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Pauline Roberts

Edith Cowan University, pauline.roberts@ecu.edu.au

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10.1080/1475939X.2018.1447989

Roberts, P. (2018). Developing reflection through an ePortfolio-based learning environment: design principles for further implementation. *Technology, Pedagogy and Education*, 27 (3) 313-326. Available [here](#)

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Developing Reflection Through an ePortfolio-Based Learning Environment: Design Principles for Further Implementation

Pauline Roberts

School of Education, Edith Cowan University, Perth, Australia

ECU Mount Lawley. 2 Bradford Street, Mount Lawley, 6050.

pauline.roberts@ecu.edu.au

Pauline is a Lecturer in Early Childhood studies at Edith Cowan University (ECU) in Perth, WA. She has taught across the education sector in Early Childhood, Primary and Tertiary settings in a range of curriculum and content areas. Pauline's doctoral research centred on the use of an ePortfolio to scaffold reflection in pre-service teachers which remains an on-going area of interest and research. In her current role at ECU Pauline has undertaken teaching in the Science content area for Early Childhood with the goal of developing play-based approaches to the development of science skills and concepts in young children.

Developing Reflection Through an ePortfolio-Based Learning Environment: Design principles for Further Implementation

This paper discusses the implementation of an ePortfolio-based learning environment with Bachelor of Education students. The intention was for the platform to be an agency for the development of reflection. The environment scaffolded reflection through (1) exemplars of good practice; (2) the opportunity for discussions and (3) activities to support the development of reflection. There were issues within the research around the introduction of the platform at this stage of the students' degrees but the environment was successful in the provision of a teaching and learning platform. The findings provided design principles for a model to guide the development of similar learning environments including (1) the need for ePortfolio platform to be embedded across the degree program with (2) regular tasks for the students to complete that have (3) a clear purpose that the students are aware of and (4) utilise interaction patterns that mimic the structures of social media.

Keywords: ePortfolio; reflection; eLearning; action research

Introduction

The term reflection has been used widely in education since the early 20th Century when Dewey, (1933, p. 9) proposed the definition that it was a process of “active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and further conclusions which it tends”. Despite the identified importance of the process for educators, the challenge continues around how to develop these skills and abilities.

It has been identified that many tertiary institutions “fall short in allowing opportunities for reflection” (Barak, 2006, p. 133) and although students are asked to reflect throughout their degrees, they often graduate with little confidence in this area (Roberts, 2014). To provide an alternate focus, it was identified that the increase in the use of technology in higher education settings may provide the solution to some of the problems encountered in the development of reflective skills and abilities.

ePortfolio technology has increased in use in Higher Education over recent years due to mandated use of these tools in the United Kingdom (Joyes, Gray, & Hartnell-Young, 2010) and the enhanced capabilities of these platforms. To date, much of the work related to the use of ePortfolios, has been focused on assessment against set criteria or standards (vonKonsky, Oliver, & Ramdin, 2009; Pelliccione & Dixon, 2008), although it has been identified that there is great potential for the use of these platforms as teaching spaces (Barrett, 2005; Chesney & Marcangelo, 2010). To fully explore this potential, a systematic implementation and review process was identified as being required (Roberts, Maor, & Herrington, 2016) with a focus on the pedagogical aspects of the implementation (Shepherd & Hannafin, 2011). It has been cautioned, however, that care is needed as ePortfolios are “not a panacea” (Housego & Parker, 2009, p. 409) for the problems associated with the enhancement of reflection. It has been suggested that online teaching and learning environments be established, trialed and reviewed to ensure that the technology is being utilized as an integrated part of the learning process for pre-service teachers and not just added as an extra expectation (Phillips, McNaught & Kennedy, 2011). This was the goal of this research.

This project utilised the eLearning Lifecycle model developed by Phillips, Kennedy and McNaught (2011) as it is a cyclic process of implementation and review specifically for electronic learning environments. The model was implemented in the PebblePad platform to provide an ePortfolio-based learning environment for fourth year Bachelor of Education students.

