



One-to-one Computing: Considerations and issues for the Higher Education Sector

Miriam Tanti

Faculty of Education
Australian Catholic University

Leanne Cameron

Faculty of Education
Australian Catholic University

As a direct result of the Australian Government's Digital Education Revolution Program (DER), many of the school leavers soon to enter the Higher Education sector will be accustomed to a one-to-one student laptop learning environment. Therefore, it is not unreasonable to assume that these students will expect a similar environment when they enter university. Training pre-service teachers to use the one-to-one ratio effectively in the classroom is also critical to their capability in implementing requirements expected of them in the classroom in the 21st century. It is within this context that this research is set.

The authors report on a pilot project that aims to capitalize on the one-to-one student experience by transforming the current, traditional lecture and tutorial model adopted in most tertiary institutions, with one-to-one integrated lectures and workshops. This paper describes the first phase of the research: an investigation into how prepared Australian universities are to cater for these students.

Keywords: one-to-one computing, Information and Communication Technology (ICT), laptop pedagogy

Introduction

The international and national agenda driving information and communication technology (ICT) in education has been largely based on greater access to technology, faster connectivity, the expansion of access to information, various software applications and the use of ICT across the curriculum. Largely in response to this, the Australian government has recently invested \$2.4 billion in the Digital Education Revolution (DER) to

ensure that every Australian secondary school student has access to technology, a laptop for secondary school students in Years 9-12 along with sophisticated software and broadband internet connection for each school.

As a result of the DER, many schools from all educational systems throughout Australia (State, Catholic and Independent) have undertaken initiatives to provide students with ready access to laptops. Common to most of these projects is the idea that the students have individual access to the laptops but there are variations in the management of the programs. For example, some schools have given students ownership of the laptops and other schools purchased mobile laboratories, self-charging trolleys full of laptops, to be shared amongst classes and stored at school.

Background

One-to-one computing defined

The one-to-one computing model is an

"instructional technology application in which all users have their own mobile multimedia digital devices that possess the capability of connecting to the Internet, such as a laptop, as opposed to the one to many computing model, in which one desktop computer is stationed in a lab and shared by many students" (Di Gangi et al., 2007, p. 367).

Whilst one-to-one student laptop programs differ in many ways, as indicated above, there are commonalities across most, such as:

- students have individual access to computers loaded with contemporary software such as word processing, spreadsheets and multimedia creation tools;
- access to internet is through wireless networks; and
- the focus on using laptops is for research, assignments, assessment tasks and presentations (Department of Education and Training, 2009).

The benefits of the one-to-one computing model is that the ubiquitous, 24/7 access to the technology makes it possible for students to access a wider array of resources to support their learning, to communicate with peers and their teachers, and to become fluent in their use of the technological tools of the 21st century workplace. When students are also able to take the laptop home, the enhanced access further facilitates students keeping their work organized and makes the laptop a more 'personal' device (Vahey & Crawford, 2002; Penuel, 2006), facilitating anytime, anywhere learning.

Teachers have also reported that when working in a one-to-one student laptop learning environment, students are more engaged and motivated to learn. The teachers also believe that the one-to-one student laptop environment facilitates more authentic, collaborative and project-based learning (Swan, Kratcoski, Mazzer & Schenker, 2005), which often leads to a greater incidence of higher-quality work.

Challenges of one-to-one computing

The success of the one-to-one student laptop initiative is determined by the way in which the technology is deployed in the learning environment and also the pedagogical model that underpins the initiative (Muir, Knezek & Christensen, 2004). Currently there are many schools and international universities who have implemented one-to-one computing initiatives of varying scale and depth. However, the '*Research: What it says about 1 to 1 learning*' Report (Apple Computer Inc., 2005) indicated there is no conclusive evidence to show that the quality of education has increased as a result. Similarly, Albion (1999) and Muir et al. (2006) argued that laptops were presented as the answer without actual scrutiny about their effectiveness and appeared to be more of a trend. Furthermore, advantages of laptops over desktops are not conclusively demonstrated and there are a number of issues yet to be resolved, for example, connectivity, ease of transportability, obsolescence, laptop pedagogy, etc.

Some of the challenges presented in the literature and explored in this project are summarised below.

Pedagogical issues of one-to-one computing

Changing the learning environment for students to incorporate the integration of one-to-one student laptop ratios will be one of the major obstacles to overcome in the tertiary education environment. Current pedagogical practice indicates that it may not be apparent to lecturers how laptops can be used as learning tools as many lecturers do not necessarily incorporate higher levels of technology skills into their teaching and student assessments. In many cases, PowerPoint presentations remain the norm, even online instructional environments typically consist of presentations and static text files. Current literature reports that many lecturers are simply adapting traditional teaching strategies to incorporate more adult productivity tools and having students work independently and in small groups, but they have not yet begun to implement widely more student-centered strategies such as project or inquiry-based learning.

Lecturers may be missing an important opportunity as one-to-one student laptop initiatives have been found to promote student autonomy enabling them to work quickly and independently. Students can access and organise information as well as pursuing particular points of interest, going into the topic in more depth. They can work at their own pace and devise their own search strategies. Students using laptops have opportunities to work with a range of diverse media to create content. They can use multimedia tools for creative expression, presentations, project work, narratives and design and create multimedia presentations, which, it is hoped, will lead to them a better understanding of content (DET, 2009).

