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Abstract

The rapid proliferation of mobile devices nationally coupled with high levels of individual ownership both nationally and internationally provide many opportunities for exploring ways in which students own mobile devices might be integrated into teaching and learning activities in higher education. Amongst other benefits, mobile learning is seen as providing considerable opportunities to link formal and informal learning across a range of educational contexts. Equally, rich media such as vodcasts (video podcasts) and videoconferencing are increasingly seen as supporting a range of teaching and learning activities, particularly in distance learning situations. This paper describes two case studies that explored the implementation of mobile devices and rich media in the Health Sciences and concludes that mobile learning can make valuable contributions to linking different learning environments. The motivation for the exploration of mobile connectivity came from the need to find ways to better support students on clinical placement in two different contexts.

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Utilizing Students' Own Mobile Devices and Rich Media: Two Case Studies from the Health Sciences.

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Abstract—The rapid proliferation of mobile devices nationally coupled with high levels of individual ownership both nationally and internationally provide many opportunities for exploring ways in which students own mobile devices might be integrated into teaching and learning activities in higher education. Amongst other benefits, mobile learning is seen as providing considerable opportunities to link formal and informal learning across a range of educational contexts. Equally, rich media such as vodcasts (video podcasts) and videoconferencing are increasingly seen as supporting a range of teaching and learning activities, particularly in distance learning situations. This paper describes two case studies that explored the implementation of mobile devices and rich media in the Health Sciences and concludes that mobile learning can make valuable contributions to linking different learning environments. The motivation for the exploration of mobile connectivity came from the need to find ways to better support students on clinical placement in two different contexts.

Keywords—*mlearning; elearning; rich media; mobile devices*

I. INTRODUCTION

The ownership of mobile devices is becoming increasingly commonplace, with most Australians owning at least a mobile phone [1]. Along with this, availability of bandwidth and reliable access, particularly in remote and rural areas is becoming increasingly dependable. In the higher education setting in Australia, it is increasingly common for many students to have ownership of at least three different mobile devices – mobile phones, mp3 players and laptop computers [2] - creating opportunities to explore ways in which mobile devices and mobile learning might

enhance the learning process. Mobile learning is viewed as providing the means:

to realize the promise of ubiquitous, pervasive, personal, and connected learning. ... It also connects formal educational experience (e.g., taking a class, attending a workshop, or participating in a training session) with informal, situated learning experience (e.g., receiving performance support while on the job or taking advantage of what David Metcalf has called "stolen moments for learning" while riding the train or sitting in an airport waiting for a flight) [3] p.44.

Consequently, the integration of mobile learning into the spectrum of technology supported learning in higher education is one that is growing rapidly [4][5].

II. DEFINING MOBILE LEARNING AND ELEARNING

There are many definitions of mobile learning in the literature, (e.g., [6][7]). For the purposes of this paper we will utilise the description of mobile learning provided by Pieri & Damantini [8].

With the term mobile learning we refer to a modality of distribution of any learning content with portable devices such as the Personal Digital Assistant (PDA), Tablet PC, e-book, and mobile phones. More generally, it is possible to call mobile learning any form of learning through devices which are very small, autonomous from the electrical supply, and small enough to accompany people anytime and anywhere (p184).

Mobile learning differs from elearning in that the learning is mobile [8], so that the use of mobile learning to link different learning contexts provides expanded educational opportunities. Mobile learning also provides increased opportunities for "mobility" in learning.

III. THE CONCEPT OF MOBILITY

Mobile technologies are seen as having unique abilities to promote the notion of mobility in relation to learning [1][9], a concept which differentiates mobile learning quite distinctly from other modes of online learning. The concept of mobility embodies anytime, any place learning and connectivity and frees the user from reliance on fixed technologies and spaces [10]. Mobile technologies have the capacity to support frequent and personal use of 'computational technology' [10] and importantly have the capacity to link different learning contexts including formal and informal [11].

The concept of mobility is complex and while providing opportunities in teaching and learning also creates challenges. As Traxler [9] points out:

'Mobile technologies deliver knowledge and information in ways that challenge formal learning, its institutions and its professionals. (p.5).

Further to this, Naismith, Lonsdale, Vavoula & Sharples [12] suggest that:

'the ability to link to activities in the outside world also provides students with the capability to 'escape' the classroom and engage in activities that do not correspond with either the teacher's agenda or the curriculum' (p.4).

These views raise important issues as to how staff and students manage the integration of mobile devices into teaching and learning activities to maximise the advantages and minimise the disadvantages.