Within this ePortfolio-based environment, reflective prompts were developed and implemented based on the sections of the Enculturation Teaching Model designed by Tishman, Jay and Perkins (1993) which was developed to enhance higher order thinking skills. This model included (1) examples of good reflective practice, (2)

opportunities for interaction among students and staff, and (3) activities that targeted the skills of reflective practice. This paper provides an abridged version of the implementation and results of this study as well as outlining the design principles that were generated. The design principles are provided as ideas that are transferrable to other electronic platforms including alternate ePortfolio programs.

Literature Review

The investigation of prior research in relation to this study focused on a review of literature in two key areas – (1) reflection and (2) ePortfolios, particularly in relation to their capacity to be used as electronic learning environments.

Reflection

Reflection is not a new term in higher education and there are many definitions of this concept (Penso, 2001). Numerous terms are used in the description of the process (Rogers, 2001). A dictionary definition of reflection is “a fixing of the thoughts on something; careful consideration” (<http://dictionary.reference.com/>) but in the academic context it has been defined as “a complex process that strongly influences learning by increasing understanding, inducing conceptual change and promoting critical evaluation and knowledge transfer” (Strampel & Oliver, 2007, p. 973).

Despite the importance afforded to the development of reflective skills and abilities, recent research has identified that the “teaching of reflection [remains] inconsistent and superficial” (Barton & Ryan, 2012, p. 1). This is perhaps due to the difficulty in defining and investigating reflective ideas and concepts (Hatton & Smith, 1995). Pre-service teachers appear to have a broad understanding of reflection and the process involved (Pedro, 2005), but without focused attention to all levels on the reflective spectrum through scaffolded experiences (Ryan, 2013) the development of the

required skills and abilities continued to be “tagged on, rather than constituting a way of working and learning” (Barton & Ryan, 2012, p. 2).

Concerns have also need raised with regard to the assessment of reflection as this alters the purpose of reflection. If students are to submit their work for university assessment, it is no longer a personal reflection and there is pressure to write in a specific way with standardised content that will meet external requirements and therefore receive a good mark (Hobbs, 2007; Roberts, Farley, & Gregory, 2014). This takes the focus away from the reflective process.

It has been identified that there is a need to focus directly on reflective skills and abilities to develop practitioners that are able to continue as lifelong learners, to develop teachers that can keep up to date with the changing world of education (Gikandi, 2013; Hawkes, 2001) and cater to the growing diversity of student needs (Pedro, 2005). It is argued that reflective practice can and should be taught (Russell, 2005) but the format used is crucial to this process (Hartmann & Calandra, 2007; Hobbs, 2007; Russell, 2005). The increased use of technology as learning environments in higher education settings may provide an avenue to explore solutions to this problem. The digital nature of the ePortfolio tool may offer a more effective multimodal means of developing reflection through the use of text, images, videos and hyperlinks that allow for additional types of evidence to be integrated into the process (Hartmann & Calandra, 2007).

ePortfolio

Developments in technology over the past ten years has allowed ePortfolio platforms to become podiums for the provision of teaching and learning environments. Although there has been an increase in the use of electronic portfolios in higher education, the focus has remained on their use as an assessment tool or for accreditation purposes by

mapping development against industry required standards across courses (Hallam et al., 2010; McAllister, Hallam, & Harper, 2008). The potential of them to be used as spaces for student development rather than the presentation of evidence against required skills and competencies has not yet been fully explored (Housego & Parker, 2009; Stefani, Mason, & Pegler, 2007).

An ePortfolio is “a collection of authentic and diverse evidence, drawn from a larger archive representing what a person or organization has learned over time on which ...[they have]... reflected and designed for presentation to one or more audiences for a particular rhetorical purpose” (Barrett, 2005, p. 5). This definition highlights the processes of learning and assessment built into the practice of developing an ePortfolio and proposed that the technology had become available to “engage students in active participation” around reflection through “assessing and managing their own learning” (Barrett, 2005, p. 23).

