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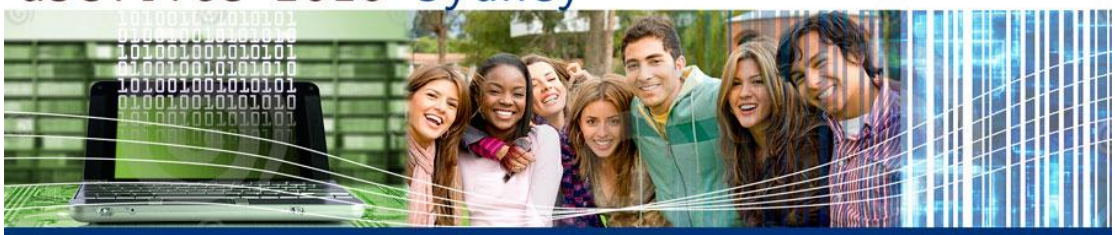

Minimising the distance, maximising the learning: Successful selection and implementation of an online virtual whiteboard for tutorial sessions

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Emerging online technologies are increasingly being evaluated to meet the needs of the expanding group of students who wish to balance education with their career and family commitments. This paper describes the collaboration between Educational Developers at Macquarie University Learning and Teaching Centre and the Department of Biological Sciences, to research effective new technologies to facilitate an improved learning environment for Distance Ed students. We detail the process, from the needs analysis and extensive research of possible solutions, to the ensuing procedure of trialling, demonstration, implementation, training and support. The criteria and steps in testing and trialling the nine possible solutions are described, in addition to the subsequent implementation process of the final solution, Scribblar, a free Web 2.0 online interactive whiteboard.

Keywords: Distance Education, technology, online technologies, virtual whiteboard, Scribblar, Web 2.0

Introduction

Effective collaboration between academics and educational developers is basic to a fundamental design practice where the aim is to produce qualitative, documented improvements in learning and teaching. Where the learning context is distance education, strategic and informed choices of educational technologies that support both learning and teaching processes for physically remote teachers and students, can be critical to the successful delivery of courses. This paper discusses collaboration between educational developers at a large research university in Australia and a lecturer in the Faculty of Science's Department of Biological Sciences.

The project provided an online synchronous solution that facilitated tutorial sessions between Distance Ed students and the lecturer. It was designed to address the problem of providing distance learners with direct participation in problem-solving tasks in their biology course and practical support for their learning process. From a teaching perspective, the lecturer needed to find a solution to the problem of how to teach the methodology of problem solving in Genetics to remote students. In this subject, the methodology involves elements of probability theory, higher maths and logic, which, for on-campus students was taught in weekly face-to-face tutorial sessions where both students and the lecturer worked through problems on a traditional whiteboard. Due to the nature of the subject, distance students are required to attend on-campus workshops, designed purely for external students, twice

during the semester, which was the only opportunity they had to participate in live face-to-face tutorial sessions or to meet fellow students and their course teacher. It was also their first opportunity to seek direct support when working through the mathematics of the problem solving tasks. In 2010, the course lecturer wanted to implement an additional delivery mechanism, using emergent educational technologies that would give distance students the opportunity to participate in some preliminary preparative classes through a live "virtual classroom", as yet undefined.

The Educational Development Group at the University's Learning and Teaching Centre has a background in exploring emerging educational technologies and making recommendations for their use in learning and teaching contexts, so a project was set up to define the problem, analyse the needs and trial possible solutions. After initial discussions and examination of existing tools we had available, it became obvious that any effective solution would be likely to involve a synthesis of several technologies i.e. both hardware and software applications, given the normal teaching style of the lecturer (displaying mathematical solutions on a static whiteboard) and the overall task requirements.

Background

Many authors have described how technological advances have created a paradigm shift in education. In 1996, James Morrison (as quoted in Bingham, 1999), states that telecommunications, software, and the Internet eliminate walls and boundaries. In addition, he states that an increasing number of students want and need non-traditional, flexible schedules. To further reduce a student's sense of isolation, Anderson (2005) identifies student interaction with content, with their teacher and with other students as contributing to a more positive learning experience for Distance Ed students. More recently, as networking and broadband technologies improve, Web 2.0 tools have emerged and evolving digitised forms of learning continue to provide new and effective possibilities for educators (Kesim and Agaoglu, 2007).

