The E-Portfolio as PLAR and Possibility for Higher Education

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ABSTRACT

This paper presents one case study of a graduate school applicant who used semantic mapping to profile his industrial engineering work experience to demonstrate equivalency to an undergraduate degree. The larger research study examined the development of a cohort of students who were applying to a graduate school in Canada. Prior learning assessment recognition (PLAR) is gaining more currency as an assessment tool in higher education, enabling students to transfer skills, work experience, and equivalent courses to gain credits at institutions of higher learning. More study is needed to understand how e-portfolios can provide clear evidence of work experience for purposes of academic credentialing. At the present time, little research is available on the use of the e-portfolio as PLAR to allow adult learners to qualify for graduate school based on recognition of work experience and academic courses. The case study reported here illustrates that quality assurance for PLAR should involve recognized achievement standards, but should also consider aspects which are more difficult to measure such as authenticity, relevance, professional growth, and learner efficacy.

Keywords: engineering education; prior learning assessment recognition (PLAR); e-portfolios; user-generated content; semantic mapping

1. INTRODUCTION

As greater numbers of higher education institutions now include online courses, definitions of teaching, learning, and assessment become open to re-examination and re-conceptualization within the new e-learning spaces. This includes innovative approaches such as the use of e-portfolios to establish prior learning assessment recognition (PLAR). This research study examines how the affordances of the internet and semantic mapping can facilitate the design and construction of e-portfolios used for purposes of meeting admissions criteria and how this design process may scaffold the transitions from work experience to the academy.

The larger study involved a cohort of applicants who created e-portfolios to synthesize their work experience, academic credentials, and community contributions in order to qualify for graduate school. The research reported here focuses on a case study of one PLAR e-portfolio which was based on experiential learning in engineering education, specifically automation.

2. THEORIZING THE E-PORTFOLIO

Assessment of prior learning is responsive to the emergent needs of the changing population of learners in tertiary education; a US study finds that the majority of students in higher education could now be described as non-traditional [1]. According to one major Canadian review of PLAR use in Canadian universities, the use of prior learning assessment has had a short history in Canada at the tertiary education level, and has been employed more often at the community college level than the university level [2]. When PLAR was first introduced in Canada, it was generally used to establish equivalency for a single course credit, or toward the total number of credits required to complete a degree [2]. At the present time; however, PLAR is used in multiple Canadian universities to allow non-standard applicants the opportunity to establish equivalency to the entrance requirements through the documentation of their work experience and other credentials [3]. Canadian data show that students who have been granted PLAR credits are more likely to engage in post-secondary education and to persist toward completion [3]. Similarly, US data from over 60,000 college students indicate that applicants who have used PLAR are twice as likely to persist to graduation [1].

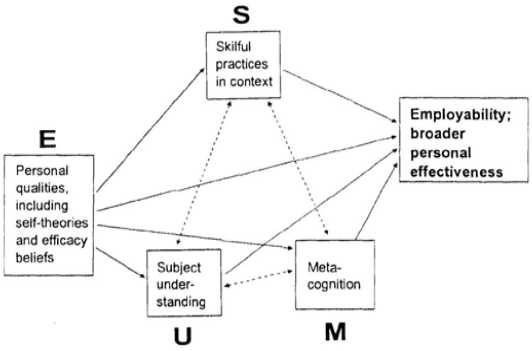
Different types of learning have been identified through the portfolio process. Barker describes the e-portfolio as process and product; the process includes, "the identification, collection, selection, reflection and presentation of evidence of learning and culture" [4],2. Conrad however situates the development of a portfolio as PLAR in the post-secondary culture as a process of *knowledge-building* – here the emphasis is on the portfolio as a learning tool, and its construction is a form of pedagogy in itself [5], 139. She theorizes that in the process of the portfolio development, the selection, reflection and presentation of the learning artifacts activates students' prior knowledge and prompts new learning [5] – in effect a learning process within a process.