IV. STUDIES IN MOBILE LEARNING IN THE HEALTH SCIENCES

While work in this area is limited, mobile learning has been utilised to support a range of teaching and learning activities in the health Sciences. Kenny, Park, Van Neste-Kenny, Burton & Meiers [13] investigated the use of Hewlett Packard iPAQ PDAs with five students in a Bachelor of Nursing course. While the students found a immediate access to information such as drug interactions enabled by their mobile technologies to be valuable, wireless connectivity problems proved to be a barrier. Students experienced difficulty in understanding this technical side of the use of mobile technologies and needed time to develop the skills to use the tools more competently [13]. Garret & Jackson [14] also investigated the use of PDAs in Nurse education. Their study focused on enabling students in clinical situations immediate and remote access to resources and the ability to record their experiences using a variety of media in an e-portfolio. While the project was successful in enabling students to demonstrate the development of their competency in particular areas, recording reflections in eportfolios while in the workplace

proved to be a difficulty. Additionally students found the PDA interface hard to manage. In other work Boulos, Maramba & Wheeler [15] explored the possibilities offered by wikis, blogs and podcasts for virtual collaborative clinical practice. They suggested that these collaborative web tools offered many opportunities to students to share their learning. The study also explored issues related to the use of open and closed online tools. However, amongst other things, issues around patient privacy need to be carefully considered, particularly in open environments and appropriate permission sought before posting digital images of patients online. To date there is no work on the use of students' own mobile technologies to support learning in the Health Sciences or information about the ways in which these tools might be utilised in distance learning environments or to link different learning contexts.

One of the issues being faced by higher education institutions implementing these technologies relates to decision-making about upgrading and extending institutional networks or utilizing the wireless network rolled out by commercial providers across Australia. One down fall is that the wireless infrastructure of the telecommunications companies lacks sufficient reliable bandwidth for effective teaching via rich media, particularly in rural areas. For example, this issue is currently limiting initiatives for distance education and remote practicum support of students in the Joint Medical Program which has a rural focus.

V. RICH MEDIA

The rapidly growing availability of high speed bandwidth is making the use of mobile technologies to access rich media resources and technologies such as video and videoconferencing in higher education contexts more realistic and achievable. Rich media resources and technologies enable users access to the "rich" aspects of language such as non-verbal cues and vocal inflection (Daft and Lengel 1986, p. 560 cited in Baecker, [13]). Videoconferencing, in particular can enable immediate feedback and guidance to learners, consequently enriching the learning process. Access to rich media can be particularly useful to students in a range of learning environments, particularly those where they are distant from the lecturer and/or other students, as this can allow for immediate intervention, feedback and collaboration.

A. Podcast and Vodcasts

Podcasting and vodcasting (video podcasting) are increasingly being used with mobile technologies in a range of teaching and learning applications. Podcasting is defined as "an audio or video file distributed to an appropriate media player over the internet" [14] p1. As more and more students own MP3 players, the use of these applications in mobile learning contexts is becoming more possible and more attractive to lecturers.

The ability to listen “on the go” using a portable media player, PDA (personal digital assistant), cell phone, or personal computer has made podcasting an attractive tool for learning [14] p.1.

Significantly, as Meng [15] points out, technologies such as podcasts and vodcasts are not considered fads but are viewed as useful ways of expanding access to teaching and learning activities in higher education in a sustainable manner.

While many lecturers are choosing to record their entire lecture for students to listen to and review outside class time, this approach has both advantages and disadvantages.

B. Videoconferencing

As visual connectivity improves, educators have an opportunity to enrich and rethink the place of learning design in rich media environments. This opportunity comes from emergent technologies and their scope for personalized synchronous interaction which has been missing in online environments and in previous generations of distance education [16][17].

Many innovative teachers are hampered by technological and institutional limitations in their use of rich media technologies. Although teachers have been encouraged to consider their choice of media as an integrated aspect of planning their teaching, some reluctance can be attributed to technology that has not approximated natural communication because of delays in audio and video transmission. Therefore its potential has not yet been well utilized because of connectivity, hardware, software and peripheral device limitations. These issues have confined the teacher’s ability to plan interactive teaching of particular aspects of a unit or course according to the:

- purpose for teaching and the needs of the learners [16];
- need for, or usefulness of, various media within the discipline;
- fit of the media to the circumstances of the learners [18].

The current generation of portable and wireless equipment and relative cheapness of connection through the broadband networks, now make it possible for Australian university teachers to utilize the richness of videoconferencing for more learner-centered teaching [19]. Broadband technology allows many times the quality in picture and sound so that these approximate the images seen on television screens. Dual transmission of live action enhanced with simultaneous transmission of video, PowerPoint slides and audio tracks is easily achieved on both room-based and desktop systems. Thus, new opportunities exist to reduce student isolation and provide greater

opportunities to enhance distance teaching, learning and supervision of research [18].