Much of the literature on the integration of technology in distance education has focused on asynchronous communication approaches, which include email, discussion boards and some messaging systems (Hrastinski 2008). Feedback from a teacher on reflective assessments such as essays can make effective use of such systems because it is not a time-critical process and delays in delivery do not impede progress to further learning. Where the learning task is procedural, the feedback needs to be more immediate, as misunderstanding a process step will prevent a student from moving on to the next one. This situation requires a synchronous approach, which allows the teacher to provide model examples, and gives a student the opportunity to attempt a solution knowing that any corrections will be immediately available and thus avoiding any delays to the overall learning process. While some of the research literature has explored the use of synchronous systems in distance education (Schullo, S., Siekman, S., & Szydlo, S. 2003), there have been few investigations on the integration of a face-to-face teaching technology such as an interactive whiteboard with Web 2.0 tools such as Scribblar that combines synchronous communication capabilities including voice, text and graphics.

Just as students are seeking learning opportunities that are more flexible and dynamic, educators are increasingly looking to create more ubiquitous learning environments for their students (Morrison 2003). In choosing the most appropriate technology, educational developers need to consider some critical factors. The tools chosen for these environments must not only allow students to gain greater understanding of the concepts but also provide a positive learning experience (Bonk and Park 2007). This positive experience is most important, not just for the students but also the educator. The teacher should feel comfortable and confident with the technology and be able to interact with the tools and online environment in as seamless a way as possible. The technology should also facilitate prompt feedback, direct involvement by students and the educator, provision for social interactions, and use of collaborative learning strategies.

The project begins: Needs Analysis

This project was instigated by a lecturer in the Department of Biological Sciences, who enquired about a possible development for the online aspects of her 2010 Semester 1 unit, Human Genetics Theory. She had a mix of internal and external students, with a significant group of external students from locations across Australia and New Zealand, some of whom are regular students and others who are medical practitioners taking the unit as a single non-award unit.

The internal students had a weekly 2-hour tutorial in which they worked collaboratively through genetics problems of the mathematical kind. They took turns to solve the problems on the whiteboard with the lecturer giving immediate feedback and additional teaching and explanation. For the external students, the weekly problem sets, as well as written solutions to the problems, were posted every few weeks. The solutions displayed the 'working out' of the problems, but there was no further clarification of the mathematical aspects until the on-campus session. These on-campus sessions, for external students only, were held for a whole day, twice a semester, when they would have back-to-back tutorials and work through the problem sets with the lecturer.

Macquarie University values feedback from students and staff on unit structure, content and delivery. Our academic staff, similar to educators around the world, are committed to improving the learning process for their students, particularly in view of recent technological advances (Bingham 1999). So, when in 2009 some of the lecturer's external students enquired about the possibility of having additional 'distance' sessions regularly through the semester in between the on-campus sessions, the lecturer contacted the Learning and Teaching Centre for advice on a possible solution.

The initial consultation between the lecturer and an Educational Developer took place in early December 2009. The lecturer explained how her course worked, how the tutorials were structured and how her internal students interacted to solve the weekly problem sets. In discussions, we focused on defining the needs of the solution and clarifying the lecturer's goals, which mainly centred on improving the learning experience of her external students by providing three extra tutorials, which would be interactive, multimodal and online. The project's main requirements consisted of a synchronous, interactive learning space for external students that had to be free of cost, have 6 - 15 users interacting via voice and an online 'whiteboard' space for drawing. Following the meeting, we drafted a Needs Analysis pro forma, with top and secondary priorities.

Table 1: Priorities of design solution

Top priorities:	• Voice option - lecturer and students to all have option to speak and listen • Drawing space - drawing mathematical functions / formula and diagrams; being able to 'rub out' and 'draw' correct function / fraction • Coloured pens • Free of cost
Secondary priorities:	• Coloured pens for different users AND colours available for lecturer • Text / chat box for students without microphone and for written discussion points by students • Session to be recordable for later viewing (has to be easy) • Facilities to link / upload / attach / show images, diagrams (jpgs already on file) • Participant list (so therefore some sort of log in or signing up facility) • Session needs to last from at least 1 hour and no more than 2 hours.

A project timeline was also defined by the Educational Developer and agreed upon by the lecturer.

