Learning with Personal Laptops in School: Benefits & Gains, Obstacles & Constraints – Following a Longitudinal Study

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Abstract

Despite the many ways in which computers can be distributed in schools, teachers' and students' reports still indicate that computers are used only part of time, and a small part at that. Around the world there is a dramatic increase in initiatives that provide laptops to students and teachers. Early research suggests several positive outcomes from 1:1 initiatives. This study explores these issues and describes an innovative project currently taking place in four schools: three elementary schools and one middle school – grades 5th - 9th. All students and all teachers were provided with laptops for class and home use. This longitudinal study focuses on how students use 1:1 laptops and what impact a personal laptop has on students learning and attitudes. The research data were collected through a mixture of qualitative and quantitative methods. Results indicate that students develop components of information literacy, learning abilities and motivation for learning over the three years of study. Students have mixed perceptions and concerns about the 1:1 setting. Our findings suggest that 1:1 computers have enriched students' learning experiences and opened up more opportunities and possibilities. The findings of this research add unique and positive evidence to the growing body of research regarding ICT integration in school studies, and especially 1:1 models.

Keywords: Ubiquitous computing, 1to1 laptop, ICT

Introduction

In recent decades access to computers in schools has increased. New reforms formulated new standards that reflect the overall goal of preparing students for the requirements of the 21st century knowledge-based society. Nowadays, educators are required to redefine educational goals and integrate technology into the school curriculum. However, teachers and students still report using computers in school only a fraction of the time each day. (Bebell, & Kay, 2009; Bebell, Russell, & O'Dwyer, 2004; Russell, Bebell, O'Dwyer, & O'Connor, 2003).

The integration of technology in schools has evolved: From desk-top computers to laptops (1:1); from computers used in a specific lesson to computers used anytime anywhere (24/7), and so on. Despite the many ways in which computers can be distributed within schools (e.g., in labs, libraries, or on shared carts), many observers theorize that the disjuncture between the dramatic increase in the presence of computers in schools and the relatively unchanging degree of use is due in part to the fact that student-to-computer ratios have not yet reached the stage where the

technology is ubiquitous (Bebell, & Kay, 2009; Bull, Bull, Garofolo, & Harris, 2002; Rockman, 1998).

Yet there is a dramatic increase around the world of initiatives that provide laptop computers to students and teachers aimed at reaching the pervasiveness of computers in schools. Early research and evaluation studies suggest several positive outcomes from 1:1 laptop initiatives, including: increased student engagement (Cromwell, 1999; Rockman, 1998; MEPRI, 2003), decreased disciplinary problems (Baldwin, 1999; MEPRI, 2003), increased use of computers for writing, analysis and research (Cromwell, 1999; Baldwin, 1999; Guignon, 1998; Russell, Bebell, & Higgins, 2004), and a movement toward student-centered classrooms (Rockman, 1998). Baldwin (1999) also documented effects on student behavior at home – more time spent on homework. Gulek and Demirtas (2005) compared test scores between students participating and not participating in a voluntary 1:1 laptop program in middle school. A significant difference in test scores was found, in favor of students participating in the laptop program.

Despite the growing interest in and excitement about 1:1 computing, there is a lack of sufficient, sustained, large-scale research and evaluation that focuses on teaching and learning in these intensive computing environments (Bebell, & Kay, 2009). Specifically, there is a lack of evidence that connects use of technology in these 1:1 settings with measures of student achievement. This is a particularly salient issue in light of the high cost of implementing and maintaining 1:1 laptop initiatives and the current climate of educational policy (Bebell, & Kay, 2009).

Lei & Zhao (2008) contend that when it comes to the question of what really happens when every child has a laptop and how the laptops are being used in classrooms, current studies provide only general information on "what" and "how much" is used, as well as changes in "what" and "how much," but there's a dearth of information on "how" the laptops are being used in teaching and learning practices (Lei & Zhao, 2008). Due to the expansion of such initiatives in many countries, it is necessary to question the effectiveness of such learning environments (Penuel, 2006; Kozma, 2003), to characterize the one-to-one learning environments and to analyze the impact of such environments on students' achievements and other variables (Beresford-Hill, 2000).

