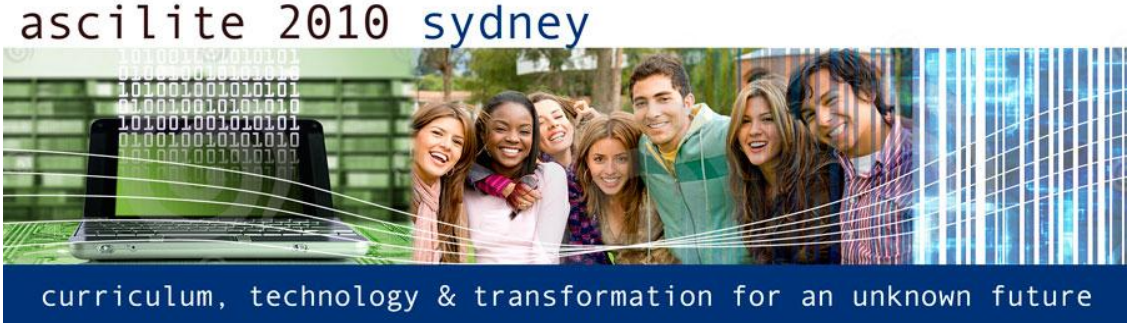

They think they are learning, but are they? Strategies for implementing Web 2.0 to positively impact student learning

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University instructors worldwide are implementing Web 2.0 technologies into their teaching as a means of improving and enhancing student learning. Although the affordances offered by Web 2.0 technologies appear to provide increased opportunities for high levels of reflection and higher-order thinking, they are not always used to their full advantage. This paper reports a case study of a tertiary instructor using eportfolios. The results showed limited instances of high levels of reflection demonstrated by the students using the eportfolio application. A number of instructional strategies were identified that encouraged reflection in the *writing process* but not in the *eportfolio process*. Based on the findings of the study, several instructional strategies are suggested to be considered when implementing Web 2.0 technologies in tertiary education. This study forms part of a larger investigation which will combine these outcomes to develop some principles for better use of Web 2.0 to enhance student learning.

Keywords: Web 2.0, instructional strategies, eportfolios, higher-order thinking, reflection

Introduction

Computer-mediated technologies are increasingly being introduced into university teaching and learning settings as possible contexts for higher-order learning. Recently, a trend has been to move away from technologies that support primarily an individualistic cognitive approach to social-networking technologies which offer support for social constructivist learning. Because these tools, referred to as 'Web 2.0 technologies', offer read/write features, they are often praised for their interactivity and social networking capabilities which can lead to participatory knowledge building and collective intelligence (Barrett, 2008). With the surfacing of Web 2.0 technologies has come an emergence of e-learning applications used in educational settings (Roberston, 2008, p.425; Lambert & Kidd, 2008).

Web 2.0 technologies boast several advantages to the learning context. Lambert and Kidd (2008) suggest that these technologies are learner-focused and put the power of creation and distribution in the learners' control, unlike the popular use of learning management systems in the Web 1.0 era which encouraged learners to 'passively absorb others' information' (p.6007). Specific affordances of Web 2.0 that have implications for educational settings include: connectivity and social rapport; collaborative information

discovery and sharing; content creation, knowledge and information aggregation, and content modification (Lee & McLoughlin, 2008, p. 3826-3827).

Despite the growing popularity of Web 2.0 in e-learning, Al-Senaidi (2008) suggests that there may be repercussions from the use of these technologies for learning and teaching that should be studied in-depth. Lambert and Kidd (2008) note that Web 2.0 tools may cause cognitive overload for students and thus 'distract from development of a real understanding of content' (p.6004). Furthermore, Lambert and Kidd (2008, p. 6004) believe that 'there is often a gap between designers' assumptions, student opinions, and learning that actually happens in e-learning environments'.

Instructors are often using new technologies without taking advantage of the affordances the technology offers and thus providing little value-add to student learning (Holmes, 2009; Harmon & Jones, 2006). Further research is needed, therefore, to investigate how Web 2.0 technologies can be used in tertiary environments to promote meaningful learning (Lambert & Kidd, 2008; Lee & McLoughlin, 2008).