Table 2: Project timeline

Dates	Steps
December, 2009	• Initial meeting, needs analysis, LTC to explore options
January, 2010	• Testing, evaluating and trialling in LTC
February, 2010	• Demonstrating and trialling with the lecturer to choose final solution • Tutorials, fine tuning of technical aspects; set up of online 'room'
Semester 1 begins: March, 2010	• First session with external students

Research and testing the possible solutions

An important element in any change or improvement in the educational process is having a collegiate collaborative approach (Fullan 1993). This is a key feature of the relationship the Learning and Teaching Centre Educational Developers work with their academic colleagues to research and implement emerging technologies. As Fullan explains, the process should be collaborative, not *co-optive*. As is illustrated in this project, the lecturer was fully involved in the process, not only in the process of initiating the project but also in setting priorities and needs.

An Educational Developer researched a number of possible solutions, deciding on their initial inclusion based on satisfying the lecturer's top priorities, which included an audio option, drawing space and no cost. These were culled down to nine online virtual whiteboard tools worth further exploration:

1. Twiddla (http://www.twiddla.com/)
2. skrbl (http://www.skrbl.com/)
3. Scriblink (http://www.scriblink.com/)
4. Groupboard (http://www.groupboard.com)
5. Dabbleboard (http://www.dabbleboard.com/)
6. Virtual WhiteBoard (http://www.virtual-whiteboard.co.uk/home.asp)
7. FREE Virtual Classroom! (http://www.wiziq.com/Virtual_Classroom.aspx)
8. GE IWB (http://www.imaginationcubed.com/index.php)
9. Scribblar (http://www.scribblar.com/)

Based on the lecturer's priorities and the structure of her on-campus tutorials, we determined the following Evaluation Criteria to evaluate the nine possibilities:

▪ Audio/Voice: the ability to speak and to hear other participants	▪ Drawing: freehand tool similar to a whiteboard pen
▪ Coloured drawing pens	▪ Free: no cost
▪ Session recordable: drawings, audio and chat to be saved and accessed at later time	▪ Facilities for images: import jpgs or other pictures / diagrams for use in tutorial
▪ Session times: length of free session / time limitations	▪ Text on drawing: a text tool to allow typing on the whiteboard
▪ Text / chat box: area participants can type responses or ask questions	▪ Room address: URL or unique address for the online whiteboard
▪ Coloured text for different users in text chat area	▪ Inviting users: by email? web link?
▪ Maximum number of participants	▪ Participant log in? or just enter room

The Educational Developer investigated each of the possible solutions and explored its features in an authentic learning context, looking at the interface, audio and drawing tools as well as any additional key features. An important aspect when analysing any online tool is the human aspect (DiMicco, 2005). Feedback from previous external students indicated that they valued the interaction with the lecturer and other students in the face-to-face problem-solving tutorials so it was essential the online tool replicated this.

While exploring and evaluating the online tools, comments were written to describe the features as well as a brief description of useability. See Table 3 as an example.

Table 3: Example of Research Criteria

	9. Scribblar	1. Twiddla	5. Dabbleboard	7. Free Virtual
	www.scribblar.com	www.twiddla.com	www.dabbleboard.com	http://www.wiziq.co sroom.as
Voice:	Yes, but need to test with someone else (volunteers?)	Yes, but need to test with someone else (volunteers?)	Yes, very easy and cool! Need a friend to test with. Is video and audio .. Need to test with computer without built in webcam. Can pause video. Test with 3 people to see if can see others	Yes, and can also and/or video for indi any tim
Drawing:	Yes, freehand, shapes, text box	Yes, freehand, shapes, text box	Yes, freehand and lines/arrows in basic set up plus can get shapes from 'Drawings'. Can group, flip etc. Has a grid (in settings) and also snap to grid. Has undo but can't see an eraser	Very good quality/h Pencil, thickness and basic shapes - all w thickness, also som also eraser, high emotico
Text on drawing	Yes	Yes	To type (also with maths functions) just click on page and start typing.	Yes and special M (under
Coloured drawing pens:	Yes, whole palette	yes, whole spectrum plus can have grid background, various pen thicknesses	Yes, 7 colours and 3 thicknesses	Yes, 16 co
Coloured pens for different users:	Yes, on name/chat .. and choice of pen colours, so would have to allocate colours first	I don't think so .. But need to test with more than 1 user	Sort of .. It shades behind your text a different colour	Yes has name in dif and content of tex everyor
Text / chat box:	Yes	Yes	Yes	Yes

The testing process resulted in four online whiteboard tools satisfying the majority of lecturer's Top and Secondary Priorities.

