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# The Feedback Loop: Encouraging Student Submissions

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**Abstract**

The use of a network of tablet PCs to teach a first year computing degree mathematics class has shown that students value the learning involved in seeing other student's submissions and the teacher comments on these as well as comments on their own submissions. The lecturers value receiving responses from many of the students and not just the few who always answer.

This paper discusses the use of an active learning pedagogy, student submissions, and feedback in a database class based in a standard PC computer laboratory. Instructor perceptions and student reactions to this pedagogy are discussed. Student reactions were collated from a questionnaire. In spite of many technical problems both lecturers and students reported benefits for teaching and learning.

**Keywords**

Student submissions, Active Learning, Educational Technology

**Introduction**

It is recognised that interactive learning has many advantages over the standard lecture format both for students and for the lecturer (Crouch & Mazur, 2001; Draper, 2004; Guthrie & Carlin, 2004; Knight & Wood, 2005; Su, 2002). Classroom Presenter (CP) has been used at Christchurch Polytechnic Institute of

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Technology (CPIT ) since semester 1, 2008 on a trial basis. It has been used only to teach a first year degree discrete mathematics class using a classroom set of wireless networked tablet PCs. The responses, from teachers and students involved, suggest that the main benefits are the active learning and immediate feedback enabled by this approach. CP enables active learning, concept testing, immediate lecturer feedback, and student involvement by all of the students.

Student submissions provide valuable feedback to the lecturer on the level of understanding of the class as a whole (Robson & Kennedy, 2010). Other researchers have noted similar findings (Anderson, Anderson, VanDeGrift, Wolfman, & Yasuhara, 2003; Huettel, et al., 2007; Koile & Shrobe, 2007). The major advantage the tablet PC has over a standard PC is the 'natural' writing capability which is useful for instructor inking (Anderson, et al., 2004; Price & Simon, 2007), and it enables a range of questions that are just not possible with text only input e.g. equations, diagrams, colouring and shading (Denning, Griswold, Simon, & Wilkerson, 2006). CP can be used on a network of standard PCs but it uses multi-cast networking and although student text input is possible it is quite basic and not easy to use (Wilkerson, Griswold, & Simon, 2005).

Ubiquitous Presenter (UP) was developed by University California, San Diego to specifically address these issues and allow students to interact via a web browser from tablet or non tablet PCs. The students can choose to overlay question slides with text or ink depending on the capabilities of their PC. The teacher can use a standard PC but there is no text box for comments – it is assumed that the teacher will be using a tablet PC. UP allows a teacher to add ink to lecture slides. These

slides (plus ink) are available to students via the website both during the lecture and after the lecture. The student PCs need only to have a browser installed (Denning, et al., 2006; Wilkerson, et al., 2005).

An increasing number of lecturers are now using tablet PCs to enable lecturer inking of slides and for active learning via questions and student submissions (Guthrie & Carlin, 2004; Knight & Wood, 2005; Loch & Donovan, 2006). They report advantages for student learning and immediate instructor feedback on student understanding. This paper seeks to see if some of these advantages can be realised on a standard PC network.

### **Methodology**

UP was used with a second year degree database management course. Classes were taught in a standard PC laboratory for all sessions and consisted of a combination of lecture and laboratory exercises. Questions for each session were developed in Power Point and, using the UP add-in, uploaded to the UP server. During a teaching session the students log in to the UP server and select the slides for that session. The lecturer can control the question sequence. A series of questions were developed as formative assessments for each lab session and these were delivered to the students via UP. The students entered their answers via a textbox and submitted an anonymous response. The instructor selected "interesting" submissions to display and discuss. UP was used only to deliver questions and receive submissions from students and not for lecturer inking of lecture slides.

UP was typically used for one of the two weekly sessions. After eight weeks the students were asked to

complete a questionnaire to determine their attitudes to this style of teaching.

### Results

The majority of the database class had experienced the use of CP in a previous year so they were familiar with the idea of answering questions and submitting responses. However the use of UP with this class was very much in the nature of a trial. The lecturers, and the students, learnt a lot about the pitfalls of using technology for teaching. There were times when the network went down and times when the system did not work as intended. This was time-consuming and frustrating for all concerned and is reflected in the questionnaire responses.

Of the 29 students in the class, 21 completed the questionnaire.

