Student reflections on preference and use of lecture notes and recordings

Emily J Cook
Swinburne University of Technology
Aaron S Blicblau
Swinburne University of Technology
Therese Keane
Swinburne University of Technology

This study examines feedback from students about the use of Tablet PC technology in material science lectures to help us understand how students use available learning resources and to inform the creation of future materials. Students commented on their preferences for being given full notes or partial notes which were annotated during the lectures and also on how they used notes and recordings in their learning. Students presented conflicting views on which style of note-taking they preferred with a varied range of reasons for their preferences. Feedback indicated that students perceive that live lectures are important and that the distribution of complete notes and recordings were useful as revision aids and if missing a lecture was unavoidable. Suggestions were made that the technology could also be used to produce podcasts of key points and videos of demonstrations performed in lectures.

Keywords: Annotated notes, asynchronous, learning management system, Tablet PC, perceptions

Introduction

This study explores the effective use of technology using a tablet computer with a digital stylus in a large, compulsory, first year engineering subject *Materials and Processes*. The project aimed to 'understand our present' by evaluating the student's perceptions of their learning environment and their preferred delivery mode, and, specifically, to evaluate the effectiveness of electronic handwriting (e-inking) from the learning and teaching perspective. This study was conducted in conjunction with a faculty-wide program where Tablet PCs and support were given to lecturers to increase interactivity in the lecture environment.

Tablet PC technology, which allows handwritten annotations to be projected and saved, is no longer novel and has been implemented in a variety of ways in higher education teaching. Tablet PCs have been shown to improve the instructor-learner dialogue in projected presentations with associated note-taking (Colwell, 2004) and are part of the technology-rich learning environments (Galligan, Loch, McDonald, & Taylor, 2010; Garrick, Villasmil, Dell, & Hart, 2013).

Many current university students belong to the Net Generation (Judd & Kennedy, 2011; Kennedy et al., 2009). At the University where this study was conducted, the majority of first year students (~ 80%) are part of the Net Generation. They have been brought up in a world where information technology is integrated into their lifestyle. Their use and familiarity with a variety of information technology communication devices has necessitated the delivery of instructional material at tertiary level to be commensurate with the student's own portable electronic devices (Hamilton & Tee, 2010; Skene, Cluett, & Hogan, 2007).

A Learning Management System (LMS) was used for asynchronous delivery of both the teaching material and recordings of the lecture process. This resulted in a blended learning program to extend the classroom experience into a multimedia environment.

Students vary significantly in their approaches to studying and learning and even have different perceptions of how to approach the same course (Felder & Silverman, 1988). It has been suggested that lecturers take into account students' previous experiences in the academic environment to determine and implement appropriate subject delivery methods (Prosser & Trigwell, 1999; Trigwell, Prosser, & Waterhouse, 1999).

Being exposed to modern computer based technology, with a Tablet PC, LMS and recordings for asynchronous learning in the university environment, is new to many of the student cohort, (Blicblau & Pocknee, 2003; Brodie & Loch, 2009).

The quality of student note taking is dependent on their engagement and it has been observed that, in science classes, many students are not effective note-takers (P.-H. Chen, 2012; Peper & Mayer, 1986). To ameliorate the effect of ineffective note taking, a number of material delivery methods have been suggested, including pre-class full notes (J. Chen & Lin, 2008), pre-class partial or "gap" notes, post class full notes and recorded classes with a variety of notes, (Cornelius & Owen-DeSchryver, 2008; Kinchin, 2006; Marsh & Sink, 2010). The outcomes from these studies suggested that students receiving partial notes performed better on examinations later in the semester and on conceptual questions during the cumulative final examination than students receiving full notes. The benefits of learning with partial notes on improving student outcomes have been equivocal. This paper does not scrutinize outcomes in terms of examination results, but instead focusses on the students' perceptions of the technology, their preferences in how information is disseminated and how they use the different teaching materials produced in their learning.