The trial of the possible solutions

The four possible contenders were then used in a 'live' setting with a group of three other Educational Developers, who were all located in separate offices. As the solutions had only previously been utilised with one user, an important part of the process was to test the technical aspects when used synchronously with 4 remote users, as would be the case with external students. In preparation for this testing process, online 'rooms' were created in each of the four tools (Scribblar, Twiddla, Dabbleboard and Free Virtual Classroom) and an activity was created which consisted of free play with the tools as well as collaboratively completing a Sudoku game and decorating a photo. We also extended the Evaluation Criteria to include aspects for teaching and learning, such as effectiveness to improve learning outcomes.

Some time was spent in each 'room' exploring the options and troubleshooting the tools. Discussions between participants through the audio function of the online tools were invaluable for the trial process as it gave a much clearer assessment of the strengths and weaknesses of the online whiteboard tool.

The Educational Developers completed evaluation forms for each online tool and a follow-up discussion was held with the group to compare findings and discuss strengths and weaknesses of each solution. No single online tool was a clear winner as each of the four had a number of positive aspects as well as some limitations. We tabulated the evaluation forms by ascribing a point value to the rating (4 for Excellent and 1 for Poor). The numeric transfer was somewhat compromised as all the team had not ticked all criteria. The comments were much more informative as far as describing strengths and weaknesses.

Demonstration of the final contenders

We then demonstrated the four final contenders to the lecturer, so she could make a more considered opinion about which ones to test with students. We supplied screendumps of each online tool together with notations of features, strengths and weaknesses. We also had copies of Educational Developers' evaluation forms and results, so the lecturer could ascertain the differences more easily. Each online whiteboard tool was demonstrated to give the lecturer an understanding of how the tool worked as well as an overview of its features and how it would suit her problem solving tasks. As she had not used a similar tool previously, we decided to involve her as a non-active participant. Her input consisted of asking questions, querying possibilities and making comments, which were recorded for future follow-up.

Each online tool provides a space on the Internet, that a number of computers can access simultaneously. The lecturer can interact with this space or 'room' using a computer mouse or an interactive whiteboard. The 'room' usually has a unique web address and some are able to be saved. The main differences between the final contenders lie in the tools provided, the screen layout and the audiovisual facilities.

Following the demonstration of each online whiteboard tool, we had a discussion that highlighted how the tool satisfied the lecturer's particular learning and teaching needs. It was concluded that:

1. Wiziq was too sophisticated, so the ones to trial with a student will be Twiddla, Scribblar and maybe Dabbleboard
2. The video aspect was not an important requirement
3. Preparing the 'room' at an earlier time, before the tutorial, was a major benefit
4. Saving the 'room' for later reference by students was also an advantage
5. Using a real interactive whiteboard would make the physical interaction with the online whiteboard much easier for the lecturer (rather than a PC and mouse).

It was essential for the lecturer to not only feel the tool satisfied the needs of her Distance Ed students but also that she would feel comfortable learning and using the tool herself. To this end, the educator needed to feel relaxed and confident with the technology, thereby ensuring the learning experience was positive for her as well as the students. Her comments and feedback about each tool's suitability were valuable and gave a much clearer picture about its viability.

The pilot with lecturer and student

The final step to decide on which online tool would best fit the lecturer's needs consisted of a practical trial with the lecturer and one student. Having added the interactive whiteboard as a key ingredient, we needed to find what resources were available in the university and organise booking of these. The lecturer coordinated one of her students to take part in the trial plus lab personnel to be available for technical issues. To facilitate this trial process, the student was located on a PC in the same room as us so we could easily talk through any technical problems.

An essential part of the process was to provide the lecturer with the technical skills to use the online whiteboard tool. Twiddla, the first online whiteboard solution was accessed. We worked with the lecturer to use the tools, master the IWB 'pen' and run the lesson. After doing some problem solving tasks, the lecturer and the student discussed the strengths and weaknesses of the online whiteboard tool. This process was repeated with Scribblar. With what the lecturer had learnt from these first two trials, in conjunction with the previous demonstration, it was decided that Dabbleboard was not going to be a viable solution so the pilot was concluded after the first two.