In higher education, ePortfolio research has examined student perceptions of the process of completing an ePortfolio (Lewis & Gerbic, 2010) as well as examination of reflective writing completed within the ePortfolio space (Ayan & Seferoğlu, 2011). The focus of these studies, however, were on the ePortfolios as a presentation space rather than a learning tool (Roberts, 2014).

The idea that the ePortfolio can facilitate enhancement of process while developing the product make it a useful platform to further investigate (Strampel & Oliver, 2010). Some studies have used the ePortfolio in teacher education including the Mahara platform being used in Internship placements to complete reflection-based tasks (Oner & Adadan, 2011) or to embed questions, directions and supports for pre-service teachers (Shepherd & Hannafin, 2011). A similar study used the ePortfolio to provide structured prompts to first year students to enhance ownership of experience as well as

developing reflective skills and abilities to set educative and career goals (Buyarski et al., 2015). There has yet to be a wider systematic implementation and review process in this area (Roberts et al., 2016; Stefani et al., 2007). This was why this research aimed to provide design principles that could cross the gap of the platform formats, or processes for reflection in the ePortfolio.

The ePortfolio platform used in this research was PebblePad 2.0. This version allowed for the development of the teaching environment within the *Gateway Blog* area of the program. The *Gateway* was the area of the environment that all students were able to access for submission of assessments and allowed the tutors to share resources. The environment was provided to the students through a *Blog* that allowed the research team to post entries. These posts were prompts that gave examples to the students and outlined activities to complete as well as allowing students to post comments as part of the interaction component of the teaching environment. Further details of these reflective prompts are outlined in the methodology section of this paper. The literature reviewed highlighted the need for a systematic implementation of ePortfolios as learning environments rather than only a repository for evidence. This led to the research question of:

In what ways can an ePortfolio platform provide an environment for scaffolding reflection in pre-service teachers in a University environment?

Methodology

The methodology used for this research was a cyclic model of implementation and review based on the eLearning Lifecycle developed by Phillips, McNaught and Kenndy (2011). This model was proposed for the development of electronic learning environments and utilised the frameworks of both Action and Design-Based Research.

The eLearning Lifecycle process involves a number of cycles of implementation and review towards the identification of design principles for use within the environment in future iterations (Phillips et al., 2011).

For this research, the lifecycle was implemented within the PebblePad environment using the Enculturation Teaching Model (Tishman et al., 1993) that was designed to develop skills and dispositions towards higher levels of thinking and cognition, which include reflection. In this research, the *activity* components – those designed to target skill development were the activities developed from the Framework for Teacher Reflection outlined by Colton and Sparks-Langer (1993). Figure 1 provides a visual of how the three components of the research methodology work together within the teaching environment to provide a model for the development of reflection in pre-service teachers. This model could be utilized in any electronic platform that has provision for a shared learning space.

** Figure 1. Overview of Frameworks utilized in the research.

The square around the outside edge of the figure represents the learning environment within which the scaffolding occurred (in this case the ePortfolio platform). The three circles within this square signify the three components of the Enculturation Teaching Model (examples, interaction and activities), while the text at the intersections represent the elements of the Framework for Teacher Reflection (action, construction of knowledge and meaning, professional knowledge base). The Colton and Sparks-Langer (1993) framework comprises of three areas in the process of developing reflection for pre-service teachers and was selected due to its integration of much of the literature related to Action, Construction of Knowledge and Meaning, and the Professional Knowledge Base.

The research comprised of cycles of implementation and review with two different cohorts of students before a formal evaluation process that included the collection of data using surveys, focus group and individual interviews and document analysis. The second group of students had more directed reflective prompts based on the results of the first cycle that gave guidance throughout the full action research process.