The benefit of the internet-based technology is that it enables videoconferencing that is more closely approximated to regular face-to-face communication. High definition cameras and dedicated bandwidth support high speed transmission enabling synchronous verbal and non-verbal communications including multiple visual and aural cues in natural language, body language and intonation of speech. Immediate feedback increases the personalization of learning.

VI. MOBILE LEARNING TO SUPPORT CLINICAL PRACTICE AT THE UNIVERSITY OF QUEENSLAND

In 2008 a team of staff in the department of Speech Pathology within the School of Rehabilitation and Health Sciences at the University of Queensland were awarded a UQ strategic teaching and learning small grant to explore the use of students’ own mobile devices in a standardised patient clinical practice setting. In recent years the growth in student numbers and the shortage of clinical placement locations has resulted in the development of standardised patient clinics. In these clinics actors are carefully trained to present as a patient or to present an aspect of a patient’s condition according to educational need [20]. The standardised patient clinic is currently timetabled for the end of the semester, leaving little opportunity for staff to follow up on students’ reflection of their experience. The original design also offered few opportunities for students to link their learning about voice therapy techniques to the clinical practice. Typically, students struggle with this aspect of the clinical practice; in particular they often feel uncertain about demonstrating the techniques to clients.

For this project, students were invited to use their own mobile devices to support their learning in the standardised patient setting and in other settings that suited their needs. A pre-clinical practice survey identified that the majority of students were willing to use their mobile devices for teaching and learning activities.

In this project, a number of activities were designed to encourage students to use their mobile technologies to reflect on their clinical practice activities and relate these to other aspects of the course. Amongst other activities, a clinical educator recorded a number of short vodcasts demonstrating several voice therapy techniques that students were likely to use in the clinic. The vodcasts were intended to enable students to revise and practice these voice therapy techniques and to help them develop competency and confidence in using these techniques with patients. Some of the vodcasts were recorded on a mini-camcorder and downloaded to a MacBook Pro for minimal editing with iMovie. Other vodcasts had been developed using a range of tools and file types for other courses, primarily for downloading from the Blackboard site onto computers

available in the school. However, the clinical educators decided they would be suitable for the standardised patient clinical practice component and these vodcasts were consequently also made available to students. All the vodcasts were made available on the course Blackboard site for students to download to fixed or mobile devices. Along with the vodcasts students were encouraged to use their mobile devices in ways that they thought might support their learning and many students made voice recordings of their clinical practice sessions. Students were required to record reflections immediately after each standardised patient session and to complete a delayed reflection a few days after this. Additionally students were invited to discuss these reflections online in groups.

A. Project Outcomes

A mixed methodology with clear linkages between the different methods and the focus of their data collection was utilised to evaluate the project [21]. Data were collected through a pre-project survey, reflective comments and a focus group discussion. The survey included demographic data, information about which technologies students used and open-ended questions relating to the ways in which students used their mobile technologies. The focus groups provided considerable insights into the ways in which students use their different mobile devices. The reflective comments provided rich insights into students' thoughts about their clinical practice and the ways in which mobile technologies supported their learning in this environment.

The use of vodcasts to support the development of clinical competencies was warmly welcomed by the students. Students commented that the vodcasts were particularly useful in increasing their confidence in dealing with patients. Importantly, students also felt that the ability to practice techniques on their mobile devices improved their competency in relation to the use of the voice therapy techniques particularly in demonstrating the use of the voice therapy techniques to patients.

Those students who owned laptop computers mainly used them at home. They found them heavy to carry around and preferred to use their phones and MP3 players while on the move. Some students commented on the usefulness of being able to access the vodcasts on their mobile phones where-ever they might be.

Students also found that using their mobile devices to make their own voice recordings was useful in reviewing and reflecting on their activities. While recordings of the standardised patient clinics had previously (and currently) been made by fixed cameras in the room, access to these recordings was limited for students. The lab in which students could access the recordings only contained a very small number of computers which were often occupied or not working. Further limiting access, as pointed out previously, many students were working and had limited

time on campus. The flexibility and mobility offered by using the mobile devices greatly increased their 'anytime, anywhere' learning

The biggest barrier to students was downloading the vodcasts onto their mobile devices. The major reason for this difficulty was the variation in file formats and sizes. Several of the vodcasts had been recorded for different purposes, for different programs and using a range of file types. In the main these vodcasts had primarily been designed for downloading from the Blackboard site to a desktop computer and did not translate well to the mobile environment. The use of technical support was a key factor overcoming this difficulty and supporting the use of the mobile technologies.