We compared these two online whiteboard tools, from the teacher's perspective (using a real interactive whiteboard (IWB) and from the student's perspective (using mouse and computer). Given the nature of the problems to be solved and the interactions between teacher and student that provide successful learning, it was decided Scribblar was the best solution. The pilot also highlighted that the audio set up, including headphones, could cause possible future technical issues for students.

Preparing for the first online tutorial with students

The lecturer aimed to mirror her on-campus tutorial structure in her online sessions with external students. During on-campus tutorials, students would take turns to demonstrate how they arrived at an answer for one of the problems in the weekly Problem Set. This solution, with working out, was written by the student on a static whiteboard in the classroom with the lecturer giving feedback and clarifying mathematical processes. The lecturer would provide further teaching and explanation as required.

For the first online session, the lecturer created a 'room' on Scribblar and set up introduction pages for her students. We also decided students would benefit from completing a Scribblar orientation task prior to the first online tutorial session. The Educational Developer created these tasks, with the aim being for students to become familiar with the Scribblar tools as well as to troubleshoot for technical

problems, which could then be solved prior to the tutorial. The lecturer gave us access to the Blackboard online unit as 'Teaching Assistant'. A 'How To' page was created that explained some of the tools used in the orientation task plus a link to a YouTube Scribblar demo video. We also created an Audio Set Up guide for students. These support materials and learning resources were posted in their Blackboard unit. A Discussion page was set up to:

- make announcements to External students about Scribblar tutorials,
- canvas their preference for the date of the first 'practice' Scribblar session, and
- provide a place for posting technical problems and solutions.

We located a more satisfactory interactive whiteboard for the lecturer to use. This one was located in a room that had excellent audiovisual facilities (microphones in the ceiling) as well as a Mimeo interactive whiteboard that had the choice of a digital pen as well as a felt nibbed electronic pen, for drawing. This suited the lecturer much better than the previous digital pen. The lecturer tested the use of the Mimeo board for Scribblar with an Educational Developer on hand to support her use of the technology as well as another Educational Developer in a remote location. This session was also a learning activity for the lecturer, allowing further experience to become more confident in using the Scribblar interface and tools.