The students involved in the research were required to complete the Professional Action Research unit as a compulsory component of their 4th and final year. The first cycle of implementation with approximately 60 students involved the provision of reflective prompts that focused on engagement within the PebblePad platform and the utilization of the platform for documenting the students' action research projects. Feedback from the students on this cycle informed the implementation of Cycle 2. The second cycle with 84 students focused on the development of reflective writing and implementing a number of small reflective development activities and completing the final two assignment submissions. A full list of the reflective prompts provided are detailed in Table 1.

** Table 1. Reflective prompts in Environment with source and purpose.

At the conclusion of the two rounds of implementation the second group was invited to take part in the formal data collection of the research project. A mixed methods approach to data collection was adopted to identify the influence of the environment in developing reflection in the pre-service teachers involved in the trial. The data collection included an online survey, learning analytics of usage data obtained from within the platform, transcripts of focus group and individual interviews and document analysis. The online survey was administered through Survey Monkey and consisted of a Likert scale question about the reflective prompts used in the

environment followed by longer format questions to gauge student perceptions of the experience with the ePortfolio. The data was collected, analysed and reviewed with each stage of information received informing the next level of analysis. The results were then examined to identify design principles for implementation of ePortfolio-based learning environments to enhance pre-service teachers' skills and abilities to reflect. Across the data sources (online survey, focus group and individual interviews, document analysis), feedback was collected from 47% of the total cohort. The research was approved by the university ethics committee (approval #2012/117), and was supervised by university academic staff.

Results

The results of the review of the environment were generally positive. There were issues identified that were consistent with other research in terms of participant resistance and implementation concerns (Janosik & Frank, 2013). The students did use the platform to complete their required tasks. Figure 2 illustrates the usage of the reflective prompts within the PebblePad platform in relation to the number of assets created by the 84 students.

** Figure 2. Group statistics of assets created in the PebblePad platform.

This graphic shows that the cohort of 84 students uploaded *Files* (849); created *Thoughts* (282); *Webfolios* (250); and *Blogs* (104) within the platform. There were also 88 *Forms* developed. These usage statistics align with the reflective prompts as the students were provided with guidelines for the creation of the *Blog* asset to utilize for their reflective journals (104 blogs for 84 students). Although the *Blogs* were created, they do not appear to have been utilized by the cohort as each time an asset is added to these *Blogs*, it is recorded as a *Thought* asset and only 282 of these were added to the

104 Blogs. The assignment submissions were required to be in the Webfolio format so this appears to have been completed (84 students x 3 submissions = 252 Webfolios). The number of file uploads shown (849) is significant in terms of the way the students were using the ePortfolio platform. The feedback obtained from the interviews indicated that this high number was because the students were preferring to work within other formats (like Microsoft Word) then transfer files to the platform.

Although these statistics give an overview of what the students created in the platform, there needed to be further investigation into how the reflective prompts that were placed in the ePortfolio teaching environment were used. The online survey was used to identify which of the reflective prompts the students accessed, and how they made use of these prompts. The return rate from the cohort for the online survey was 32%. Although this rate was lower than planned, the same questions were asked in the focus group interviews and received a similar pattern of response to further reinforce these numbers. The statistics in Table 2, show the responses from the survey with regard to the use of the reflective prompts provided as ranked on the Likert scale for: 'Did not look at', through to 'Shared' if they completed the activity and shared it with a peer.

****Table 2. Percentage of students reporting using the reflective prompts**

The shaded sections within this table are the reflective prompts that were directly related to the assignment submissions. Once these prompts have been discarded, the reflective prompts that were reported as most accessed and used the most by the pre-service teachers, were the ones relating to reflective writing and the conclusion of their assignments. The concerning area of these statistics from the research point of view is that none of the students reported sharing any of their work that they completed as part of the reflective prompts. This is emphasized as a concern

because the interaction component of the Enculturation Teaching Model (Tishman et al., 1993) highlighted sharing and discussion as important in the development of higher order thinking skills of which reflection is a type. The impact of this will be discussed later in the paper.