VII. THE JOINT MEDICAL PROGRAM MOBILE PROJECT

The Joint Medical Program (JMP) is an initiative of the University of Newcastle and the University of New England in partnership with Area Health Services across the northern half of the state of New South Wales in Australia. The intent of the JMP is to teach a Bachelor of Medicine which promotes the training of doctors for rural and remote practice. The enabling technology for this project is videoconferencing. The curriculum is based on the problem-based learning (PBL) approach pioneered by University of Newcastle almost 30 years ago. As the new venture nears the end of its second year, there have been many advantages of the use of videoconferencing for joint administration, research and planning. Opportunity cost savings made through the use of videoconferencing for these purposes have been significant when compared to the costs of travel between the two university campuses. On average, it takes 4.5 hours, each way, for staff to travel between campuses, necessitating at least one night's accommodation in most cases. It is estimated that more than 70% of committee meetings have taken place via videoconferencing, a considerable saving in down-time, travel, accommodation and sustenance costs, as well as greenhouse gas emissions from motor vehicles used for travel. Generally, videoconferencing is used for joint/cross campus lectures which could be more interactive. Student evaluations of their experiences in the program so far support the use of videoconferencing, in the main, despite some technical difficulties, room set-up limitations and presenter ambivalence. For one PBL group at University of New England, their tutor has used desktop videoconferencing to facilitate his tutorials from off-campus locations rather than missing them, teleconferencing or engaging a substitute teacher. Critical issues for him were the room set up to enable him to see all 8 students, their whiteboard work and information from the plasma screen.

In Year 3 in 2010, desktop videoconferencing will be the cornerstone technology with students, on clinical placement in General Practitioner's Surgeries, being required to connect into their regular on-campus PBL tutorials. The

intention here is to reduce students' feelings of isolation, enable routine contact with their tutors and peers and to integrate clinical placement seamlessly using videoconferencing technology. Trials so far indicate that tutors will need to facilitate the learning differently, adding more structured communication than might currently occur in the free-flowing PBL group.

Experience in 2009 has shown that tutors will require additional training to support facilitation of remote attendees working in the PBL groups. The pertinent issues relate to ensuring that no one is left out of the PBL discussion, that the technology does not get in the way and that interaction is as worthwhile as in the face-to-face situation. The former and latter can be addressed by tutor and student training while the issue of technology has proven problematic in trials so far because wireless broadband connections for laptop computers are not always reliable enough for desktop videoconferencing to be effective. Student feedback on the 2009 trials showed a high level of frustration with unstable connectivity so this is the focus of technology trials intending to improve student experiences in 2010.

By mid 2010 the Year 3 Planning Committee will evaluate the use of desktop videoconferencing as a learning technology, particularly in relation to its suitability for students connecting via laptop computers with wireless broadband modems from rural and remote locations which may be outside the primary broadband footprint. Student feedback will be vital to ongoing problem solving and evolutionary planning of this implementation.

VIII. CONCLUSIONS

These case studies clearly demonstrate that the use of mobile technologies and rich media can enhance the learning process in clinical practice settings for both on-campus and off-campus students.

The opportunities for academic and teaching staff to integrate the new generations of rich media technologies appropriately into the curriculum design for the units they teach provide new ways for students to engage effectively in learning via this improved medium. Most successful teachers tend to be good adapters so they are able to take new and emerging practices and strategies from elearning experience and integrate them in seamless ways that make them easily acceptable to students [22]. For example, the use of email, chat, Listservs and voicemail instead of letters are now accepted means of reducing the isolation of distance education students through more frequent and rapid communication with their teachers [23][24]. For many teachers, the alteration of practice in this manner is quite common [25], stimulating creativity and pushing the technical as well as the pedagogical barriers.

The advent of mlearning devices adds impetus for the convergence of elearning and rich media technologies and creativity in pedagogy to support them. How widespread these innovations become will rely on factors well beyond

the individual academic or student's control so an holistic approach to planning for them is advisable [26][27][28], particularly given the evidence of past initiatives which have foundered.

Electronic, mobile and rich media technologies are advancing in quality, affordability and accessibility at rapid rates but there is little concrete evidence of their sustainability and viability available in the published literature. As indicated earlier the lack of adequate vision and strategic planning for adoption, implementation and maintenance of such applications is an impediment to more widespread use [26][27][28]. Nevertheless, they hold great promise for the future of learning in tertiary settings in developed and developing countries alike.

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