Towards Transformation: AlwaysOn Students and Health Education

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Abstract. How can teachers integrate ICT into student school learning? How does ICT contribute to improved or extended learning? This study compared m-learning, e-learning and contemporary learning pedagogies in the context of Health Education. It was undertaken in schools located in the states of Victoria and Tasmania, Australia. Findings from 170 Year 7 (age 13) students in two linked schools are described in this preliminary report. In general, students were more adaptable to technology, but teachers felt ICT was an imposition requiring additional planning and management. We show schools can overcome many significant barriers to integrate ICT into learning.

Keywords: ICT, transformation, AlwaysOn, PDAs Health Education.

1. Introduction

Much research has been done on the evolving form of m-learning, where students use highly portable digital devices to manage their studies and provide access to content, mentors and peers [1, 2]. Examples of success show how such devices can facilitate authentic learning in the field [3] together with classroom studies and learning at home. Amongst the related literature are opinions about pedagogies, appropriate software and the affordances of various hardware [4], including debate about device formats such as personal digital assistant (PDA), laptop, tablet etc. There is also a significant discourse on the barriers to ICT adoption by teachers [5, 6]. Some of these are cultural and systemic; others relate to infrastructure availability and performance.

These two backgrounds formed the context for our investigations. The M-Learning landscapes: transforming school cultures through next generational thinking project was funded for three years (2006-8) by the Australian Research Council. It examines the ways in which teaching is altered by information and communication technology (ICT), and how student learning is changed. Of particular interest were the behaviours of teachers, the way ICT affected their patterns of work, methods of classroom management and their accommodation to technical innovation within the governance structures of the school. In respect of

students, were keen to monitor opportunities for extended time on task and inter-school communication to enrich learning. This was a Linkage Project jointly conducted by La Trobe University, the University of Tasmania, and the Departments of Education in Victoria & Tasmania. Our co-researcher was Margaret Robertson.

2. Method

The aim of this project was to investigate authentic learning strategies which link digital learn-spaces (see Fig. 1) with ubiquitous access for Year 7 and Year 9 (age 13 & 15) learners in Victoria and Tasmania. We planned to do this by comparing learning about the same content (a topic selected by the school in the Health curriculum) by learners in three distinctly different kinds of classes:

- Traditional or contemporary classes where teachers taught using their usual methods (which may have involved a video or even the occasional group session in a computer laboratory);
- Online classes where students mostly used material from a learning content management system;
- PDA classes where all students were allocated a personal handheld device for the duration of the course, and trained in its use. Students were encouraged to personalise the handhelds and take them home, but learning could also encompass the online content management system.

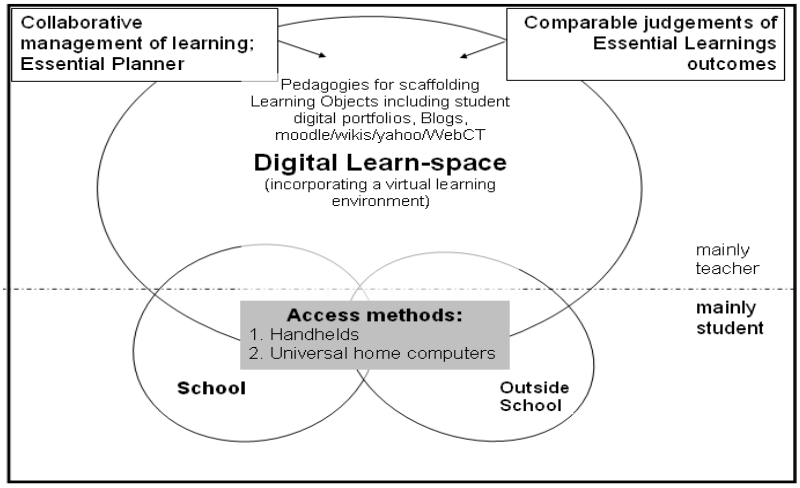

Fig. 1 The 'Learn Space' concept model [7]

Setting up the learning online content management system proved problematic, since no jurisdiction would permit access by extra-territorial persons. The project contracted with a web-hosting provider in Brisbane to provide a Moodle and