Electronic portfolios as learning tools

One increasingly popular Web 2.0 concept is the electronic portfolio (eportfolio). Eportfolios, an innovation arising in the early 1990s (Barrett, 2001) are, essentially, an extension of paper portfolios that combine the use of electronic technologies to create and publish a portfolio that will likely be viewed using a computer (Barrett, 2001). Gordin, Grueneberg, Laff, Lam, and Martinez (2003, p. 2163) suggest that 'ePortfolios are today's horseless carriages: A new technology described in yesterday's terms'. Technologically, there seem to be many advantages to using eportfolios in higher education, not the least of which is the space-saving capacity of eportfolios as compared to their paper-based counterparts (Gathercoal, Love, Bryde, & McKean, 2002). In a virtual environment, students are able to house several different forms of artefacts, including images, audio files, videos, Word documents, PowerPoint slides, spreadsheets, and so on (Botterill, Allan, & Books, 2008, p. 72). Unlike paper portfolios which require physical space, eportfolios make it possible to keep a substantial archive of students' work with multiple revisions (Greenberg, 2004, p.30). Furthermore, Barrett (2006) suggests that using Web 2.0 to create eportfolios provides the 'potential to change with the ***pedagogy*** of interaction'; in the virtual environment, instructors can view students' artefacts and provide immediate feedback (Gathercoal et al., 2002). Students can also share their eportfolios with and receive feedback from anyone in the world, thus taking advantage of the collaborative learning capacities of eportfolios (Wang, 2009). Finally, eportfolios offer students ownership of their learning: students have total control over their own portfolios, what goes in them, and who can see them (Gathercoal et al., 2002). According to Greenberg (2004, p.30) 'digital convergence, affordability, and ease-of-use are creating portfolio opportunities for more disciplines while enhancing the opportunities for fields with long portfolio traditions'. Indeed, in the last decade, the use of eportfolios in higher education has increased as a way for students to document and showcase their work (Lambert & Corrin, 2007).

Two assessment purposes are generally cited for implementing portfolios in disciplines across tertiary education: process and product (Wilson, Wright, & Stallworth, 2003). The process of creating, or adding to, an eportfolio includes the ongoing documentation and analysis of experiences (Wilson, Wright, & Stallworth, 2003). Essentially, eportfolios as a process describes the procedure students engage in to consider significant experiences (for example, in teacher education, often teaching experiences) and choose relevant artefacts to demonstrate competence in a prescribed area or skill. In the eportfolio process, students reflect on their achievement, on their rationale for the selection they have made, and on the overall portfolio (Barrett, 2001). This process is thought to promote meaningful learning. The product of the eportfolio process is considered a representation of knowledge and competence (Wilson, Wright, & Stallworth, 2003). It is the product that students can show to educators and employers to demonstrate understanding and ability in a host of competencies and skills. In teacher education, students often use their eportfolios to demonstrate achievements and growth across a range of government-prescribed competencies.

Eportfolios and reflection

One of the primary affordances enabled by eportfolios is their potential to be implemented in a way that fosters and encourages reflection. In order for student reflection in the eportfolio process to lead to meaningful learning, however, instructors need to ensure students are engaging at the highest levels of analysis and evaluation. Reflection is a complex process comprising of several levels: stimulated reflection; descriptive reflection; dialogic reflection; and critical reflection (Strampel & Oliver, 2007). Essentially, when presented with new information, the student begins an analysis of the experience, taking into account his/her emotions and reactions to the experience (stimulated reflection). In an attempt to make sense of the new information, the student may use prior knowledge and past experiences to help describe the experience or event in a detailed way, with reasons and justifications for actions, whilst avoiding judgments and identifying others' views and perspectives (descriptive reflection). If the student continues to engage in reflective thinking, he/she will then re-evaluate the experience and be able to create possible alternative solutions and thus engage in conceptual change (dialogic reflection). Finally, students who engage in the highest levels of reflection will be able to critically analyse the situation or event, decide on appropriate action, and evaluate new decisions (critical reflection).