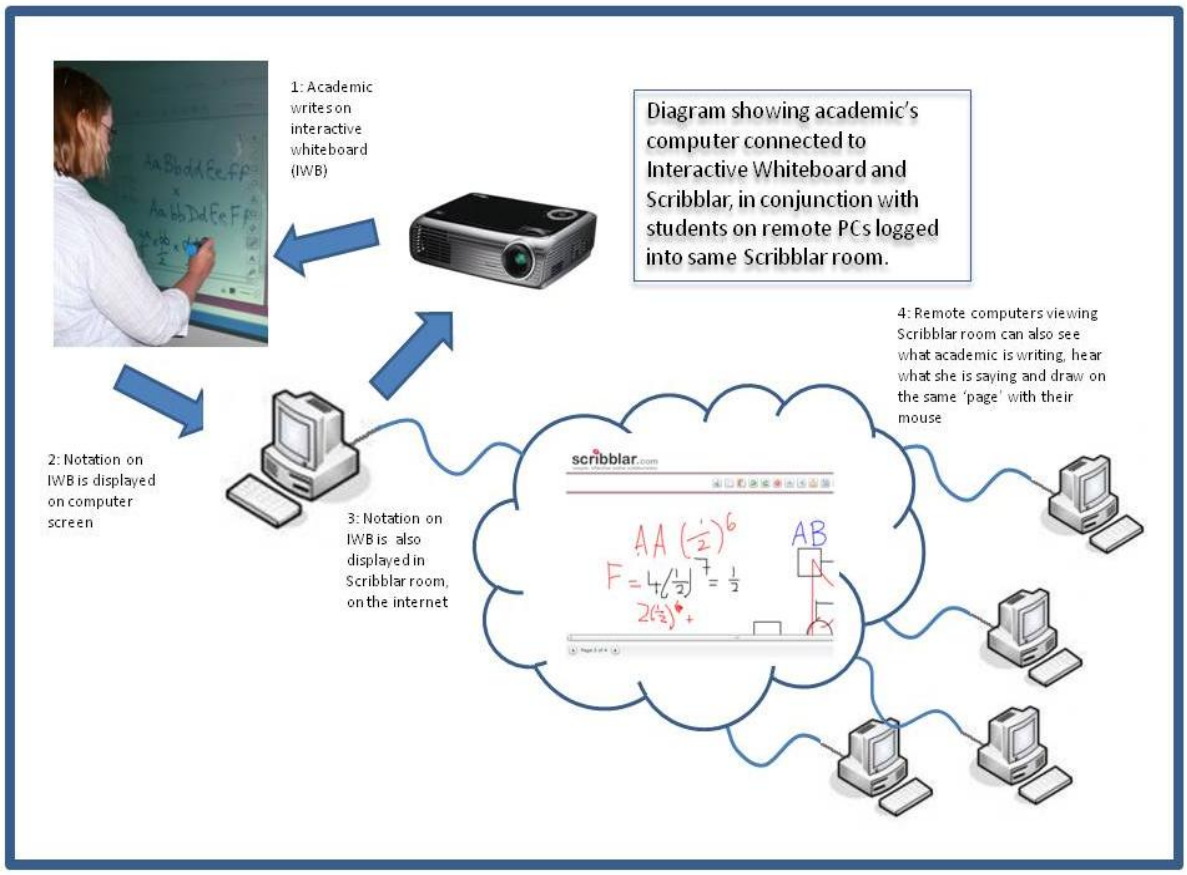

Figure 1: Diagram of the typical setup of the technology for an online tool

Scribblar online tutorial sessions

Three online tutorial sessions were held for the Distance Ed students enrolled in the Biological Sciences unit. The sessions were timetabled in the evening, from 5.30 to 7.30 pm and attendance was entirely voluntary. The first session was held in Week 3 of the semester, with nine participants attending, some staying for the whole 2 hours, while others arrived later or left earlier. The second session was held in mid-term break and was attended by seven students and the third session, a few days before the final exam, was attended by 8 students. Each session was run by the lecturer, at the interactive whiteboard, and an Educational Developer, who provided technical support for the lecturer as well as the students.

In an effort to reduce frustrations and technical problems, we also had a Science IT support person, and additional Learning and Teaching Centre staff set up for the first online session. The physical set up of the technology included a computer connected to a data projector and a Mimeo interactive whiteboard. This computer was also connected to the Internet. In the 30 minutes prior to the scheduled start, we logged in to the Scribblar 'room' and did a microphone and speaker volume check. We also logged in via a laptop so there would be an online support presence for the external students. As students began the log in process, the lecturer introduced the University staff in the room as well as doing a technical check with external students to see if they could hear her and if we could hear them. Some students had microphone issues and the Educational Developer tried to solve any problems by typing suggestions into the chat box via the laptop.

Once the scheduled starting time arrived and a number of students were logged in, the lecturer began the session. She firstly explained 'online' protocols that would facilitate the session. These included changing their written chat font colour so it was easy to discriminate between different students, muting their microphones unless speaking, using headphones if possible (otherwise mute), and saying their name before asking a question or providing an answer.

The lecturer then engaged the students in solving the sets of problems that had been set in previous weeks. She had previously set up the 'assets' section of the online whiteboard tool with jpg images to be used in solving and explaining the answer to the problem. She asked various students to solve problems on the whiteboard by drawing or writing the answer and showing the mathematical calculations. She also asked them to 'talk' through the solving process. If they made a mistake or didn't explain clearly, she would chip in and add some explanation or add to the student's notation on the whiteboard.

This tutorial process continued through the following 90 minutes, with different students contributing audio and written solutions to the problems. The final minutes were spent checking all students were happy with their understanding of the concepts and the solutions. The lecturer thanked everyone for their contributions and said that we would put some troubleshooting tips on to Blackboard. All nine participants either vocalised or text commented that they were positive about the session, indicating the online tutorial was successful.

A second online session was held in mid-term break and was attended by seven external students. This session was again successful with external students using the online whiteboard tool and audio to clarify problem-solving approaches. A third and final session took place a few days prior to their examinations, and following this, students were given the opportunity to respond to a short written survey. This consisted of questions relating to the evaluation of Scribblar as an interactive technology as well as its effectiveness to support their learning. We also asked what they thought about the online tutorial sessions in helping their learning, understanding and revising.