When the e-portfolio is designed using online affordances, the student can design the presentation for a limitless, virtual audience using hyperlinks and video to increase readability and authenticity. Barrett theorizes that the purpose of the e-portfolio is to provide this *richer picture* of the abilities of the student [6]. In e-portfolio design, students integrate both multimedia skills and self-assessment skills for the portfolio development [6].

There is evidence that e-portfolios are increasingly in use in engineering programs in the US, although they find it is not "pervasive" [7]. As more engineering institutions are responding to considerations of quality assurance and evaluating the learning gains from portfolio development, models of portfolio assessment are emerging. In the Aeronautics program at MIT for example, students use the portfolios to: document their educational progress; illustrate integration in the learning process; assess their experiential learning and performance; and reflect and self-assess relative to their goals [8].

Similarly, in a Master's of Engineering program at Cambridge, portfolios are assessed using a model designed to evaluate employability skills [9] known as the USEM model [10].

Figure 1: USEM model [10]



As user-generated multi-media content becomes easier to design and produce, students are able to create e-portfolios that employ multiple forms of media and build an online social presence [11] to explain their learning and to gather feedback on their e-portfolio development process. Higher education institutions are considering these e-portfolios for assessment purposes and acknowledge that they also personalize the learning experience [12]. The use of multi-media can build authenticity, allowing learners to give a more accurate picture of their skills, and the process of evaluating prior learning can scaffold knowledge construction [13]. In addition, e-portfolios have the potential to promote self-regulation for learners [14]. Specifically, e-portfolios which were initially designed for science, technology, math and engineering students have been seen to help students develop an "academic identity" when they transition into higher education and begin to see themselves as part of a scholarly community [15] which has been connected to persistence in the degree.

E-portfolios have also been described as "essential" for engineers working in the knowledge economy because engineers will work in times of cultural, economic and social change and they need the kinds of transferable skills which e-portfolio development can provide [9].

There has been a call for higher engineering education to find ways to foster creativity [16] [17]. Personal learning environments such as e-portfolios can become spaces where learners remix and share material, and online labs and e-portfolios have been identified as key tools in nurturing science and technology education [16].

In summary, the use of e-portfolios is emerging as a form of both pedagogy and assessment that serves multiple purposes but most importantly, has been seen to improve the students' learning experience [5] [6] [16]. The use of PLAR as a tool for demonstrating equivalency for entrance qualifications or for credit equivalence demonstrates a responsiveness to the changing demographic of tertiary education students. E-portfolios in fields such as engineering are seen to have the promise necessary to build employability skills through enhancing learner efficacy, metacognition and subject understanding [8] [9] [10] [15]. The focus of the study described here was to evaluate the learner outcomes from a PLAR e-portfolio process, using the participant's verbal description of the process, his e-portfolio, and his reflections.

3. RESEARCH DESIGN

Following a review of the literature to determine how PLAR and e-portfolios have been theorized, a qualitative research design was selected. The larger research study employed semi-structured interviews using video software which captured the recordings. The interviews were timed so that the graduate students who had created the e-portfolios for credentialing purposes were already enrolled in graduate school. This was done to allow an investigation regarding how the portfolio design process might be predictive of the skills required in the graduate program. Data from the interviews were triangulated with the documentary evidence of the e-portfolios, and also the participant's written reflections on the e-portfolio process. The interviews were transcribed and returned to each participant for validation. A case study approach was used to provide an in-depth study of each learner in the PLAR program.

The participants were interviewed by a professor who was not known to them. In the interviews, they were asked to describe the process of their portfolio development. In particular, they were asked to describe the thinking processes which they could recall as they worked on their portfolios. The interviewer asked specific questions about the types of structures which assisted them in their work such as meetings with the mentor or working with peers. Each participant was asked to explain the organization of the portfolio and how this was derived. The participants each "walked" the interviewer through their portfolios, describing the decisions they made and the areas where they found difficulty. Participants were asked if they had maintained reflection logs during the process of portfolio development, and if so, they were encouraged to refer to those logs to respond to the questions. Specific questions asked about their most challenging and most rewarding moments during the portfolio design.