There are several cognitive behaviours that are associated with the levels of reflection. Being presented with new information, places the learner in a state of cognitive disequilibrium. When the learner tries to make sense of the new information using prior knowledge, she engages in cognitive retrieval and challenges her existing knowledge to make sense of the new information. Conceptual change occurs when the learner begins to critically analyse the situation and synthesize and integrate knowledge. Finally, when the learner is able to make decisions about following actions, she should be able to apply her new knowledge to a variety of situations. It is this transformation and application that tertiary educators should be fostering and encouraging with the use of Web 2.0 technologies. Presently, however, instructors are often having students create eportfolios for the product, rather than the process. The result of this is that many opportunities are missed for high levels of reflection leading to transformation and application. To ensure enhanced student learning outcomes, eportfolios should be used to their full advantage.

To better understand how instructors can design learning settings that use eportfolio technologies to promote reflection, we have undertaken a number of studies in tertiary classrooms. This paper describes a study that sought to investigate the factors impacting on the levels of reflection achieved by students by exploring:

1. The levels and scope of reflection demonstrated by students in eportfolio related activities.
2. The influence of instructional strategies employed by the instructor on the scope and form of student reflection.

Methodology

A case study was conducted with a first year class in the Bachelor of Education at an Australian university. The instructor of the unit volunteered to participate in the case study after communicating personally with the researcher. The instructor had previously used traditional paper portfolios in other units but was making the transition to eportfolios. As a result of this decision, she was particularly interested to know if using an eportfolio version of the traditional teaching portfolio was an effective way for students to document their reflections. The data gathered to explore the research aims included:

1. An instructor pre-activity questionnaire (open-ended), completed prior to the implementation of the learning activity. This questionnaire sought information about how the learning environment was constructed and how the instructor perceived the task to promote reflection.
2. A student questionnaire (Likert-style and open-ended), administered in-class after the eportfolios had been completed and submitted. The student questionnaire canvassed student perceptions in three main areas: the learning environment; levels of reflection; and stages of cognitive processing.
3. An instructor post-activity questionnaire (open-ended), completed after the activity was complete and the instructor had a chance to read through and provide feedback to student work. The questionnaire asked for the instructor's comments on the success of the activity, any changes that might be made in

the future to improve the activity, and the instructor's perceptions on the levels of reflection evident from the task
4. The eportfolios, maintained by students, were also used as data to provide evidence regarding the amount and levels of reflection being attained in the task.

Following the approach of qualitative data analysis outlined by Miles and Huberman (1994) the questionnaires and eportfolio pages were searched and organised around emergent themes and patterns including aspects of the learning environment and levels of reflection. The quantitative data from the student questionnaires was organised by descriptive statistics in SPSS and compared to the qualitative data to help guide the researchers in finding areas of interest. The student data was compared to the instructor data to triangulate data sources and identify common themes. The data was read and analysed by two separate researchers to ensure validity of findings.

Description of learning environment

As this unit was a first year, first semester class, the students were new to university and thus to teacher education. They had not previously created or maintained a professional teaching portfolio. This unit offered students the opportunity to create an eportfolio using the template provided on the School's learning management system. It was explained to students that the hiring process of teachers was very competitive and thus developing and maintaining an up-to-date professional portfolio during the four years of their pre-service education was essential. Students were told that their eportfolio should contain evidence of their 'understanding about learners and learning and [their] teaching skills' (Unit Plan, 2008, p.10). Students were strongly encouraged to link the evidence and artefacts they included in the portfolio to the *Competency Framework for Teachers*, developed by the Education Department of Western Australia. The Unit Plan (2008, p.10) suggested the purpose of the eportfolio was to provide students with a structure in which they could: write professional reflections about teaching and learning experiences; audit learning in terms of the Teacher Competencies; collect evidence of learning; and, begin building a Professional Portfolio for presentation to significant stakeholders.

Creating the eportfolio was not an assessment item in the unit, but students were encouraged to create and maintain an eportfolio, which they could continue to develop throughout their teaching career. The following sections describe the learning design by considering the learning task, learning supports and learning resources (Oliver & Herrington, 2001). The learning task is described in terms of what students were asked to include in their eportfolio. Learning supports describes the instructional support available to students throughout their creation and development of the eportfolio. Learning resources discusses the resources provided to students to give them the content and information they needed to be able to complete the task and the development of their eportfolio.

