Learning Technology by Collaborative Design and Evaluation

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Abstract: Forth Year Secondary Education students spent five weeks working in pairs to design and develop a web-based learning/teaching resource as their course assignment. Prior to the final submission, the students had their web-based learning resources reviewed by two pairs of peers by using Camtasia. The recorded screen movements were then uploaded as videos to EVA where the students viewed the videos and discussed the peer critiques. The innovative approach was well received by the students.

Conceptual Framework

How to prepare pre-service teachers for technology use in the classroom is an enduring issue. It is commonly agreed that pre-service teachers would benefit the most from exposures to technology integration modeled by curriculum subject faculty members. Yet, in reality, practical reasons often make it difficult for teacher education institutions to take this approach. As a result, stand-alone technology course continues to exist as an important venue for pre-service teachers to be prepared for technology integration in the classrooms. A frequently asked question is how stand-alone technology courses can best prepare pre-service teachers.

Mishra and Koehler (2006) advocate an approach of learn-technology-by-design for preparing technology integration, in which pre-service teachers "propose software and hardware solutions to their specific contexts and problems" (p. 1034). Instead of "direct instruction about particular software programs or technology", pre-service teachers have "spontaneous and short tutorial sessions - both student to student and instructor to student-driven by the immediate requirements of the groups" (p. 1034). Design-based learning activities are usually carried out in groups and pre-service teachers develop deeper understanding through the experiences of "dialogue and action" and "reflection in action" (p. 1035).

Learn-technology-by-design tasks are accomplished in the environments where pre-service teachers feel comfortable working collaboratively and are encouraged to use ICT tools to build a learning environment where learners could benefit from peer interactions and working collaboratively. Joint construction of knowledge and sharing cognitive load facilitate higher levels of learning (Ploetzner, Dillenbourg, Preier & Traum, 1999), and the possibility of exchanging multiple perspectives forces learners to engage with ideas in a deeper sense (Anderson, 2003).

Research Context and Method

All the 4th year Secondary Education students at the University of Sydney take a compulsory 10-week course (20 hours) – Information Technology in Education. The overall objectives of the course are to create awareness among pre-service teachers of issues related to ICT integration, such as policies, affordances of various ICT tools, and strategies of integrating ICT tools into teaching and learning process. Students are expected to learn at least two technical skills in the course: (1) interactive whiteboard and (2) web page creation. Focuses on these two specific technical skills are in line with the recent development in the national and local educational systems. As part of a recent national initiative, schools are provided with interactive whiteboards and all students from Grade 9 are provided with a laptop computer.

Of the 10 weeks, eight are devoted to the development of the technical skills specified above via two design tasks. Both design tasks follow learn-technology-by-design approach. The tasks are problem-centered and are driven by the solutions to teaching/learning needs. Learners work collaboratively and engage in reflective practice in the design process. For example, for the web page creation (five weeks), students are presented with a problem scenario where they are presumably in-service teachers asked by their superiors to design a short web-based student-centered learning activity that integrates environmental education. To accomplish the task, students would have to demonstrate that they are able to create a simple website consisting of three linked pages. Further, they need to demonstrate that they are able to embed two activities in the website by employing different software applications to enhance intended students' learning. For instance, a website aimed at brining awareness of the air pollution caused by car emission could embed (1) an Excel sheet where learners could calculate car emission, and (2) an online forum where they could discuss the impact of air pollution on the environment. Both design tasks require students to work in pairs.

Prior to the final submission of the web creation task, students have their web pages reviewed by two pairs of other students. To complete the peer review, students go through their peers' web pages and fill out a paper-based peer review form abstracted from the assignment marking criteria. Students are also offered with the opportunity of using screencast software Camtasia and educational video with collaborative annotations (EVA) in their peer review process. Camtasia allows recordings of screen activities (mouse movements and

clicks) and students' conversations while going through the pages being reviewed. EVA is a web-based teaching and learning platform that consists of video streaming, indexed video cue-segments, and associated list of users' annotations (Wong & Reimann, 2009). Consequently, students view the video recordings and discuss the peer feedback via EVA. This report is based on the data collected from 18 (9 pairs) students from an intact class in 2009, focusing on the students' perceived benefits of collaborative design and evaluation. The data was gathered from the students' project development reports and reflections. The report does not include the analysis of the peer evaluation or the impact of peer review as a formative evaluation on the students' final work, which have been reported elsewhere previously (Hu, Wong, Fyfe & Chan, 2010a, 2010b).

Findings and Discussions

All the students responded positively to the approach of learn-technology-by-design. The students considered working collaboratively to design/develop web-based learning activity a meaningful experience. One pair of students described how they originally planned a learning task that asked students to create a poster by using Word or PowerPoint. After some discussions, they decided that the task "would not attain much success in terms of interactive learning, as well as a strong encapsulation of ICT". Instead, they decided to embed an Excel sheet in their webpage with which "students are able to interact with the use of technology, whilst at the same time gaining a visual aid on the unit that is being taught to them".

The students were overwhelmingly positive about the formative evaluation through peer feedback. One student wrote: "I particularly enjoyed the opportunity to give others critiques of their creation and also receive critiques from our peers of our own creation. This process allows us to constructively learn from other people how we can improve our design". The students especially welcomed the possibilities provided by the technologies that enabled them to see how their peers had navigated their web pages and to hear their comments at the same time. One student wrote in the reflection, "my partner and I felt that our website was easy to navigate and clear to understand". However, having watched how their peers used their pages, "it became clear that our site was a little more convoluted than we had first thought, and we had the advice we needed to create a more successful web page". This comment was echoed by another pair of students, "by watching and listening to them as they navigated our website, it was easy to see the confusion we caused through our instruction and the way we designed the page". "Most of the peer feedback we received helped us to rectify issues that students might face when navigating there way through our webpage", said another pair of students.

The design process seemed also have deepened the pre-service teachers' understandings of the affordances of the Internet technology, and better understanding have apparently made them to think more about how such technology may be used to improve their teaching practices. One of the frequently reported experiences by the students was their changed views of how the Internet should be used in teaching/learning process. One student wrote in the reflection, "My previous understanding of web-based learning was merely to use a search page as a means of research to complete paper-based activities but with my understanding of web 2.0 I now know that this is undervaluing a very useful tool of critical and reflective learning. I also can see that students would feel critically engaged and in control of such activities which would foster their drive to learn". Perhaps the most important outcome of the learn-technology-by-design project was the fact that some pre-service teachers experienced conceptual change and become more positive about technology integrations in the classroom. One student pointed out that the specific strategies experienced in the collaborative design and peer evaluation could be used in their future classroom "as one way to engage students".

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