This study explores these issues and describes an innovative educational project that started in 2006 in Israel, taking place in four schools: three elementary schools (one of which includes both elementary and middle school) and one middle school, in two small urban communities. (I.e., covering grades 5^{th} – 9^{th}). All students and all teachers were provided with personal laptop computers for class and home use. The teaching and learning has been routinely taking place in an ICT-saturated environment and Virtual Learning Campus (VLC).

Since extensive time is necessary for technology to affect student outcomes, this study examines the first stages of laptop use in schools. Specifically, this study focuses on the following questions: How do students use one-to-one laptops and what impact does a personal laptop computer have on student learning and attitudes? Answers to these questions can provide insights for future practice and research.

The following research questions were addressed:

In classes with 1:1 laptops and VLC:
- What are the characteristics of learning with regard to the development of information literacy, learning abilities and motivation for learning?
- What perceptions and concerns do students hold regarding one-to-one computing?

Methodology

Research Sample

In this paper we present a longitudinal study. Data were collected over three years. As mentioned above, the study took place in four schools: three elementary schools (one of which includes both elementary and middle school) and one middle school, in two small urban communities. Participants included 701 – Students: 50.7% boys, 49.3% girls, grades 5^{th} - 9^{th}.

Research Tools

Research data were collected through mixed methods. Qualitative methods included: classroom observations, interviews, analysis of the virtual learning environments, students' outcomes. Quantitative methods included pre-post questionnaires.

Interviews: 20 students were interviewed in semi-structured interviews. The interviews took place in school in a quiet place. Interviews were recorded and transcribed.

Observations: The researchers conducted 25 none-participating observations in classes in various disciplines. During the observations, detailed and thorough minutes were taken.

The virtual learning environments and students' outcomes were analyzed according to a detailed marking scheme that was developed. Criteria were defined following analysis of the interviews

Questionnaires: Pre- and post- digital questionnaires were introduced to students at the beginning of each year of research and toward the end of each year. Questionnaires included Likert-type questions and open questions.

Results

One of the most universal findings in the current study was that both the implementation and outcomes of the program were somewhat varied across the four schools and over the three years of the student laptop implementation. However, results show that in the four schools that took part in this research, the majority of students indicated that they gained positive experiences thanks to the integration of the personal laptops into their studies.

In the next section we will present part of our findings according to the research questions.

What are the characteristics of learning with regard to the development of information literacy, learning abilities and motivation for learning?

The majority of students who participated in the study indicated that their level of information literacy and learning abilities were enhanced and improved. For example: 63% of students believed that the laptops enable them to be more organized in their studies. 80% of students believed they are better able to locate information needed and to differentiate between reliable and unreliable information. 72% of students indicated they write more drafts when preparing their tasks.

Analysis of students' outcomes according to a detailed marking scheme showed improvement in skills such as information retrieval, data representation and knowledge presentation. Teachers reported on improvement in writing and especially in the willingness to write longer paragraphs and more drafts.

Quantitative data showed significant elevation in agreement with phrases that express a sense of self-efficacy as shown in Figure 1. Similar results were obtained for other variables such as control of learning, external and intrinsic motivation, etc.