Learning design

The task required students to analyse their implementation of Learning Experience Plans that they had created. Students were given the opportunity to engage in 'guided critical reflection' (Unit Plan, 2008, p.8) in which they were encouraged to relate their classroom observations to their personal teaching experience and their readings to the content of lectures and tutorials (Unit Plan, 2008). Specifically, students were asked to write a 'reflection' of the effectiveness of the learning plans they had implemented during Professional Practice. Within their writing, they were required to refer to the evaluations they had made on their learning plans at the time of implementation and include their Mentor Teacher's comments. Students were also required to discuss any modifications they had made to the lessons and provide reasons for changes. Finally, students were required to submit the piece of writing in their eportfolio.

In terms of supports to aid students' analysis of the teaching process they had engaged in, the instructor introduced the students to the *5R's Writing Framework* (Bain, Ballantyne, Mills, & Lester, 2002) which describes five components of reflection, as taught by the School of Education. The Unit Plan also provided some prompts for students to follow. The instructor also provided several learning resources to students to assist them in completing the task. To give students the information and content they needed to complete

the eportfolio activities, they had access to the unit textbook, other unit textbooks, and a list of both useful websites and significant references.

Results

Sixteen students participated in the study. Twelve of the sixteen participants included the 'Reflection' page in their eportfolios. From analysis of the eportfolios, it was found that 100% of the pages demonstrated evidence of both stimulated and descriptive reflection; 50% of the pages demonstrated dialogic reflection; and, none of the pages demonstrated evidence of critical reflection (Figure 1). The following sections describe the evidence of reflection found in students' eportfolios.

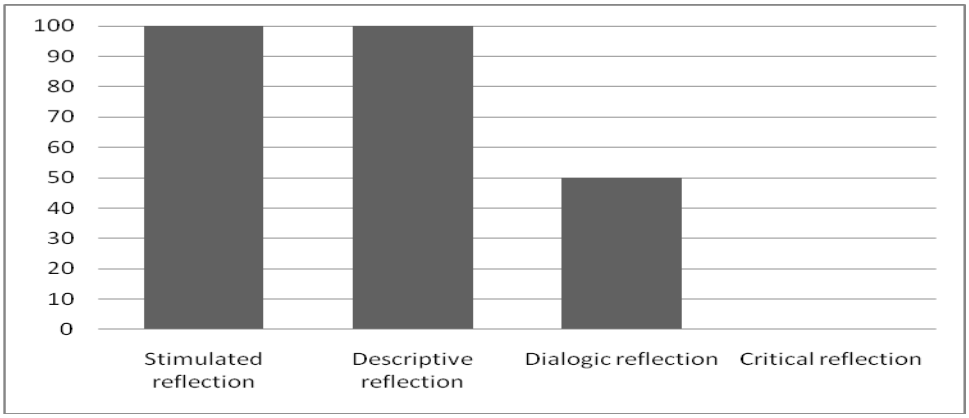

Figure 1: Percentage of students' eportfolio pages with evidence of reflection

Stimulated reflection

All twelve Reflection pages demonstrated some form of stimulated reflection on the teaching process. The pages described something as new, or different, and sometimes exciting. The situation that was new to the students was the actual implementation of their Learning Experience Plans. All twelve pages gave a detailed description of the two lessons the students implemented as a new situation. Some of the pages also briefly mentioned the emotions the students were feeling regarding the lessons.

Descriptive reflection

All twelve Reflection pages demonstrated evidence of some form of descriptive reflection on the teaching process. Essentially, the students followed the task instructions very well (utilise your Mentor Teacher's comments...discuss any modifications you made...and why you made them), which resulted in detailed summaries that acknowledged alternate views and provided reasons for actions.

Typically, the pages demonstrated evidence of students recounting their teaching experience, using the lesson plans, in great detail whilst providing reason and justifications for actions when necessary. For example, in one page, the topic of the lesson was described in detail ('This lesson covered several activities involving symmetry with the purpose to give students and understanding of what symmetry is and be able to identify...'); issues that arose with the implementation of the lesson were summarised ('I did not manage my time effectively, and should have spent longer on each activity'); and modifications made to the second lesson because of this experience were explained ('Initially I had planned a number of activities for my second lesson on Symmetry, but after my first attempt...I decided to focus on the one activity/skill'). In this page, learning that occurred in university lectures and tutorials is also used as justification for actions. Many of the eportfolios also demonstrated an acknowledgment of alternate views, either the mentor teacher's and/or other student-teachers in the same class.

