-one laptop programs. It also provides clear guidance for navigating this complexity to achieve success.

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