To further interrogate the statistical data of the online survey, the research incorporated focus group and individual interviews. The examination of this data identified four key areas of findings which are discussed in the following paragraphs, with quotes to support the conclusions.

(1) Timing of the implementation

Sixty- three per cent of the 37 students who responded to the online survey or took part in focus group and/or individual interviews commented that if they had have had access to PebblePad from their first year at university and were able to build upon work in previous units throughout their degree, then the implementation of PebblePad would have been much more successful. There were several comments like this in the data:

I found the use of PebblePad quite frustrating. I would have preferred to use PebblePad prior to my last year of uni rather than have another hurdle to try and overcome (M – email feedback).

The introduction of the platform in one unit in the final year was not conducive to PebblePad's success, as the students had already developed habits of working and felt that the timing of the introduction added extra pressure:

It is hard enough to survive and take time out to do study, let alone having to learn new programs all the time (R2 – online survey response)

The later introduction of the platform further reduced students' interaction within the ePortfolio space and led to the issues around the use of other platforms.

(2) The use of other platforms

Approximately 80% of respondents throughout the data collection process identified that much of the reflective journal writing and assignment drafting was being completed in other platforms (predominately Microsoft Word). The students were then either uploading these files to their asset stores as evidence, or cutting and pasting the text from one platform to another. This was supported by the uploading of 849 files by the 84 students, as well as comments in the interviews. The students reported that they felt more comfortable with these formats and preferred to work in there as they felt it was quicker and easier to use.

I did it in Word documents on the computer and ... transferred it (Mad – Ind Interview)

Did a lot of my documents in word and then just uploaded them (Ch – Ind Interview)

The data here highlights that the students were not spending time within the platform, which led to the next area of concern – the perceived time constraints.

(3) Perceived time constraints

As well as issues relating to the late inclusion of the platform, another problematic factor of the environment was the workload of the students and the perceived value of the additional activities. On average, 35% of students responded that they read the reflective prompts posted in the environment but did not have time to complete extra work that was not being assessed:

I read some of them but I just ... time was a factor. I did the first one but then there was too much else going on to do it (A – Ind Interview)

Others commented that they thought the extra activities were designed to assist students who were struggling with the unit rather than being there for the whole cohort:

I think for someone who was really struggling in those aspects, I would have used them but I didn't feel like I had to write it down (MD- FG Interview 2)

The lack of time spent in the platform further impacted on the interaction component of the Enculturation Teaching Model (Tishman, et al., 1993) as students were interacting outside the platform. This led to the final area of the results.

(4) Discussion outside the platform

The last key area of the results was the use of other avenues for the reflective discussions. The pre-service teachers did recognize the importance of reflective discussions and identified that they were occurring, it was just that they were happening outside the platform through options such as direct personal contact, email and FaceBook.

I use limited amount of blogs as my lines of communication already existed in the form of emails and texting (A20 – online survey response)

FaceBook, friends, email text messaging small gatherings (A6 – online survey response)

We have a FaceBook page that talked about different units and [prac] and that's where everyone offers ideas and what they did so I suppose it's a different forum (K – FG Interview 2).

The students appeared to have an understanding of the need to interact with peers around the projects, reflection and the development of the ePortfolio, they were just selecting their own mode by which to do so and utilized pre-existing structures. The review of these results were then compared against the literature to identify if there were any commonalities with other research.

Discussion

Based on the results identified in the data analysis, the review of the effectiveness of the environment needed to re-examine the literature and other research to develop appropriate design principles to move forward with research in this area. To outline this, the headings of the results section will be used to guide the discussion.

Timing of implementation

As was demonstrated through the quotes in the results section, the students involved in the research project presented concerns around the use of the PebblePad platform for one unit of their degrees and in their final year. Although the university had the license for the platform for a longer period of time, no other unit had utilized the platform in their teaching and learning strategies prior to the Action Research unit.