Dialogic reflection

Six of the twelve eportfolio Reflection pages demonstrated some form of dialogic reflection on the teaching process. This number correlates strongly to the students' perceptions of the level of learning they had engaged in. Only 54% agreed that the task had helped them change their previous thinking; 69% agreed that the task had helped them create something new or generate new ideas; and, 58% agreed that the task had helped them change their understanding of several concepts. The six eportfolio Reflection pages that did demonstrate dialogic reflection on the teaching process provided some indication that the students had examined the teaching experience after it had occurred and begun to imagine and explore alternative actions they could have taken to improve the experience, and that they might take if they teach the lesson again. Of the six pages that provided evidence of dialogic reflection on the teaching process, four did so in a very limited way, using very general terms. One page, for example, described the reward system already in place at the primary school and the student noted that she will 'aim to use it more often'. Two of the eportfolios provided more detail regarding the alternate actions the students could have taken. For example, one student writes 'I might just need to go around to the students individually', this is a very specific action item the student has taken away from her review of her teaching experience. The same student also noted that if her students were having difficulty with a task, 'simplifying or reducing the number of questions might be necessary'.

There were six eportfolio pages that showed no evidence of dialogic reflection. These pages tended to simply summarise the teaching experience, while providing reason and justification for actions, and often acknowledging others' views, but they did not challenge previous assumptions or begin to imagine or explore alternatives. Generally, it seemed that half of the students took the stance that 'what's done is done' by simply recounting the story of the teaching experience, while the other half went a step further than recounting and began to analyse the experience.

Critical reflection

Although half of the students' Reflection pages demonstrated some form of dialogic reflection on the teaching process, thus suggesting that the students had begun an analysis of the experience, there was no clear evidence of critical reflection in any of the Reflection pages. The pages that demonstrated dialogic reflection suggested that the students had learned a takeaway message from the experience, namely alternative actions they could have applied to change the outcome of the experience. It seems that these students, while able to explore alternatives, were not quite willing to justify a change in action and apply their actions to other scenarios. Had the students engaged in critical reflection on the teaching process, their eportfolio pages would have demonstrated that the students were able to consider how alternative teaching methods could be successfully employed in different scenarios.

It was interesting that data from the student questionnaire suggested many of the students believed the task had prompted them to engage in aspects of critical thinking. For example, 65% agreed that the task had helped them change the way they would normally do things. Of course, this corresponds to the previous discussion in that many of the students decided that in future teaching practice they should 'speak louder...and in more detail', etcetera. Quite a few of the students, 77%, also believed that the task had helped them critically analyse an event. It is possible that students did critically analyse their teaching experience and this was not visible in the eportfolios, or it is possible that at the first year level students' perception of what critical analysis is varies from that of tertiary instructors. Interestingly, 85% agreed that the task had taught them concepts that would be useful in their career but only 69% agreed that they understood how to apply what they had learned to other parts of the course. This demonstrates that students were able to picture themselves teaching in their careers, after having taught lessons as a student-teacher, but could not see how their learning was applicable to other university learning situations.

Factors influencing the levels and types of reflection

In this study, students were required to add to their eportfolios in a manner prescribed by their instructor. The intentions of the task were twofold: to help students expand their teaching portfolios so that they would

be completed by the time students graduated and needed to register for the Australian State College of Teaching and to provide opportunities for higher-order thinking through the writing of the documents to be included in the portfolios. In this way, the central focus of the task was clearly on the eportfolio as a product, not a process. The result of implementing eportfolios as a product for assessment is that many opportunities for higher-order learning were missed. The purpose of creating an eportfolio is to house several forms of artefacts as evidence of accomplishments and the way students learn is by choosing what to include in their portfolio. Engaging in the collection and selection of artefacts and reflecting on the artefacts, on the selection process, and on the portfolio contributes to deep and meaningful learning (Barrett, 2001).

Although the quality of the task was diminished in many instances because the eportfolio was not being used as a process, the writing element of the task did provide some opportunities for higher-order thinking. In their writing, students were required to consider a teaching experience, as they remembered it, describe the event and what they had gained from it. To encourage meaningful deliberation and evaluation in the writing component of the task, the instructor took several approaches that positively impacted student learning outcomes. The following discusses these themes.