Research Methods

Materials and Processes is a 12-week subject run across an academic semester by two lecturers that team-teach. Simon and Jon each take 6 lectures, and employed the same Tablet PC technology and provided students with notes using PowerPoint. Jon provided students with a full set of notes, however Simon provided the students with partial notes, which he filled with e-ink (annotating on a Tablet PC with a digital stylus) as the lecture progressed. At the end of the lecture, Simon provided students with a full set of annotated notes from the lecturer and placed the file on the LMS for dissemination.

At the end of the semester, and prior to exams, all students enrolled in this subject in both Semesters 1 and 2 were asked to voluntarily complete an anonymous paper-based questionnaire which had been approved by the University ethics committee. A quantitative methodology was employed comprising of a questionnaire with 20 questions and opportunities for participants to provide qualitative responses. This instrument contained multiple choice and open-ended questions. As the unit was repeated in both semesters, the questionnaire was distributed to two different cohorts of students. Participants were assured that the results of the study would be solely used for research purposes to improve the teaching and learning methodology, and would have no effect on their current or final results according to ethics approval.

In total, 103 students participated and completed the questionnaire. This data was combined from semester one (n=72) and semester two (n=31). In semester 1, there was a higher participation rate (48%) than in the second semester (21%). This can be contributed to research fatigue experienced by students who have been over committed (Clark, 2008; Schuh, 2009). The analysis was guided by the following overarching research themes that emerged out of the issues presented in the introduction:

- Student perceptions of the subject delivery employing a Tablet PC as an engagement tool in the learning of lecture material
- The perceptions of students in the use of partial/annotated notes as an aid to learning compared to full set of notes,
- Student perceptions of the benefits of accessing complete lectures asynchronously as an aid to learning.

The research team met regularly and discussed the analysis of data several times to ensure internal validity of the process and agreement about the interpretation. Entries to survey tick data were compiled to provide

quantitative data. Free text entries were read repeatedly to enable the coding and categorisation of responses, then counted to enable quantitative comparisons. This qualitative data analysis method was informed by the work of Boyatzis (1998) and Bogdan and Bicklen (2007).

Results and Discussion

After the end of the lectures all annotated slides as *pdf* notes were uploaded to the LMS for Simon's section of the course whereas Jon's complete notes were already available on the LMS. Students were asked if annotations were being made available to them after class, of which 94.6% per cent said yes, while the remaining 5.4% were unaware of this learning resource. Students who commented on how they used the annotated notes (n=25) stated they mostly used them for revision or if they had missed a lecture (Figure 1).

Lectopia is a lecture capture and delivery system which records presentation slides, lecturer delivery and any student audio interactions. Lectopia recordings of the lectures were also made available to students using the LMS, with 55% of students surveyed having used them in some way. Their comments indicated that they used Lectopia recordings in much the same way they use the annotated notes, namely to revise and catch up on work from missed lectures. The key difference between how the resources were used is that recordings were primarily viewed as a means of catching up on missed lectures, whereas the provision of annotated notes was seen as a revision tool.

An additional and unexpected use of the recordings was that students used them to better view graphs and diagrams which were not clear when viewed on the screen and most likely too small when printed in the notes. This should be considered further when identifying topics for potential podcasts. It may be that short videos explaining diagrams which can be zoomed in on could be greatly beneficial to students who strain to see the subtleties of a particular chart during a lecture.