The students presented arguments about having to learn a new platform rather than concentrate on content and that the benefits of an ePortfolio are in being able to collect and collate evidence from a number of sources over time (Beishuizen et al., 2006). This additional time and cross-over of unit may have led students to identify the capabilities of the program that may add depth to their reflections (Hartmann & Calandra, 2007) or begin to identify the value of the process beyond the assessment piece (Buyarski et al., 2015; Hobbs, 2007). The feedback from these students resonates with other studies in this area that have identified the need for an integrated approach to ePortfolio implementation and calls for it to occur across whole programs rather than be introduced into individual units that are not linked (McAllister et al., 2008).

Based on these studies and the results of this research, the first design principle to be identified was:

(1) Embed the ePortfolio into degree courses from first year with units that access it throughout the entire degree.

Experience of the Australian ePortfolio Project (Hallam et al., 2010) identified that the process needed to be embedded across the degree with constant and varied opportunities to use the platforms. This would appear to result in a streamlining of the process for students and make it more efficient. This practice could also allow students to become more familiar and confident in using the platform for a number of purposes, which in turn may allow them to focus more intently on the content of the ePortfolio

entries than the mechanics of how the platform works or to expand on the types of evidence utilised within this space.

In relation to reflection, this process could allow the students to be confident in including reflective writing into the platform so they can spend the additional time on developing stronger reflective writing skills and abilities. Additional confidence in the platform could also reduce the incidences of students using other platforms to complete their reflective work.

The use of other platforms

The high number of file uploads and the comments about copying and pasting from Microsoft Word to PebblePad showed the proportion of work that students were doing outside of the ePortfolio platform. As well as decreasing the time spent in the platform that may have increased confidence levels in that arena, the use of other platforms limited the exposure of the students to the reflective prompts and structures that were inherent in the platform. Given that it has been identified that reflective skills can and should be taught (Russell, 2005; Ryan, 2013) this connection to the prompts is important.

The PebblePad ePortfolio platform was developed with a focus on reflective scaffolding so there are a number of templates designed to specifically scaffold reflective writing as well as other templates having a section for reflection included. It is these affordances of the ePortfolio and in particular the PebblePad platform, that make it appropriate as a teaching and learning platform as well as a repository of evidence (Barrett, 2005; Strampel & Oliver, 2010).

Similar studies that have used PebblePad as the ePortfolio platform have highlighted the use of Workbooks (a feature added since this research was conducted) to provide the teaching and learning activities to the students within the PebblePad space (Watt, 2014).

These workbooks are created by academics and shared with the students so they can complete the required tasks, and have this as a record in their own asset store. The use of workbooks has also been used to assess students learning and can be released either all at once or over time to scaffold the continuous work in the platform. This process gets students into the platform on a regular basis, provides a range of formats for scaffolding reflection and allows for everything to be collated and assessed within that space (Watt, 2014). Whether a Workbook is used or not, the regular use of the platform to complete smaller tasks and build resources is the focus of the second design principle:

(2) Embed in the ePortfolio a sequence of tasks for students to complete so that they are accessing the platform regularly and developing a collection of items for later use.

The regular use may develop some habits around the creation of assets as well as assisting the students to see the value of the platform for their ongoing learning.

Perceived time constraints

From the results of the data analysis there were a number of comments in relation to time constraints and students only reading the activity prompts offered in the ePortfolio rather than completing the task. There were a number of factors that had an impact on this but all led to the students not identifying the purpose of the additional activities, which is an inherent problem of non-assessed work in online and face-to-face environments. Some students thought the activities were there for students who were struggling, while others simply said they did not have time when other work took precedence. If the students felt that there was a purpose and/or benefit for completing these activities that directly related to the development of their skills and abilities in relation to reflection, they may have prioritised them made the time to complete them.