1. *Self-scrutiny of one's personal ability to engage in the learning process seemed to provide opportunities and encouragement for high levels of reflection.* This study focussed only on documented reflection within the eportfolio, and so other areas of reflective writing were not assessed, for example students may have engaged in analysis, reasoning, and evaluation when creating their lesson plans. One student, however, included a separate page in her eportfolio. This page demonstrated that the student valued the process of thinking about and considering experiences and documenting the resulting analysis. This 'extra' analysis was a reflection on self, not a reflection on the teaching process, in which the student shared a very personal scrutiny of her own anxieties and fears as well as abilities and weaknesses about attending university, for example, there is a heavy emphasis on fear of not coping and not passing assignments: 'makes me feel like I won't be able to cope and I will fail'; 'I feel like I am the only one not coping with the workload'; 'I will have to watch my tendency to procrastinate. The results of the test Wednesday morning will be interesting'. Amongst such negative emotions, the student seems to boost herself up a bit, much like a pep talk 'there is a stronger part of me that knows that this isn't going to happen and that I will succeed and become a good teacher...'.

   This example did not portray high levels of in-depth reflection but it did show the student engaging in a very detailed analysis of her emotions. This type of self-reflection is often encouraged in private, personal journals, but not necessarily in university classrooms, and not at all in this case. The student, however, was able to make the connection between the value of reflection on the teaching and learning process, as encouraged by the instructor, and reflection on self for coping with the teaching and learning process. Interestingly, this is one of the students whose Reflection page demonstrated dialogic reflection. Although this personal scrutiny was undirected and unplanned by the instructor, it demonstrates that given guidance on how to engage in this type of analysis and understanding the importance of the analysis, can lead to unintended reflection that may prove beneficial, not just for the students' sense of self, but also for the students' understanding of the learning process.

2. *The model of reflection students followed limited their depth of analysis.* The students in this case were provided with a model of reflection in their eportfolios. Following the 5R's (Bain, Ballantyne, Mills, & Lester, 2002), the model included an example for each of Reporting; Responding; Relating; Reasoning; and, Reconstructing. For reporting, the researcher found that the model poorly described the incident being written about, did not take into account any feelings or emotions, and did not show any analysis of the reciprocal affect the incident had on the author and the author on the incident. In brief, it encouraged a very low form of stimulated reflection. Similarly, throughout the rest of the model's examples, no attempt is made to acknowledge alternate views and there are no references to outside literature (which the students in this case were required to include). There is some reason and justification for statements given but there is little else that demonstrates descriptive reflection. Furthermore, there are no instances of dialogic reflection in the examples given in the model: no prior relevant knowledge is recounted or challenged, no alternatives are given, and it's not clear that prior conceptions are being replaced with new ones. In terms of critical reflection, the model gives very

similar accounts as those given by the students in this case, with vague statements about changes in action.

With limited detail about conceptual change, lack of evaluation of experience, and little detail about how the author would apply his/her learning in the model, it is not surprising that the eportfolios in this case demonstrated limited instances of high levels of reflection. There appears to have been insufficient support for high levels of reflection in this case.

3. *Requiring the inclusion of artefacts helped students to make connections between workplace learning and classroom learning.* The software application in this case was created to house students' Reflection page, lesson plans, and relevant resources for the students. For example, one of the main documents stored in students' eportfolios was a list of Teacher Competencies. Using this chart, students were able to upload documents to each competency if they had completed an artefact that demonstrated the criteria. In this way students were able to see both what they had learned and what they still needed to learn before parting university and beginning a teaching career. This was intended to help students see the connection between what they were doing in university and how it would help them in their careers (and gain employment). This was also intended to help students connect what they were doing in their teaching practice to what they were learning in class. For example, under 'Facilitates student learning: undertakes planning' in the Teacher Competency list, many students included the lesson plans they had created in class and implemented on practicum, then students were required to use this document to help them write their reflective piece. By allowing students to include artefacts of this nature, their ability to note the significance of the materials they had included and to connect learning was greatly improved. In other words, students were able to use the checklist they had been provided with, the Teacher Competencies, to help them understand what they had learned, how what they had learned is defined by the Government Department of Education, how applying what they had learned in a teaching situation provided evidence of the competency, and what other competencies were needed before graduation. The overall outcome of making these connections was higher levels of reflection because students needed to analyse their own actions and how they related to classroom learning and could be improved to better meet the requirements of the competency framework.