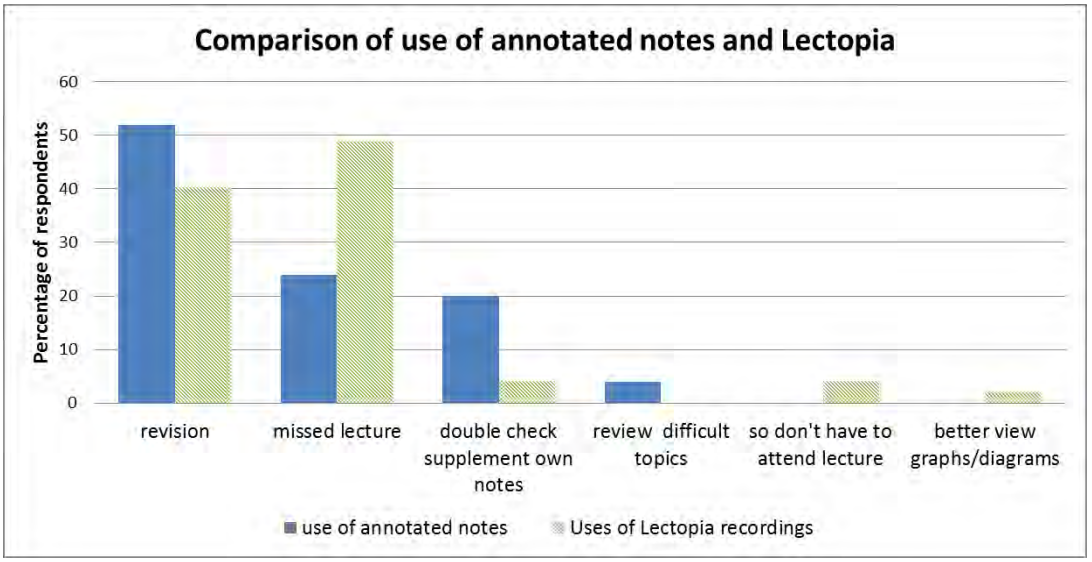

Figure 1: How students used annotated notes and Lectopia recordings in their learning

Only a very small minority (4%) used the recordings as a substitute for lecture attendance. One student explicitly stated "I only use them when I am unable to attend. There is no substitute to actually going." Even with the availability of recordings, attendance at the lectures was preferable. Viewing recordings provided students with the ability to fit their learning around their own schedule. "There is a 8.30 lecture on Fridays my only class on a Friday. I watch the lecture at home rather than going." These comments emphasise that students value attending lectures, but use recordings to supplement their learning.

Accessing the recordings and notes through the LMS allowed students to study off campus and at a time which suits them (asynchronously), with students commenting that they access the notes to "read on train" or download the recordings and "read on phone, take to work". This portability and flexibility of learning resources

is an important addition to the traditional lecture with online learning materials making it possible for students to take control of how, when and where they study.

Students were asked about their preference of annotated (partial lecture notes) as can be seen in Figure 2. Just over 50% of students preferred annotated notes compared to a complete set of notes.

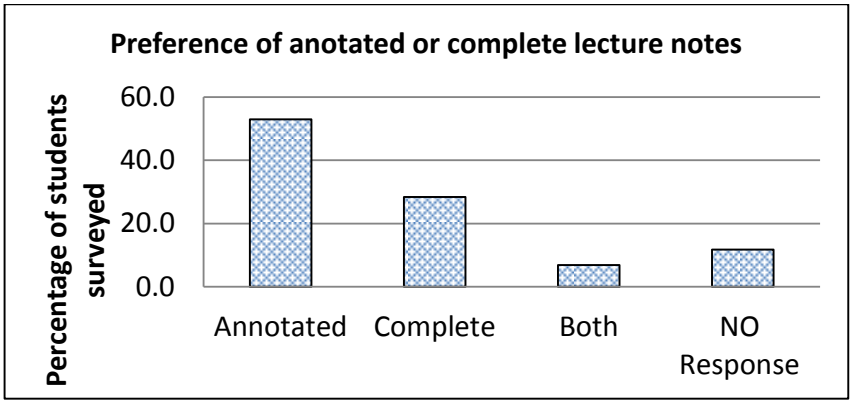

Figure 2: Student preferences for annotated or complete notes

There were many reasons for different preferences for a particular style of note giving as can be been seen in Figure 3. Of the student cohort that responded, 47% found that annotated notes allowed them to concentrate more easily, 22% stated that lectures were more interactive and engaging when slides were annotated during lectures and 10% stated that they learnt better and this style of learning directed them to important points. A student who was clearly in favour of annotated notes stated "usually the annotation half is the most critical of the notes," and this was supported by another student, "I like annotations of the lecture because it made you participate, read and actually learn". However, some students realised the limitations of the use of this style of lecturing and criticised this approach, "annotations keeps you focussed but sometimes moves too quickly and I don't have time to copy". The majority of those who preferred annotated notes did so because it kept them active during the lecture making it easier to stay focused on what was being said and ultimately helping them to learn better.