Because each of the participants was attempting to demonstrate that his/her work experience and academic experiences would qualify as the equivalent of a baccalaureate degree, each participant was asked to connect his or her work experience to academic concepts such as breadth and depth of knowledge in particular fields.

The findings of the larger study have been reported earlier, and indicated that, while students initially experienced challenges identifying work and life experiences which would qualify to match academic credentials, all of the participants in the study were able to do this successfully. First, it was important for them to understand the competencies required for a baccalaureate degree. Next, one of their most challenging and rewarding tasks was the process of organizing artifacts of their experiences, which led to concept development. In summary, the larger study indicated that, with support, the adult students were able to reconceptualise their work experience and their community service activities as learning.

The case study reported here represents one participant in the cohort. The multiple data sources (interview, observation, e-portfolio, artifacts, and graduate applicant reflections) were analyzed for emergent and recurring themes or codes [18]. Four themes emerged from this process: 1) experiential learning; 2) authenticity; 3) ownership of learning; and 4) efficacy. The data were also analyzed using the theoretical framework of the USEM model [10] in order to make sense of these recurring themes.

4. FINDINGS: CASE STUDY

The participant in this case study is an automation controls designer who teaches in the automation program at the college level. He identified early in the process that his work experience would include his "industrial perspective" as well as his "teaching perspective." One of his first questions regarding the portfolio design was to discern the purpose of the portfolio. He had earlier prepared a linear, print version of his skills and certificates, and was initially not clear on the differences between what would appear on a written experience summary compared to an e-portfolio website.

He described his first efforts as essentially a "matching game." Once he had decided to use Google sites to build his e-portfolio, he began to match artifacts from his work experience and courses to the required provincial competencies for a bachelor's degree in the province of Ontario, Canada (the location of his university). Table 1 is an example of a compliance chart that he designed for the e-portfolio.

The following table links artifacts from organizer tabs on this website to published Ontario Council of Academic Vice Presidents (OCAV) criteria, to demonstrate suitable compliance with undergraduate degree level expectations. On the student's website, these links are live, connecting the viewer to media clips and documents.

Table 1: Student Designer Links Prior Learning and Experience to Academic Expectations

Organizer Tab Title	*Artifacts*	*OCAV Expectations*
PROFESSIONAL WORKS	• Automation Controls Project Design Schematics (2004) • Automatic Palletizer Machine Video (2004)	1 a, b, c, d, e 2
TEACHING and CURRICULUM	• Electrical Control Fundamentals Course Outline (2012) • Automation Fundamentals Course Outline (2012) • Automation Fundamentals Laboratory Exercise #1 (2010) • Water Level Trainer Schematic Set (2009)	3 a, b 4 5
RESEARCH	• Scientific Research and Experimental Development Report (2005) • Draft Research Plan PRSP 1140 (2013)	1 a, b, c, d, e 2 3 c 5
TRAINING and COMMUNITY	• Diversity in the classroom website (2012) • Electromechanical Engineering Technology Diploma (2001) • EMTY Program Marketing Plan (2009) • Resume	1 a, b, c, d, e 2 3 b 6 a, b, c

OCAV Competency Mapping Table

This compliance chart which has been labeled the OCAV Competency Mapping Table (Table 1) is helpful in illustrating some of the research findings which are listed below:

1) *Experiential learning*: The table demonstrates that the participant selected four categories as *content organizers* for the e-portfolio design. He found this process of selecting themes of his prior work and academic experience "challenging." He re-organized the artifacts multiple times under different concepts, trying to find the right themes and sub-themes to

represent his prior learning. He organized using categories for Professional Work; Teaching and Curriculum; Research; and Training and Community. In the process of working through this design, the participant realized that his engineering experience matched many academic competencies. He found that the process of the portfolio design reinforced for him the value of his earlier experiential learning and the learning involved in creating the e-portfolio.