4. *The prompts provided to students encouraged analysis and evaluation.* As well as the 5Rs model provided to students, the instructor also provided a form with prompts for reflection in the unit handbook and housed on the eportfolio tool. Students were encouraged to follow the prompts. In many ways, these prompts served the purpose of promoting evaluation, analysis, and synthesis in a much better way than the model that was provided to students. The prompts were more directed and asked for responses associated with high levels of reflection. At the same time, no examples were given to students, so their responses were more open and detailed than when they followed the poor examples provided in the model. With these prompts, students were asked to describe the event in detail ('what was seen, done, heard, and said'), share their emotions ('expression of feelings and reactions') and begin analysis of how the event affected them ('were thoughts, beliefs, values challenged?'). In a limited way, such analysis would demonstrate stimulated reflection but in detail it could demonstrate dialogic reflection. The reasoning section prompted students to describe the event, provide reason and justification, and, possibly, acknowledge alternate views ('An exploration, interrogation or explanation of the topic'; 'How do the above answers link to theories?'). All of these elements can demonstrate descriptive reflection. Reconstructing prompted students to engage in dialogic reflection by asking students to consider alternatives ('What will be done better/differently in the future and why?'), and recall and challenge prior knowledge ('how this new understanding impacted on personal beliefs about teaching, learning...'). Finally, Reconstructing also prompted students to engage in critical reflection by considering how what they had learned could be applied to future teaching practice ('Describes actions to be taken to ensure own professional growth in preparation for the next Professional Practice'). Considering the data provided by the eportfolios, it appeared that part of the cohort of students used these prompts to guide their writing and engaged in higher levels of reflection while other students in the cohort more closely followed the model of reflection given to students and thus engaged in lower levels of reflection.

5. *Students were better able to analyse their learning when they had access to detailed records.* Although students were required to reflect on their experience some time after it had occurred, the level of detail in the writing was quite strong. This could be because students were asked to refer to the evaluations they had made on their Learning Experience Plans. On the Learning Experience Plans, following a template, the pre-service students had been required to write an evaluation of their students' learning, a self-reflection, future actions, and include mentor teacher comments. In instances where these pieces of writing occurred immediately, or shortly after the implementation of the Learning Experience Plans, the detail that was in students' minds at the time came across in the Reflection page of the eportfolio, even though it was submitted some time later. Although it might never seem too late to reflect on an event or experience, as time passes, so do memories and the less detail the students are able to provide about what happened, their own actions and others, the harder it will be for them to understand what they have learned from the experience. In this case, although the submission of the Reflection page occurred well after the experience, students were able to include the detail from the experience by referring to documents they had written shortly after the experience had occurred.

Discussion

In this study all of the students engaged in stimulated and descriptive reflection but only half of the students demonstrated evidence of dialogic reflection and there was no evidence of critical reflection. The factors influencing student reflection describe themes that arose from the instructor's teaching strategies. Analysis of the data and a review of the literature suggests some design strategies that appear able to improve student learning outcomes when using Web 2.0 technologies in tertiary education.

1. *The provision of adequate resources for learning*. Resources give students the content, information, and underpinning knowledge required to engage in all levels of reflection and higher order cognition (Oliver & Herrington, 2001). In this case, students were provided with lists of resources in their Unit Handbook. However, many of the students did not acknowledge these resources as helpful for their learning as only 65% agreed that they had sufficient access to information outside the activity that helped them complete the eportfolio task. Similarly, only 69% agreed that a sufficient variety of resources were available to them through their use of the eportfolios. The students in this case were novice reflective practitioners, indeed, new university students, and perhaps needed both more resources to be made available to them to help engage in meaningful learning as well as the support to help use the resources. If students had more resources and understood how to use them, they would likely have been better able to change their conceptions by understanding how their actions led to certain outcomes and how modifications to actions could change outcomes. Students would then be in a better position to evaluate possible alternatives and make changes in action when necessary. When implementing Web 2.0 technologies, it is crucial to not assume that because students have access to the Internet, they will know or understand how to access pertinent resources for learning. Instructors need to make relevant resources available to students and, especially for novice reflective practitioners, instructors need to guide students in their use of the resources.