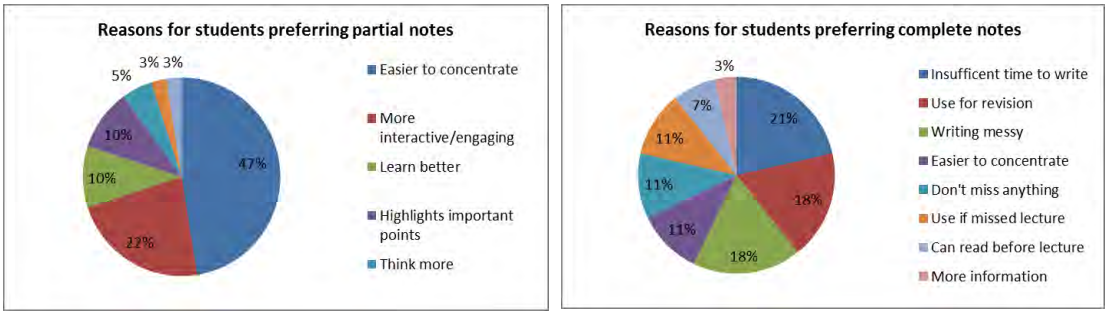

Figure 3: Reasons given by students for their preference of lecture handouts.

Of the students who preferred being given complete notes, 21% believed they could not keep up with the lecturer, having insufficient time to write every detail down. This was noted by a student who said "some slides are gone through too quickly to finish annotations as well as take in information." Students also perceived that complete notes contained more information and prevented them missing anything during the lecture. One student stated that the preference was for full notes "because then you don't miss any essential information." Some students also benefitted from being able to access the complete notes before the lecture and not just having the annotated version available afterwards as students used the notes to "read ahead and look back as well." Another student mentioned that complete lecture notes allow you to "focus more on what's being said instead of writing things down." The majority of those who preferred completed notes did so because of the *fear of missing out.*

Futures

In addition to recording of lectures, students were asked to comment on other potential uses of the Tablet PC technology in the teaching of *Materials and Processes*, viz.

- Podcasts of key concepts
- Links to videos of theory being applied in real life
- Videos of tutorial questions
- Recording of demos/props used in lectures

Students suggested that recording technology could also be used to produce podcasts of prop demonstrations performed in lectures as active demonstrations are a substantial and popular part of this particular lecture course. These demonstrations are not currently captured by Lectopia or other screen recording software (e.g. Camtasia). It is worth noting that these students would have been exposed to screen casts through their Maths course (McLoughlin & Loch, 2012). It appears that the students find them helpful for their understanding and memory, and wish to re-watch them when revising their work. The recording of demonstrations and their impact on learning is something to be investigated in future work.

Concluding Remarks

Student feedback indicated that live lectures are important to their learning. The distribution of complete notes and recordings were useful if missing a lecture and as an aid to revision. The process of annotating partial notes during a lecture was viewed as making it easier to concentrate on the lecture, and even making it more engaging.

In conclusion it appears from this study that the use of Tablet PCs for annotating slides during a live lecture and making the annotations available online is useful for students. They use the annotated notes to double check their own notes and for revision. Recordings of the lectures were primarily used to catch up on missed lectures. These resources provide students with the flexibility to engage in learning at a time that is convenient to them and they suggest that more are made available in the future.

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Author contact details:
Emily Cook, ejcook@swin.edu.au
Aaron Blicblau, ablicblau@swin.edu.au
Therese Keane, tkeane@swin.edu.au

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