Lecturer professional learning is also a very important factor in the effectiveness of the one-to-one student laptop environment. Lecturers need to be aware that laptops can enhance teaching and learning, feel confident and prepared and take an active role in professional learning to transform pedagogical practice. Formal professional development has been a critical component of many one-to-one programs, and the features of these activities are important for implementation. In the school-based implementation models, many researchers reported that what was most critical was a program that focused on helping teachers integrate technology into their pedagogical practice (Penuel, 2006). Some of the professional development that is targeted to help teachers become more “student-centered” in their teaching has been especially effective in transforming pedagogy in laptop classrooms. A good example of such a program is the iNtegrating Technology for inQuiry (NTeQ) model (Morrison, Lowther, & DeMuelle, 1999), which helps teachers develop extended problems and projects that use real-world resources, student collaboration, and computer tools to reach solutions or create final products (Penuel, 2006).

Lecturers may be very willing to adapt to one-to-one student laptop classrooms and they may also have high ICT skill levels, but they still require a lot of support. They need time and opportunities to learn about what teaching strategies, assessment strategies and resources are effective in a one-to-one laptop environment (DET, 2009). The DET also reported that another barrier to implementation was the concern for increased levels of classroom management.

Classroom Management in the One-to-one Classroom

Lecturers wonder what effect internet access will have on student behaviour during classes. There is concern that student attention will be directed away from the lecture content to non-academic pursuits such as social networking sites, e.g. Facebook and Twitter, playing games, and watching videos (DiGangi, 2007). A reduction in face-to-face interaction can also negatively impact on student learning. Students can absorb vast amounts of information but the cost may be in a reduction of social engagement between peers (DET, 2009).

The concerns of these lecturers are legitimate and there is the real possibility of disengagement with students as much time is spent on computers for planning, programming, assessing and so on. The experience in school classrooms is that laptops can provide disruptive and competitive distractions in class, requiring teachers with

strong classroom management skills to reduce the occurrence and impact (DET, 2009).

Institutional Readiness

The quality of the institution's wireless infrastructure, including the availability of support for addressing problems as they arise, is a significant factor in shaping the success in a program (Penuel, 2006). The 'Most Unwired College Campuses' survey (Intel Corp, 2005) noted that 98% of the top 50 US campuses are covered by a wireless network. A similar situation is reported in Australian universities, however, their ability to support one-to-one student laptop initiatives has been questioned. For classrooms using wireless networks, the reliability of the network is frequently an issue and is definitely a barrier to widespread use by teachers (Hill & Reeves, 2004; Tatar, Roschelle, Vahey, & Penuel, 2003).

It is evident that effective one-to-one computing must address factors such as reliable technical connectivity and support, along with other considerations such as the transformation of pedagogy to include more project and inquiry-based learning and effective classroom management strategies.

Method

Pilot

A one-to-one student laptop pilot study will be undertaken from August to November, 2011, by two lecturers in the Australian Catholic University's (ACU) Faculty of Education to deliver curriculum content and professional skills in two pre-service secondary teachers' units. In doing so, they will examine the issues, challenges and successes of the one-to-one initiative. The participants of the pilot study will be 70 undergraduate and postgraduate education students enrolled in the Bachelor of Arts/Bachelor of Teaching (BT/BA) and Graduate Diploma (Grad dip.) programs at ACU. The participants will be encouraged to supply their own technological devices, e.g. laptop, iPad, smartphone, etc. with the only prerequisite being that the device must have the capability to connect to the university's wireless network. With laptop ownership estimated at 90% due to the DER project, this is not considered an unreasonable request. It is recognised, however, that not all students will have DER laptops nor the means to purchase them so laptops will be made available for loan through the Faculty of Education and the university library.

Researching this new approach will require an action research methodology where participant observations and evaluations will form the basis of data collection. This approach seems the most appropriate choice as it provides the opportunity to utilise a "disciplined process of inquiry conducted by and for those taking the action. The primary reason for engaging in this type of research is to assist the actor in improving or refining his or her actions," (Sagor, 2005, p. 1 citing Sagor, 2000). Results from this endeavour would hopefully enhance teaching practices and student outcomes. Notes from the discussions held between the two lecturers who are staffed the unit, student responses from unit evaluations, and evidence of the assessments handed in by students will also be analysed and reflected upon to provide a potential blueprint for other educators and institutions implementing a one-to-one student laptop program. By using lecturer observations, student evaluations, and work samples, triangulation of data becomes possible thus strengthening the validity of the research (Cohen, Manion, & Morrison, 2007).

Upon completion of the unit, and phase 1 of the research, the researchers hope to provide greater insight into the following research questions:

- What determines institutional readiness for a successful one-to-one computing initiative?
- How are teachers and students using the technology in their classrooms (both within Australia and internationally)?
- What is considered recommended practice, and does this translate to the Australian Higher Education Sector?

- What challenges have been identified in the previous studies that may be relevant to the Australian Higher Education sector?
- What pedagogical issues have been raised?
- What are the classroom management issues, if any? and
- What are the overall benefits of the one-to-one environment for both teachers and students

Conclusion

The project outlined in this paper aims to investigate how the one-to-one student laptop initiative might transform the traditional, tertiary model made up of lectures and tutorials, with one-to-one integrated lectures and workshops. The researchers will develop and evaluate an appropriate one-to-one pedagogical model, the findings of which, it is anticipated, will enrich not only the delivery of the units offered in the Faculty of Education but other schools and universities implementing one-to-one initiatives.

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