The Trials and Tribulations of a BYOD Science Classroom

Shaun Nykvist[1]
1Queensland University of Technology, Brisbane
s.nykvist@qut.edu.au

Abstract: *The increase in the availability and use of portable mobile devices has had a number of impacts on society. In particular, this impact has been seen within Higher Education Institutions where staff and students are using these devices for both simple and complex tasks. Within undergraduate teacher education courses there is an expectation that students will be fully prepared for teaching their respective areas of expertise as well as having the ability to use ICT, and in particular portable mobile devices, to support teaching and learning. This paper reports on a small case study into the use of portable mobile devices in a science unit, where the students (N=16) bring their own devices into the classroom and use them in lectures, tutorials and workshops. The study highlights the changing nature of classroom practice within the university setting and the challenges faced by teaching staff and students when using these devices.*

Keywords: STEM, Science, BYOD, portable mobile devices, Higher Education teaching and learning

1. Introduction

The use of portable and mobile technologies in higher education is not a new phenomenon and there exits a growing body of research (see Gaskell and Mills, 2010; Goundar, 2011; McGarr, 2009; Tremblay, 2010 and Valk, 2010) into how these technologies can successfully be used for improved learning outcomes. In 2011, the University of Adelaide introduced an iPad program for students in the Faculty of Science where each student would receive an iPad when commencing as a first year student. In a statement about the program, the university claims that "science students increasingly are looking for more flexible, relevant and up-to-date teaching methods. The iPad enhanced learning is designed to give Faculty of Sciences students what they want, and also providing the kind of quality teaching that they need.to be used in" (2012).

It is within this context that educational institutions are responding to this new wave of students that often have access to portable and mobile devices and are encouraging students to participate in a "bring your own device" (BYOD) model of computing on campus. However, given the rapid adoption of these devices by students and educators within Higher Education Institutions and other educational institutions, there is still very little research into how students effectively use the devices that they bring on to campus to support their learning experiences. There is also very little empirical evidence that teaching and learning pedagogies are changing or supporting the adoption of these new technologies. Educational research is not able to keep up with the popularity and pace at which the adoption of these new and emerging devices is happening (Guri-Rosenblit, 2005 and Robertson, 2003).

2. Mobile devices in the science classroom

According to Goundar (2011) these technologies are ubiquitous in the developed world and are nearly always connected to a network. Many of these devices offer a near "instant on" and a battery life beyond the usual 2-4hrs that initially crippled earlier mobile and portable devices. Along with the added battery life, the processing power and in some cases the affordability has also increased to a point where

a large number of students regularly use these devices. The distinction between mobile phone and mobile computing device has become blurred with the term smart phone being used to describe a device that makes phone calls and allows for the installation of software or "apps".

This small case-based pilot study draws upon the popularity, connectivity and portability of these mobile and portable devices and the notion of the BYOD model being used by many educational institutions to identify the pedagogical approaches used with these devices and the challenges faced by both teaching staff and students. The students (N=16) were undergraduate education students enrolled in a first year science unit. The unit was changed significantly prior to the start of semester to ensure that students would not only learn about the science in the unit but to also use information and communication technologies (ICT) for teaching and learning purposes. In preparation for the unit students were not booked into computer laboratories as had been the practice in previous years. The emphasis was on the students bringing their own devices and using these in an open space and combining this with practical and theoretical learning's. A small selection of Apple iPad's were made available for loan during the duration of the class for equity considerations and for those that preferred to use them to the smaller screen smart phones.

The popularity of the mobile and portable devices is further reinforced by the large number of students that had access to a smart phone or iPad prior to the start of semester. All students (N=16) except one (n=1) owned their own smart phone or Apple iPad prior to entering the class. The student that did not have access to a smart phone or iPad at the start of the semester did purchase a mobile device (iPad) by the third week of semester. While there are several different types of mobile and portable devices available, there were two main types evident in this group of students. These were the smart phones (Apple iPhone and Android based smart phone) and the tablet computers (Apple iPad). In a survey completed by students prior to the start of the course, all students indicated that they had regularly used a computer prior to this course and thought that ICT could support science learning. All students (N=16) except one (n=1) agreed or strongly agreed that they were good at using computers and indicated on a scale of 1 to 5 that the importance of ICT in the classroom was either a 4 or 5. The remaining student indicated that the importance was a 3 on a scale of 1 to 5. The main previous experience of using ICT in education was through the use of Microsoft Powerpoint to present information to their peers. No student indicated that they had used a smart phone or tablet computer in their teaching and learning. When students were asked what they wanted to achieve from the unit all students indicated that they wanted to have a better understanding of the theory relating to the unit topic, however one student also indicated that they wanted to learn how to use their "enthusiasm along with digital technologies to engage students so they can better understand the world around them".