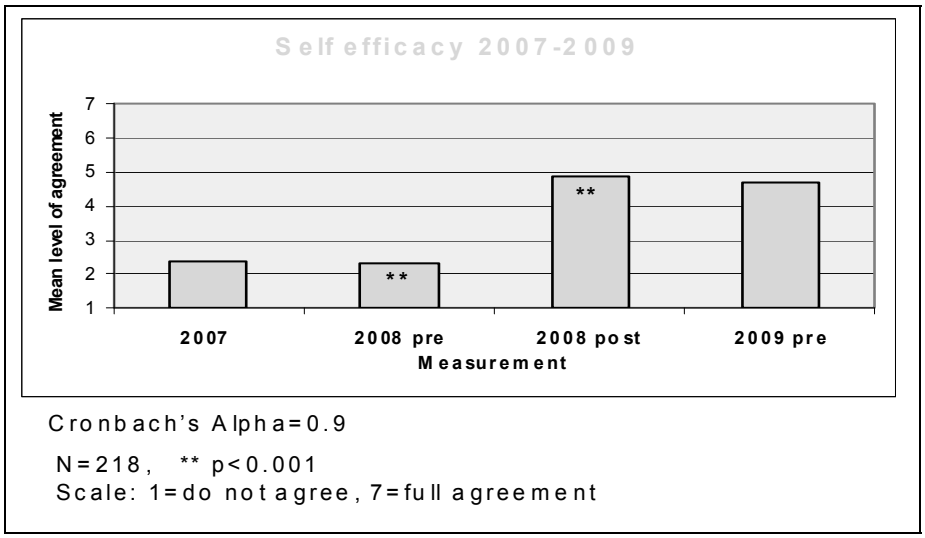

Figure 1. The development of self-efficacy among students over the years 2007-2009

What perceptions and concerns do students hold regarding one-to-one computing?
Findings indicated engagement and persistence on assignments, even at home. During interviews, students listed the following laptop advantages:

Equal access to information: "*It is much nicer to learn with laptops because it gives a sense of equality and fairness – for example, each student can express his/her own opinion…everybody has the same sources of information…same access to information…same resources. It is more fun to learn this way – much faster".*

Added interest in lessons: " When I learnt with a book – the book is full of facts. I wrote what was written in the book and answered according to what the teacher said. Now that I have my laptop I discover all kinds of reports and scientific investigations – which might be different from what is written in the book. It is much more interesting and more up-to-date!".

Improvement in achievements: "*Yes, it is a fact. I get better grades – higher achievements – because I have more time to think (T. student with learning disability)*

Observations in classes revealed that the laptops also served as a tool for writing and personal expression. Students used the laptops to work on their assignments, compose essays, write stories and prepare presentations. For many students, using a computer was easier than using pencil and paper because they found they could easily rewrite and edit their work, incorporate images in their text, insert hyperlinks to make their work interactive, and improve the design of their finished products.

The one-to-one laptops have provided great opportunities and resources for teaching and learning, but also raised issues such as student discipline problems during lessons, weight of school bag, and concerns about "overtime in front of the screens."

Conclusions and Implications

Decades ago, policy-makers hoped that the introduction of computers would lead directly to better instruction and better achievements. Nowadays, it is clear that simply providing computers to schools is not enough. At a minimum, learning goals, curricula, teaching strategies, and assessments must change as well (Zucker & Light, 2009). Thus, the aim of this study was to examine the learning processes in classes provided with personal laptop computers (1:1) and a Virtual Learning Campus.

Results from this study suggest that having one-to-one computers can significantly help increase student technology proficiency, because of the increased opportunities of acquiring technology knowledge and skills while using the laptops for various tasks involving learning, communication, expression, and exploration. Our findings suggest that one-to-one computers and related technologies have enriched students' learning experiences, expanded their horizons, and opened up more opportunities and possibilities.

The findings of this research add unique and positive evidence to the growing body of research regarding ICT integration in school studies, and especially one-to-one models. Personal laptop computers are very powerful in the classroom and enable teachers and students alike to construct and enrich their understanding. The one-to-one setting may facilitate achieving the goal of making schools more engaging and relevant as opposed to the more common, narrower goal of using computers to engage students (Zucker, 2008). This study contributes to the understanding that positive effects on students and teachers can be achieved only as part of balanced, longitudinal, comprehensive initiatives that address changes in educational goals, curricula, teacher training, and assessment.

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