One-To-One Computers in Schools

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IST 524 Instructional Technology

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December 3, 2013

What should schools consider when implementing a one-to-one computer student ratio? Studying examples from schools that have implemented programs in the past is informative; there are implications for the hardware involved. The expectations of these programs go beyond the acquisition of equipment. School leaders implementing a one-to-one program should explore the instructional strategies and learning theories involved in example programs. Also, what alternatives exists for one-to-one programs. Identifying potential overzealous expectations is as important as identifying advantages an implementation program can offer.

The One-to-one computer to student ratio is often focused on providing laptops to students. The Abell Foundation (2008) surveyed the results of 6 laptop based programs and Bebell & Kay (2010) published results of the Berkshire Wireless Learning Initiative (BWLI) in which five middle schools provided laptops for every student and teacher. On occasion specific brands or types of laptops were used, though most often the results did not hinge upon the device's manufacturing. However, Bebell & Kay (2010) note that the Apple iBooks used during the BWLI "were showing the limitations of their age and amount of use by the second year of the program" (p. 53). This suggests replacement strategies and budget should be a concern for any school system contemplating a one-to-one laptop program. The Abell Foundation also reports that the Texas Technology Immersion Project required more repairs for devices that students were able to take home (2008).

When implementing a program of one-to-one computing in a school system there must be expectations for the program's participants. Rosen & Beck-Hill (2012) notice "In most cases, the technology is implemented for traditional practices, while paradigmatic change in teaching, learning, and assessment in technology-rich environments is rare" (p. 226). Laptops are

essentially battery powered typewriters to a language teacher who has not been trained to provide opportunities for students to create a YouTube video as a part of a book report. Some one-to-one programs assumed it was not necessary to provide instructors with professional development (Larkin, 2012). This may have had influence on Larkin's observations which led to not recommend a one-to-one computing program. "The burden of change is often grater for teachers than for any other participants in a 1:1 initiative" (Bebell & Kay, 2010, p. 48). Opportunities for professional development plays an important role in the implementation of a one-to-one program. Training can foster skills that allow teachers to adopt instructional strategies to utilize the available technology.

Project based learning appears to be an instructional strategy suited for one-to-one computer enterprises. Sulla (2013) developed a pedagogy of project based learning that she calls a Learner-Active, Technology-Infused Classroom. A key element of Sulla's strategy is to design lessons around specific learning goals, not the technology skills involved in reaching the goal. For example, students could learn all kinds of interesting slide animations in a presentation program, but they should not be focusing their time on the animations. Rather, the students should be focusing their efforts on the content of the slide. This explicit description of the learning objective is important, but will require a level of technical skill with the technological tools being used.

Learning theories influence the instructional decisions of teachers, and classrooms implementing one-to-one computer student ratios are not limited to any one learning theory. Social constructivism seems to fit well with project based learning in a technology rich learning environment. Rosen & Beck-Hill (2012) and Larkin (2012) both noticed instruction within the

one-to-one computer programs provided opportunities for students to engage in content driven conversation, a key element of social constructivism. “In e-Learning, the teaching-learning method is assumed to be self-directed learning (SDL), which is supported by educational philosophy of constructivism” (Lee & Lee, 2008, p. 33). Lee & Lee’s research is based more on e-Learning in a higher education scenario, but it is important recognize that some secondary school instructors will have assignments or units that follow a more individualistic approach that students will likely encounter in higher education. Other learning theories can work within a technology enriched classroom. Sulla’s (2013) Learner-Active, Technology Infused Classroom uses Lev Vygotsky’s Zone of Proximal Development, a cognitive learning theory.

Along with the potential to apply a multitude of learning theories, one-to-one computing can offer a Response to Intervention (RTI) and differentiation for students. Rosen & Beck-Hill (2012) suggest that one-to-one computing creates easier access to resources that allow teachers to differentiate student learning:

> Though the teachers in the control schools [not one-to-one] commented on their frustration with effective implementation of differentiation in their classrooms in interviews, the experimental teachers commented that they had a differentiated curriculum available at their fingertips through the program, which made planning and implementing differentiation more feasible and more consistently functional. (p. 235)

This ability for computers to provide instant differentiation is an example of a RTI. Sulla goes further to claim “The Learner-Active, Technology-Infused Classroom provides the perfect venue for offering Tiers I, II, and II instruction - potentially all in the same classroom” (Sulla, 2013, p.10-11). The different tiers of RTI are prescribed methods for helping a student return to grade

level studies. Because all students have access to the technology, all students can have access to an internet full of opportunities.

One-to-one computer student ratios isn't the only option for creating a technology rich environment. Larkin (2008) suggests that a one-to-two computer to student ratio may be more effective. The reasoning is if two students must share a device to complete the work, then there is an opportunity for more student to student interaction. When students are each given their own laptop Larkin (2008) noticed "each student worked individually on the tasks that the teachers set" (p. 118). This may not be seen as a drawback, depending on the learning theory influencing the assignment. However it seems the situation was identified by Larkin to show teachers did not necessarily change their instructional strategies to match the tools available.

Another alternative to the one-to-one computing scenario is using mobile devices. Though most mobile devices do not have the same functionality of a laptop, mobile devices offer other benefits. Kinshuk & Jesse (2013) provide a description of an application for a mobile device and the potential of integrating the application with a Learning Management System (LMS). For example, GPS enabled mobile device using their application could document an event with time stamped and geo-located video. This learning object could directly load to a linked LMS. With the applications similar to Kinshuk & Jesse's product, instructors may not be limited to one-to-one computing. Students may have many digital devices available to complete assignments or participate in the e-Learning. However, there will be equity issues if students are expected to bring their own mobile devices to supplement the computer use. According to the Abell Foundation (2008), access to technology is one of the motivations for one-to-one computing programs.

There are expectations a large technological investments, and educational enterprises do not have expectations limited to academics. Does one-to-one computing influence student behavior? According to Rosen & Beck-Hill (2012) "The findings showed that learning in the program significantly increased learning achievement, reduced student's unexcused absences, and improved student discipline" (p. 256). Though this is very supportive of one-to-one computing, not all programs have evidence to support these claims. The Abell Foundation (2008) explains increases in learning are inconsistent, there is no correlation between computers and attendance, and classroom management is difficult. Results of one-to-one computing programs may be contrary, but there are many aspects in the implementation of these programs. Bebell & Kay (2010) suggest the level of training and support from administration for faculty can influence the success of a program. A five year progressive approach is recommended by the Abell Foundation (2008). The contradiction of these results also suggests choosing the measured expectations carefully; unattainable goals may make your program look like a failure when there are successful aspects.

If a school or district would like to implement some form of a one-to-one computing program there should be some planning. Program leaders will need to research schools that have attempted to implement one-to-one computing for example of financial and logistical obligations of the program. Development of the program should identify goals for the program; explicit expectations that can be used to measure the progress of a program. The educators involved will need to know what support they will receive in augmenting their pedagogy. Whatever changes the program aims to make to instructional strategies opportunities for professional development will be essential for the success of the venture; this could also provide teachers to innovate and find additional resources or applications like Kinshuk & Jesse's mobile application. Justifying

the expectations of a one-to-one computing program should be measureable, but realistic.

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