3. Trials and Tribulations

This unit was deemed quite experimental in its approach to using ICT and in particular mobile and portable technologies as an essential part of the teaching and learning experience for the students and lecturer. Consequently, the data was collected through surveys, group interviews and anecdotal class records. A number of key considerations were identified in the data and are discussed in further detail below. These main considerations include but are not limited to; access to common software, data storage, retrieval and presentation, network infrastructure and multiple platform familiarity.

3.1. Access to common software

The unit of work that the students were undertaking was based around topics of earth and space. While there are some excellent web-based resources available for students the practical activities revolved around activities such as the identification of stars and planets in the southern hemisphere or the identification of clouds. These activities involved field observations and the use of a portable device to aid in the location and identification of a particular planet or constellation or in the case of clouds the classification of a particular cloud. There are many great applications (apps) though some of these are free applications and paid applications. The application can also vary between an Apple iOS and Android platform or not exist at all on one of the platforms. Students may also not be able to purchase and install the particular application for the field observation if they are using their own devices. Consequently, it is important to ensure that as a lecturer or tutor you are aware of each of the apps that the students have access to and that you have planned accordingly. Alternatively the apps may be set as a requirement in such a way as a textbook is set as a requirement for a unit of work.

3.2. Data storage, retrieval and presentation

With students using the devices in the field for practical applications it is essential that they have a way of retrieving data from their devices, especially if they are working in groups and sharing a mobile device. In the case of Apple iPhone's syncing with a particular users identity to an authorized computer there can be difficulties for some students in trying to share data between group members and presenting this to the class. Time needs to be given in a tutorial or workshop for students to explore ways of using cloud storage tools such as Dropbox or for using online software such as Google Docs.

3.3. Network Infrastructure

This consideration was perhaps the most important factor identified in the use of BYOD's in the educational institution. In many cases networks were never initially built to handle an extreme load of users on wireless and apps were not always developed to allow them to work across multiple subnets in a corporate wireless situation. Using software such as eclicker for student responses in the classroom where a host and client is needed means that students need to often revert back to manually typing in the ip address of the host which can be time consuming and clumsy. When multiple classes are all using wireless in the same location saturation can quickly be reached and students will find it hard to obtain an ip address or will encounter an extremely slow transfer of data.

However network infrastructure is not just limited to the use of these devices in the classroom. Given the practical nature of the field observations it is not always practical to have a wireless signal available and there becomes a reliance on technologies such as 3G or 4G to access the Internet if it is available in the field observation location. There can also be issues of inequity where students do not have an available or sufficient data plan for their mobile device. When planning activities outside the classroom it is essential that you are aware of any limitations in the field where you will be working with students.

The devices also pose problems when presenting information in the classroom should students need to share results, findings or presentations or even demonstrate the use of an application in the classroom. Not all devices can easily be connected to a data projector and in many cases the wireless features of wireless enabled data projectors are often switched off. Using devices such as an an Apple TV with Airplay work well in a small home based network, but do not often integrate well in a corporate network even if they are allowed. Mobile and portable devices have many applications within the classroom but

are often limited in usability due to the inflexibility of the corporate network and outdated Information technology Policies and Procedures.

3.4. Multiple Platform Familiarity

Multiple platform familiarity is more of a consideration for the Lecturer or Tutor who will be asked about the availability of various apps on multiple platforms (iOS or Android) or how to install or use an app on multiple platforms. While there are some similarities, there are also minor differences in access to data and sharing of data in apps that can be problematic if they are not understood prior to the class commencing.

4. Conclusion

With the significant usage of mobile and portable devices such as smart phones and tablets in education and the wider society this small case study has highlighted a number of the challenges faced by both students and teaching staff in a Higher Education Institution. There devices have already become an essential tool for many students and staff and their growing popularity will challenge staff pedagogically and further challenge the institutions from an infrastructure, policy and procedure perspective. With the changing nature of teaching and learning with ICT, educational computing labs may only be made available for specific computing needs in future designs and the role of IT support staff will be more focused on the actual needs of the students or teaching staff rather then the design and maintenance of large fixed laboratories.

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