Drupal installation[34] which we administered remotely. Funding for the PDAs proved difficult to obtain, but we were supported by the Victorian Department of Education to provide several class sets of HP iPAQ rx4240 units. In Tasmania we obtained one set of these units, and another set of the older Palm Zire 31s. The iPAQs had wireless and Bluetooth connectivity, whilst the Zires could only use infra-red beaming to transfer data between individual units. The iPAQ units had microphones, so could record sounds to make podcasts. Text input was done on both models using handwriting recognition, and both could play audio and video. All PDAs were equipped with 1Gb SD storage cards, which provided ample capacity to store books, videos, courseware and personal pictures and documents. The PDAs deployed to selected classes in schools were allocated to individual students throughout the experimental period. With parental consent the students were able to take the PDA home and use it for personal purposes provided it was brought to the relevant class sessions in operating order. This personal 'ownership' was an important part of the project.

The research design involved 4 phases (repeated in each of the three years of the project). The phases shifted involvement progressively from local to national levels.

1. Identification and formation of class clusters in schools. Teachers were asked to complete an ICT literacy checklist and introduced through group meetings to the 'Learn-Space' concept.
2. Local Cluster Learn-Space activity. During this phase each cluster of classes 'taught' within their digital environment for a period of approximately 3-4 weeks. The research involved monitoring access, interactions and conversations of all participants (i.e. teachers and students within each school).
3. State Cluster Learn-Space activity. All clusters were linked to a project-wide digital space within which they were encouraged through common negotiated tasks to interact widely and participate in shared communication tools.
4. Interstate link-up during which students were encouraged to interact with learners in other states.

In 2007, our project proceeded with entire year group cohorts in 10 schools. Each year group was divided into the three types of class. One class was equipped with PDAs (we will use this acronym for shortness and consistency) for every student; another class booked into a computer laboratory for online learning and all the remaining classes learnt in contemporary/traditional ways. This procedure was followed with small variations in 24 contexts over a two year period. We noticed maturation of approaches in schools which used the protocol in both years.

3. Results

We were initially sceptical about the way in which students were using the online materials in a school. Data were collected using six main instruments:

[34] http://www.alwayson.edu.au

- National benchmark testing for literacy and numeracy
- Content-knowledge pre-test and post-test using calibrated open-ended response items from a bank supplied by the Education Department, Tasmania.
- Survey of personal computer use devised for a previous project, giving background descriptors of student computer use in their lives
- Observations of classroom practice by experienced teachers
- Focus group interviews with students participating in the project
- Automatic logs and chat records from the Moodle learning content management system

These data revealed some immediate problems to confound analysis. Here are some examples of the difficulties and the responses of the research team. In the first year, students in different states used different national benchmark tests. We therefore converted scores to percentile ranks for comparability. Some schools could, or would not, connect PDAs to their wireless networks. Thus the entire set of course materials was re-formatted to fit onto the SD storage card and a *PDA only* class was subsequently included in analysis. Students forgot their usernames and passwords, so we supplied a spreadsheet of these to their teachers. PDAs locked up so needed to be reset by students using self-help instructions and access to re-installation software on a web-site. Students were provided with at least one hour of formal instruction and 2-3 weeks of practice time with the PDA before the project content learning commenced. Teachers were given a one-day course in Moodle design.

In this paper we focus upon the activity of 170 Year 7 students from two linked schools in rural Victoria. This is just a snapshot of the project as a whole, but will serve to illustrate how the project is proceeding.

Over the life of the project, there was evidence of maturation: some teachers adopted the mental shift from whole class progression to individualised learning. In planning activities and individual interviews, teachers often found the biggest change in their practices was the complete preparation of learning materials for a complete unit of work in advance of delivery. There were some objections to this, because it removed some element of control from the teacher – there was no opportunity to adapt material to suit student interests, or to follow a line of engagement on the spur of the moment. On the other hand, teachers did acknowledge that students were consequently able to proceed at their own rates, an individualisation of learning.

For those classes using PDAs or online materials, the digital format was unfamiliar for some teachers. Translating familiar activities (such as 'create a poster' about a topic), was difficult to implement on a PDA screen. Other affordances of the technology, such as automatically marked quizzes, were not part of normal practices, and were sometimes difficult to accommodate.