2. *The provision of timely and sufficient feedback.* Giving students feedback allows them to learn if 'what they are doing is appropriate... and whether their own views correspond to those of others' (Boud, 2009). In this case, only 50% of the students felt that they were receiving timely and sufficient feedback. Had the instructor taken advantage of the ability to provide feedback to students using the eportfolio application, she could have helped students understand how their actions related to, or could be improved by, what they were learning in class. She also could have probed students to evaluate how their ideas could relate to different experiences. Essentially, using the affordances of the technology, instructor feedback could have prompted students to engage in higher levels of reflection by getting them to analyse alternative solutions or actions based on classroom learning or expert ideas, and evaluate how these alternative solutions could be applied to their own experience and various other situations. Web 2.0 technologies offer the capacity to provide students with feedback in a context where the feedback can be received immediately and acted upon. When students receive feedback they can use, not only can the outcomes of the task be improved but the feedback can act to 'build students' capacities as learners more widely' (Boud, 2009).

3. *The provision of safe opportunities for collaborative learning.* When students are given opportunities to work collaboratively, they are better able to experience other worldviews, to see things in different contexts, to have a better chance of challenging their assumptions, and, finally, to emerge with and be able to apply new understandings (Brockbank & McGill, 1998). In this case, many students did not feel comfortable working collaboratively or even asking their peers questions (only 69% agreed they felt comfortable). Furthermore, only 61.5% agreed they felt part of a learning community in the online environment. Had students been encouraged to work together on their eportfolios, they would potentially have had their ideas challenged, been exposed to alternative or new ideas, to problems they had not foreseen and alternative solutions, and so on. Thus engaging with others would have provided more opportunities to understand how they could have modified their lesson plans, how they could have done things differently, and how they would do things differently in the future. Furthermore, working with others may have helped students understand how their learning could be applied to more than their isolated experience. Using the affordances of Web 2.0 technology that allow for collaborative and participatory knowledge building increases opportunities for students to acknowledge and understand others' perspectives, to see their own learning from different perspectives and change their own learning outcomes. Instructors using Web 2.0 technologies should aim to take advantage of the ability for students to work with and learn from each other.

4. *The provision of tasks that allow students to take ownership of their learning.* The eportfolio process should be a student-centred task (Barrett, 2001). Students build, create, and add to their portfolios over time to demonstrate competencies and growth in various areas. When implemented in a way that takes advantage of this affordance, students will choose their own artefacts to include, reflect on their selection and how their selection meets the criteria of the standards presented to them (Barrett, 2001), and thus take ownership for their own learning. In this case, the task was quite directed. Students were instructed as to what to include in their eportfolios, which competencies to link their writing to, and how to reflect on their experience. Because of the prescribed nature of the task, only 61.6% of the students agreed that they had the opportunity to take control of their own learning during the eportfolio process. In this way, the task specifications limited the levels of reflection and higher order thinking required by the students because they did not have the opportunity to reflect on *why* they had chosen the experience or *how* the artefact demonstrated the requirements of the standards. Essentially, the students reflected on just the teaching process but if they had been able to take control of their own learning, they would have had many more opportunities for high levels of reflection on their learning process. When using Web 2.0 technologies in tertiary education, instructors need to ensure tasks are designed to allow students to take control of their own learning, thus increasing opportunities for reflection and meaningful learning.

Conclusion

This paper has described the study of a learning activity that intended to take advantage of the affordances of eportfolios to create opportunities for student learning by encouraging and supporting reflection. The results revealed high instances of low levels of reflection and few instances of high levels of reflection. Assertions were drawn of the factors that appeared to influence students' reflective activities. The findings suggested a number of instructional strategies affected students' engagement in reflection but the affordances of the technology, as they were used, only provided limited value to student learning. Based on the findings, this paper has proposed several instructional strategies which could be used to improve and enhance the implementation of eportfolios in tertiary settings. Through this study and further related inquiries, we intend to develop more substantial guidelines that might advantage teachers seeking to use Web 2.0 technologies in their learning design.

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