Learning by Collaborative Design and Evaluation

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Abstract: This paper presents the preliminary findings of a learn-technology-by-design conceptual framework in an ICT in education unit of study. One-hundred and twenty pre-service teachers participated in the study. Data sources included annotated video feedback, reflective journals and pre- and post-tests. Initial findings demonstrate that the design process deepened the pre-service teachers’ understandings of the affordances of Internet technology and that pre-service teachers had increased their technological, pedagogical and content knowledge on completion of the course.

Introduction
This paper presents the preliminary findings of a learn-technology-by-design study aimed at developing pre-service teachers’ technological, pedagogical and content knowledge (TPACK). The limited and inadequate amount of training that pre-service teachers often receive before entering a classroom means that, in many cases, they feel that they do not have the technical support, the skills, and a pedagogical rationale for implementing information and communication technologies (ICT) in the classroom (Hu, Wong, Fyfe, & Chan, 2010; Lee, 1997; Mishra & Koehler, 2006). Concomitantly, pre-service teachers have been shown to lack the confidence to use ICTs in the classroom (Angeli, 2004; Lee, 1997). This paper discusses how technology-mediated peer review helped pre-service teachers improve their understanding of the affordances of the Internet for student learning and the issues involved in designing web-based activities that promote learning.

Research Design
We used a collaborative approach in both the design of the tasks and the critical feedback through a peer review process. Mishra and Koehler (2006) advocate an approach of learn-technology-by-design for preparing for technology integration. Design-based learning activities are usually carried out in groups and pre-service teachers develop deeper understanding through the experiences of both dialogue and reflection in action. Rather than providing a generic skills course, tutorial sessions were designed so they adapted to the learning needs of the pre-service teachers. This allowed the focus of the lesson to be on the use of innovative tools to model effective ICT integration in teaching. 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 pre-service teachers could benefit from peer interactions and working collaboratively. There have been numerous studies on cooperative and collaborative learning which have focused on benefits, such as motivation, social cohesion, and higher levels of learning (Johnson & Johnson, 2002; Slavin, 1996). We adopted an ADDIE (Analysis, Design, Development, Implementation, and Evaluation) (Dick, Carey, & Carey, 2001) model for the learn-technology-by-design task to guide the design process.

Data Collection and Analysis
This study involved two different cohorts of 4th year pre-service teachers in Bachelor of Education degrees: 14 pre-service teachers in the primary education program and 106 pre-service teachers in the secondary combined degrees program. Pre-service teachers attended their respective courses for 2 hours a week over a 10 week period during Semester 2, 2011.

The task required pre-service teachers to develop a teaching and learning web resource. The design task was carried out via two separate activities that were completed in pairs (Figure 1). In order to accomplish the design task, pre-service teachers would need first to become familiar with the school curriculum and their subject area. They identified a specific topic or concept that they believed to be difficult for teachers to teach and for students to learn. The first activity required pre-service teachers to develop a website using the Google Sites tool. The pre-service teachers then evaluated two of their peers’ websites. The pre-service teachers were provided with a scaffold to guide meaningful and effective feedback to their peers about their web resource. The evaluations were recorded using Camtasia screen capture software, which recorded the audio, webcam and onscreen movements. The recordings were uploaded to a video annotation platform (EVA).

There were four stages of the data analysis. Firstly, pre-and post-test TPACK surveys were administered and were measured for differences. Secondly, pre-service teachers’ reflective journals were analyzed using a constant comparative method. Thirdly, the video recordings were transcribed and then coded to...
determine patterns and themes. Finally, on the basis of the preceding steps, the participants ICT literacy was examined and a narrative of the main results was constructed.

![Collaborative Learn-technology-by-design](image)

**Figure 1.** Workflow of collaborative and individual components of the assessment.

**Preliminary Findings and Conclusions**

The courses described in this paper tried to prepare pre-service teachers to be fluent in both pedagogy and basic design theory so that they may use newly acquired ICT skills to produce educationally sound web-based learning resources (Hu, et al., 2010). This study extends earlier research by Hu, et. al. (2010), who found that the pre-service teachers became too close to their products to detect the inadequacies of their design. As shown in this study, the feedback obtained from peer assessment helped pre-service teachers modify their designs. The process worked as a source of support, ideas and encouragement crucial for the accomplishment of the set task. Such an experience should encourage pre-service teachers to value peer review for both pre-service education and future professional growth.

Pre-service teachers displayed engagement in the activities of recording evaluations and watching peer videos for the peer assessment task. The capturing of peer assessment in the form of video and audio created a “novelty” aspect within the task that was reflected in the pre-service teachers’ engagement in the task. Pre-service teachers were able to access the video evaluations off-campus and this garnered a positive response. The way ICT was integrated in the teaching and learning processes of the course meant we were able to demonstrate its effectiveness. Moreover, pre-service teachers were able to experience the tools and pedagogical strategies firsthand, which is supported by Merrill’s (2002, p. 43) assertion that learning is best promoted when new knowledge is demonstrated to the learner. The ADDIE model (Dick, et al., 2001) used in the project task to guide pre-service teachers through the development of their web-based resource strongly focuses on “evaluation”. This aspect of the process was significant in that pre-service teachers learned about evaluating their designed artifacts [resources] and the design process itself. Above all, we have been able to evaluate the integration of ICT approach adopted in the design of the course through the administration of pre-and post-tests adapted from Schmidt et al.’s (2009) instrument. Early analysis has shown significant increases in pre-service teachers’ TPACK. This research is noteworthy on a practical level because it demonstrates successful student engagement with ICTs to support and enhance learning.

**References**