Once they had changed some routines because of the ICT, teachers adapted in different ways to the potential of the equipment. One teacher became adept at identifying useful digital educational resources on TeacherTube[35] and YouTube[36]

[35] http://www.teachertube.com/
[36] www.youtube.com/

to augment interactive materials for student learning. Another teacher established good classroom routines to make worksheets available to all the PDA students via Bluetooth from a public read-only folder, and accepted completed work in the same way.

Following the experimental period, teachers in both Tasmania and Victoria requested courses be set up in the AlwaysOn web-site for purposes outside the original project intention:

- For low ability readers – with the option to hear spoken texts. In addition, there were some spin-off projects associated with teachers who had taken on the role of PDA mentors.
- Languages other than English (Japanese) could be facilitated by the capacity of the handhelds to record and playback podcasts. This was useful for correcting pronunciation.
- In SOSE (Studies of Society and the Environment), GPS receivers were linked to the PDAs running MediaScape[37] to allow students to create learning adventure based upon location-based digital clues around the school.
- In Mathematics, teachers used the PDAs for task checking and for the calculator function.
- Generally the PDAs were also used to organise social meetings after school (covert bluetoothing) and to transport data between school and home digital environments.
- Fitness (health) was supported by using the PDAs for recording exercise diaries and mapping increasing walking distances.

These latter examples illustrate the degree to which students adopted the PDAs into their lives, using different ways to address learning needs outside the formal curriculum. It was clear from the focus group interviews that students were disappointed they had to give back the PDAs at the end of the project period.

Quantitative analysis was conducted by bringing together the data from the national benchmark testing, the pre- and post-tests of content knowledge, and the computer use survey. For this report, the data from two campuses of a school in Victoria were selected.

The initial findings compared the pre-test and post-test achievement scores for Year 7 students (age 13) in the three types of classes. 170 students were involved in 16 classes. After elimination of incomplete records, data from 129 students were used for the analysis, with 28 students in the PDA & online group, 22 in the online group and the remainder in the contemporary/traditional classes. Standard errors have been used in the chart (Fig. 2) and are presented in the form of 95% confidence intervals (1.96 times SE) following Kay [8].

Lower score improvements were shown in the contemporary classes. The highest score improvements were in the PDA class. With this small sample the confidence bars do not make this a significant finding, but indicates what may be shown by the entire project when the data from many more schools is analysed using Rasch modelling to account for varying item difficulty and linking different tests using calibrated items.

[37] http://www.mscapers.com/

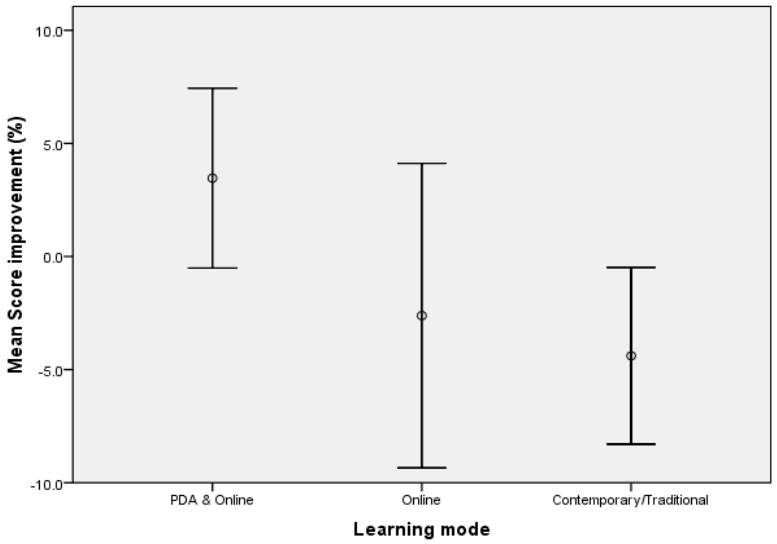

Fig. 2 Learning achievements of the three groups

It is important to examine other variables, other than the different learning modes, which might explain the differences in attainment. In educational research, there are many variables over which there is little control. The classes had different teachers, and the influence of the teacher has been shown to be very important in many studies. Did the PDA group have students with ability above the average? On advice from the Victorian Department of Education and Early Childhood, we combined the reading and writing scores equally weighted to create an overall Literacy score for Victorian students. After students who had omitted one of more tests had been culled, all scores were then converted to percentile rankings using the Excel function PERCENTRANK. Higher rankings indicate better performing students. This sensitive data has been reported in bulk terms which do not identify any of the project schools.