Discussion

Based on our observations, feedback from the lecturer and student survey responses, the goals of the online tutorial sessions appeared to be met. The lecturer and students were involved in working through steps in the problems, communicating effective problem-solving strategies and illustrating these via the online interactive whiteboard. Students participated via drawing on the whiteboard, speaking through the audio function and text chatting. The online sessions were an effective way for external students to benefit from collaborative and shared problem-solving activities. Students had a chance to ask questions, take an active role in demonstrating answers and also to clarify their understanding. By the end of the sessions all students had had opportunities to demonstrate their problem-solving technique, consolidate their understanding of any aspects and ask for further explanation. During all three online sessions, there were very few technical issues and those that did have difficulties were confined to audio issues or the occasional broadband disconnection.

Current practice in Higher Education has been influenced by emerging technologies and how they can enhance learning (Thomas and MacGregor 2005). Following the first on-campus face-to-face session, which was held on the Saturday after the first online session, the lecturer reflected on the possible differences between this year and previous years and summed up the main advantage as being able to proceed through more problems with less re-explanation. In general, the online sessions provided extra

support and tutoring for those students who needed it. Although understanding was not assessed, the responses from students suggested they perhaps gained a greater understanding of the concepts and skills involved in the activity. Student feedback also indicated that they valued the online sessions and found the opportunity of engaging with the lecturer and the problem sets to be useful for their learning.

A key aspect of our project was the collaboration and evaluation process between the Learning and Teaching Centre and the lecturer to find the best solution to mirror the on-campus tutorial in an online synchronous session. Web 2.0 tools and emergent technologies can provide many opportunities for synchronous and asynchronous communication. This is not just a recent development. In the 1990s, educators were looking to find ways for learners to communicate outside the classroom timetable and physical location (McComb 1994). During the course of this project, it became obvious that there were a plethora of tools available. It also became clear that many Web 2.0 tools are similar and a considered evaluation process, with relevant evaluation criteria, is important for ensuring that the right tool is chosen.

The collaboration between academic staff and Educational Developers also extended to the running of the online tutorial sessions. Although the lecturer had a good mastery of the online tool, there were certain implementation complexities that arose during an online session. These included balancing the teaching process with utilising and managing the technology. The presence of the Educational Developer provided support and troubleshooting of technical issues as well as ensuring the lecturer seamlessly utilised all Scribblar tools and features which minimised frustrations for both her and the students.

Issues raised in this trial indicate that more evaluations of the online tool would be advantageous. This could be carried out with larger groups of students to examine the scalability of the tool. The potential of the Scribblar solution could also be evaluated for other subjects and for other group problem-solving tasks or activities. Analysis of technical issues, home computer type, broadband service and audio equipment could provide further information for streamlining the online tutorial sessions.

This report and the Scribblar solution raise questions about the levels of engagement of students and whether this impacted on their learning. Further studies could examine how students found the sessions and whether their levels of engagement and use of the Scribblar tools helped their acquisition of knowledge and skills. Research should focus on the interactions of the students and the lecturer, how the online sessions impacted on the following on-campus sessions and on the students' mastery of the problem-solving specifically.

A secondary benefit was the learning community that the online sessions provided. External students had heard the lecturer's voice via lecture recordings prior to the online session but she hadn't heard theirs nor had they made personal contact with each other. Future projects could include capturing the online synchronous sessions and providing these as video podcasts for students who could not attend the session.

Conclusions

Reflection on this project and the process of collaboration between the lecturer and the Learning and Teaching Centre, from initial needs analysis through to realisation of a successful solution with students, indicates an effective process is in place at the University. This process includes providing technical advice and possible solutions for lecturers, who although enthusiastic and have clear goals for their teaching, have little time to undertake the testing and trials of emerging technologies that the Educational Developer group can facilitate. The process also highlights the value of ongoing support, technical facilitation and collaboration to ensure a positive experience for both lecturer and student is achieved and maintained.

Results also suggest online tools can promote improved learning outcomes for students. In this project, the students were studying via Distance Ed and the provision of the online synchronous sessions using Scribblar created a vehicle for providing effective tutorials that were previously impossible for remotely-located students. Following the three online sessions and subsequent feedback from students, the lecturer has indicated this online activity will be incorporated in future courses.

Although this project had clear limitations, specifically being only one lecturer and a small group of students, it indicates further trials and studies should be undertaken. Increasingly, university courses consist of a blended learning environment, with a mix of on- and off-campus activities attended by internal and external students. Online interactive whiteboard tutorial sessions could be utilised across this blended environment and used in peer tutoring sessions, across both groups of students.

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