There has been research in the area of completion of tasks without assessment, particularly in relation to online learning environments and much of it comes back to the students recognizing the value in completing the task (Teo & Noyes, 2011). This is particularly relevant in online discussions (Robinson, 2011). Students will prioritize things they see are important. This led to the identification of the third design principle:

(3) Provide students with a clear purpose for the completion of the activities.

Even at the university level, students appear to need to have external motivation to complete tasks. This may be reduced if the students are fully engaged in learning in an environment that is part of their everyday university experience with clear goals and scaffolding (Macdonald, 2004). If the students know why they should do a task or what specific skills and knowledge they will gain through completing it, they may be more likely to complete it. If the focus is on the development of knowledge and skills they see as relevant to their own academic and career goals (Buyarski et al., 2015) they may be more engaged. This value-add idea is also important when examining the final area of the data analysis - the interaction capacities of the PebblePad platform.

Discussion outside of the platform

Much of the literature written on reflection highlights the importance of discussion and sharing of ideas in the reflective process (Rogers, 2001) yet this was the area of the Enculturation Teaching Model (Tishman et al., 1993) that was least utilized within the provided ePortfolio space. When the students were asked about this, they replied that they did agree that interaction was important but they were doing this via other avenues (Roberts, 2014). These included Facebook and other social media platforms or face-to-face with peers and the teachers they were working with in their action research projects.

The students' use of the less formal and more regular contact of social media platforms has become part of the study habits of students in higher education. There seems to be pages set up by diverse groups across university campuses. Research into the use of social media in higher education, however, has highlighted mixed results in terms of engagement (Junco, 2012), development of educational micro-communities (Bosch, 2009) and student identity (Selwyn, 2009). The use of these platforms does raise questions about how to mirror some of the aspects of these social platforms within ePortfolio spaces so the students are more comfortable and familiar with the formats of these modes of discussion. It is also important to open channels of communication with people outside the PebblePad platform and allow for in-time interaction with others involved in the projects.

A number of students in the research mentioned that the immediacy of the face-to-face contact with the mentor teacher allowed for the interaction to happen at the moment of need and be in context. This interaction was not an option provided through the ePortfolio for a number of reasons. This meant that if the student wanted to share ideas with the teacher through the ePortfolio, they would have to type and share this with the teacher via an email link and wait for the reply. This does not offer immediacy of response and only gives the teacher access to the one asset. The importance of interaction in the development of reflection means that this is an area that needs to be improved in future iterations of this research that led to the final design principle:

(4) Integrate elements of social media platforms into the discussion area of the platform.

If the students are in the platform more often and it is becoming part of their study habits through the earlier design principles, simple changes to the format of the

discussion and more seamless avenues for sharing ideas may improve the utilization of the ePortfolio for the interactions associated with reflection.

It is anticipated that the adoption of these design principles would lead to the improved use of the ePortfolio platform as a learning environment. The additional use by students would also increase their confidence in the platform and its processes to allow them to focus more deeply on the content of their ePortfolio entries.

Conclusions and Recommendations

Based on the results of this research project, the use of the ePortfolio-based learning environment for the development of reflection in pre-service teachers, does show promise. A few crucial changes do need to be made in future iterations. Firstly, the platform needs be introduced earlier in the degree, preferably from first year and be integrated across the whole of the student's study rather than in isolated units. Students should also be provided with scaffolded tasks on a regular basis that have a clearly explained purpose to assist them to integrate the use of the platform into their study processes. It is anticipated that once they become more confident in using the platform for a multitude of purposes, the students can then begin to focus more on the content of what is being added to the platform than the technicality of adding it to the ePortfolio. This will allow for more complex examples to be shown and additional activities to be added.

In terms of the interaction component of the Enculturation Teaching Model (Tishman, et al., 1993), there needs to be more consideration given to the format of the interaction and who has access to this so the students can reproduce some of the discussion that is currently happening elsewhere. It is anticipated that the consideration of these design principles in developing future iterations of ePortfolio-based learning

environments will improve students reflection and further encourage them to work within these platforms to document their lifelong learning journey.

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