High and low computer users were identified from the student surveys:

- High computer user: uses computers outside school, uses computers for personal purposes at home and uses computers for any task more than 2 hours a week.
- Low computer user: uses computers at school for less than one hour a week and rates personal computer skills at school as average or worse.

Table 1 shows the PDA group had literacy skills equal to the Online group and above the contemporary classes. However, their numeracy skills were lower than the other groups. The PDA group were not particularly well situated to adopt ICT for learning, with just as few high computer using students as the online group. The group did however have slightly fewer low computer-using students than the contemporary group.

This additional data is therefore insufficient to convince us that the PDA group were particularly more able or better prepared to use ICT than the other groups. The learning achievements (although not at this scale statistically significant) appear to be due to the presence of the technology. We make no claims at this stage about the process which may have made this possible, but our initial speculation is a combination of additional time on task and a Hawthorne innovation effect leading to improved motivation.

Table 1 Differences between the three groups

Group	*n*	*Mean Literacy percentile ranking*	*Mean Numeracy percentile ranking*	*Percentage of group who were high computer users*	*Percentage of group who were low computer users*
Contemporary	79	52	48	19	15
Online	22	58	54	14	32
PDA	28	58	47	14	14

It is not easy to study time on task by PDA users since it would require a logging program to be installed in the device. This alone would not be certain to record all activity, since students could (and did) re-image their PDA whenever required. Logging data would therefore not be secure in such an environment, and additional ethical concerns about privacy would need to be addressed. However, we were able to log the activity of persons accessing the online materials, both individually and collectively. Fig. 3 shows the initial work done by teaching staff to prepare the course (to 1st April) and the student introduction just before 22nd April. The main learning period began just after 6th May and continued to 1st July.

The research team also plotted access against time of day, showing little activity in the early morning, but quite a long afternoon tail after school closed. 8% of accesses were outside school hours, indicating a moderate degree of additional time on task.

We wanted to know if students would use the online chat facility in the Moodle Learning management system. Students within a particular school had engaged highly with this technology, using it for discussions between school and home, and after school. Here are some examples of the discussions we found in the chatroom log files. Screen names have been changed and personal details masked. Each student was able to associate a picture such as a cartoon, drawing or photograph, with their screen-name. At an early stage the students (all from the same school) were observed exchanging phone and mobile phone numbers. This was strictly speaking a breach of internet etiquette, but since they could have done so face-to-face in class, probably not a serious breach. Conversation also considered personal friendship relationships (which was consonant with the Health and Wellness study). The dialogue then rapidly went on to personal circumstances and life-decisions which was precisely the focus for the study unit.

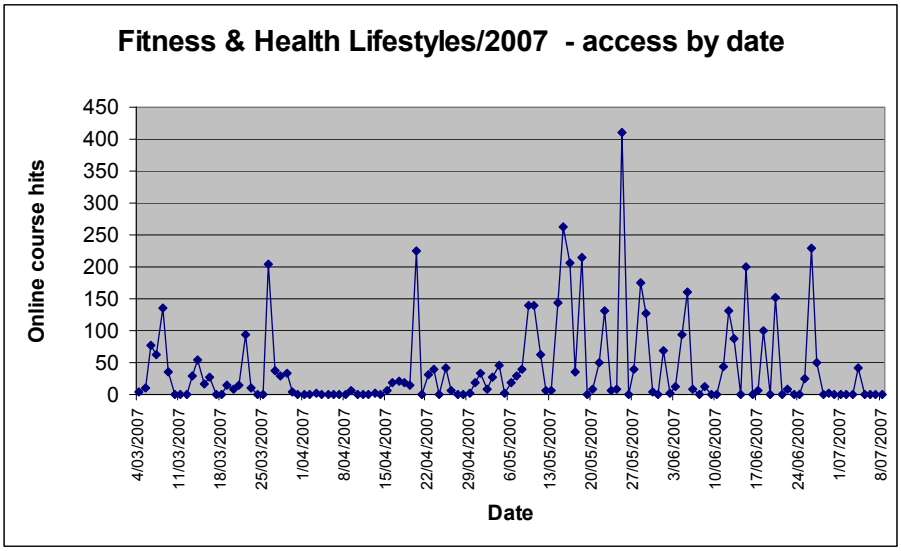

Fig. 3 Number of accesses to the learning content management system by date

The initial dialogue took place during school hours, but one of the participants was at home, sick:

Jacey: [I'm] just abit sad of everything that happening in my life
Jacey: god i HATE mylife. i will tell you something at lunch
Alice: well how do u think i feel when my mum is going to die and i have no dad then u will have to go to an orpanage
Jacey: im sorry

The conversation resumed after school hours:

Mary: On friday night me,Lana,ruth,Ethony,larry nerrng,and Katy are all stayin at jeremys lol fun xx
Jacey: oh cool
Mary: yeah lol xx
Jacey: Please dont tell that boy I like him Mary Please dont
Katy: mm are u and jeremy gonna sleep in a room by ur selfs
Jacey: Are you
Mary: yeah lol probably lol xx
Jacey: oh my god are you
Mary: yeah xx
Jacey: :0
Jacey: dont do any think dum

4. Discussion

The AlwaysOn project has run for only a short time, and this report is only an initial analysis of the outcomes. However, it appears to promise an insight into the changes required for new styles of learning to penetrate into schools. On one level

the project may provide a statistically valid comparison of e-learning, m-learning and contemporary learning pedagogies. On another level, the project is already providing insights into the mechanisms of change management in schools.

Changes for teachers using ICT are significant. Online delivery and subsequent download of learning materials into PDAs requires a great deal of initial effort. Teacher work schedules are not well framed for this kind of cyclic change. The normal employment arrangement is for a set number of face-to-face teaching periods each week, with a small number of preparation and marking periods; these times do not change over the year. In addition to this re-framing of work intensity to accommodate ICT, teachers fear loss of control, abandoning the possibility of re-directing the flow of learning to suit particular circumstances or group dynamics.

The initial findings from this part of the AlwaysOn project show that m-learning with PDAs appears to give some learning advantages. Online learning was nearly as good as m-learning, with evidence of some extended time-on-task from the logs of the learning content management system. Students appeared to be very willing to exchange personal information within the protected 'learn-space' online, and discussed important health topics. For these students, using the digital space was natural and easy – a contrast to the impact upon their teacher's ways of working.

5. Conclusion

It seems that there are four main areas which need attention if secondary school classrooms are to be transformed through ICT:

- Affordances of equipment (connectivity, portability, application software libraries, form factor, battery endurance)
- Innovation adoption techniques (governance, equipment ownership issues, policy frameworks)
- Pedagogical integration strategies (used by teachers as they link the computer to the curriculum)
- Curriculum transformations (Negotiated by system leaders with parents)

This AlwaysOn project has illustrated the great difficulty of implementing significant pedagogical transformation in schools predicated upon online or mLearning. However, it has also had a useful impact. Granting 'ownership' of PDAs to students for extended periods has impacted another school in the project. Across Australia in 2008, the government digital education revolution began to allocate funds for all Year 9-12 students to have computers throughout the school day. An AlwaysOn school decided to augment this by planning to give every year 7 student a netbook for 2009:

> *AlwaysOn made at least two contributions to our decision - firstly the name, the underlying concept that students are always on the internet and what that means for classroom practice, and secondly the experience that when kids own something, they instinctively look after it much better than when it is shared. Even the nuts and bolts of*

not having to charge 130 devices (students will do that at home) will have spin offs for us, we hope.

We make some suggestions to facilitate the uptake of new equipment and techniques in schools:

i) Before classroom deployment of new technology, teachers need to become moderately competent at using the learning content management system or portable computer.

ii) mLearning devices should be used right across the curriculum, not in single subjects in isolation, and this be supported by school-wide policies. This can be facilitated by granting 'personal ownership' of the devices to individual students who take on first line responsibility for charging, backing up data and initial diagnostic/re-imaging.

iii) Teachers practices need to change: for instance, porting a worksheet across to a learning content management system is not digital education. A series of problem-solving games suited to the equipment can be much more effective in promoting learning. Teachers should either create interactive multi-media online activities, or select these appropriately from library repositories.

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