The questionnaire comprised 10 questions that were answered using a 5 point Likert scale (1 Disagree, 2 Disagree Somewhat, 3 Undecided, 4 Agree Somewhat, 5 Agree Strongly) as shown in Table 1, and three open questions that asked for advantages, disadvantages and any other comments.

Given the technical problems encountered it is not surprising that usability questions did not rate highly.

The main motivation for using this pedagogy was to engage the students in an active learning process and to receive responses that could be used to discuss the concept involved. It is pleasing to note that questions related to this such as "Discussion of other students' submissions helped my learning" and "The questions made me think" rated quite highly.

**Table 1: Average of responses for the 10 Likert scale questions**

Question	Average Response	Standard Deviation
UP was easy to use	3.1	1.1
UP was enjoyable to use	2.9	1.2
UP helped my learning	2.9	1.3
Getting comments on submissions helped my learning	3.3	1.4
Discussion of other students' submissions helped my learning	3.9	1.0
The questions kept me interested	3.1	1.2
The questions made me think	3.9	1.0
The questions helped reinforce the teaching	3.3	1.2
The discussion of submissions showed me other ways of doing things - which helped my learning	3.9	0.9
The discussion of submissions showed me wrong ways of doing things - which helped my learning	3.7	1.0

### *Student comments*

14 students made at least one comment. There were 15 comments for advantages and 17 comments for disadvantages. The comments are summarised below.

Students listed advantages that reinforced the positive aspects of active learning with comments such as "more participate in answering questions", "instant feedback is handy", "discussions helpful", "able to know other peoples answers", and "anonymous".

Given the technical problems we continued to experience it is not surprising that all the comments listed as disadvantages related to this aspect of the use of UP and not to the active learning pedagogy. Typical comments were "does not work well", "fails a lot", "a very slow method", and " would need to have it running well before implementing".

### **Discussion**

Our experience with Classroom Presenter was that although there were initial technical problems we learned how to avoid them and they are no longer an issue. With UP we encountered a number of on-going technical problems which made it a frustrating experience for the lecturers and the students. These problems were mostly not a problem with UP as such but more network and browser problems. For the first two weeks the CPIT campus network was very unreliable (the students would log in and connect to the UP server, and then the network would go down) and at that stage when UP didn't work we didn't know if it was a network problem or a problem with the way we were using UP. The student documentation for UP notes that: "UP is supported on Mozilla's Firefox browser. You

may encounter difficulties using other browsers". The installed CPIT campus browser is Internet Explorer (IE). Using IE the students were able to register, log in to the UP server, and connect to the question slides. It was only the student submission function that did not work properly when using IE.

Firefox was available to the students but the network settings had to be changed to enable access to the Internet. Because students have limited rights to the C: drive of networked PCs and temp directories are deleted at intervals these changes were not always permanent. The UP server response times were often slow when sending and receiving submissions. The lecturer needs to be aware of this and make allowances for the delay in receiving submissions. There are some operational steps for the lecturer to become familiar with such as clicking the icon to allow student submissions. Also UP assumes that the lecturer, at least, is using a tablet PC so there is no textbox input available to the lecturer. To annotate student submissions the best a lecturer can do when using a standard PC is use the mouse for "writing" a tick, a cross, or to highlight.

Also, because students using a standard PC can really only answer using text input the range of question types is limited.

### **Conclusion and Recommendations**

Formative assessment is an important aspect of learning. The challenge is to involve all students and to provide immediate feedback on student answers. Technology, from clickers to tablet PCs, has been used to enable this interaction. In spite of all the difficulties the lecturers involved considered that the use of UP on

a suite of standard PCs did have benefits for teaching and learning. As one lecturer commented "I'm not worried whether they get it right or wrong, I just want some feedback on their understanding". It is certainly a way of getting most, if not all, students involved. The range of student submissions provides a platform for discussion of correct and incorrect understanding of concepts, and because submissions are anonymous students are not embarrassed if their response is discussed. The best questions to use seem to be single word responses, fill in the gap, short answer type questions or multiple-choice questions as most students are prepared to answer these types of question. It does take time to complete the cycle of question displayed, students think about and submit an answer, lecturer displays and discusses selected submissions so initially aim for two or three simple questions per session. Try one for revision at the beginning and one for review towards the end. Using UP on a suite of standard PCs is worth a trial. There is a set of lecturer instructions available at <http://physics.csusm.edu/eprice/research/UP/UPsupport/UPsupport.html>

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