2) *Authenticity*: One of the challenges this e-portfolio designer faced was that his field in the engineering world (automation controls) is constantly evolving, and needed to be represented in an authentic way. To do this, he drew on his "industrial experience" and provided video clips of short tutorials that he designed for his students as a way to include the laboratory perspective and to keep their skills current. During the portfolio design process, he reflected that his engineering students responded well to short videos and simulations that he designed and made available to them as media.
3) *Ownership of learning*: The format of the e-portfolio was significant for this participant's engagement and ownership of learning. In an earlier academic experience, he had created a paper-based binder of his work experience. He compared this experience to the process of the preparation of the e-portfolio. He stated, "I think because we were dealing with a digital portfolio, gratification, satisfaction, and motivation are all increased when we utilize this type of platform." This participant engaged with his mentor through meetings in Adobe Connect, which is video-conferencing software which allows file and screen sharing. Although it was his first foray into the synchronous, online environment for collaboration, he found it comparable to using Skype and reported that this did not present a barrier to achieving his goal.
4) *Efficacy*: Technology supported the portfolio development, but the social networks and technology affordances also supported learner efficacy. The participant gained from just-in-time viewing of the other students' e-portfolios on the web, even though the other participants' portfolios focused on different disciplines (e.g., law, animation, etc.). He found himself in an online community of other *e-portfolio as PLAR* designers that offered continuous support. The participant indicated that he was surprised at their "openness" to share and help others.
5) *Technology Affordances/Virtual Support*: The participant in this case study reported that frequent synchronous video meetings with a mentor allowed him to obtain formative feedback which built rapport and confidence. He preferred the virtual meetings, stating, "It wasn't like... I had to wait outside somebody's door to ask a question." He found this flexible, online video meeting support to be "a culture onto itself."

This participant was able to articulate some of the learning gains from this study. In the development of the portfolio and reflections of his process, he realized that he had an emergent philosophy of education which was reflected in the methodologies he was choosing in teaching his course. He gained new understandings of the importance of providing students with relevant and meaningful work. He also indicated that he learned that a portfolio is about "using experience to learn."

In summary, the findings of this study indicate that this student encountered some barriers initially in the design of the e-portfolio for PLAR but was able to move through them and progress. There were, however, multiple learning gains which he articulated. Some of these gains related to satisfaction with successfully matching with established baccalaureate standards. Other gains such as increased efficacy, engagement, and increased skill with the technology affordances were related to longer-term (and sustainable) learning skills. Working with a mentor and working within a community of other e-portfolio designers provided the opportunity to build employability skills.

5. DISCUSSION

The experience of establishing prior learning has been characterized as a process of constructing knowledge [5] and the e-portfolio has been recognized for building transferable skills [7] and employability skills [9]. The findings from this case study match earlier findings which indicate that the PLAR e-portfolio process can not only build, but also *enhance* connections among the workplace, academia, and understandings of the affordances of online learning (such as responsive mentorship). The findings of this study also indicate that the evaluation of the e-portfolio can move beyond an assessment of a demonstrated match with program competencies and include some consideration of the other skills which can develop as students attempt to demonstrate PLAR.

The USEM model [10] which was employed at MIT in aeronautics [8] was applied as a lens in this study, and was found to have potential to assess user-generated multi-modal content in a PLAR e-portfolio experience which includes reflection. Employing this model would encourage the portfolio evaluator to seek evidence of how the design and reflection processes connected to the development of a PLAR e-portfolio can increase learner efficacy and overall personal effectiveness. In the particular case study presented here, and in the larger study, the participants gained a sense of awareness of their competence, and felt encouraged to take on a graduate

program. As of the present time, all have continued and most have successfully completed the program.

In addition, a model such as the USEM model [10] is helpful because it acknowledges the nature of a portfolio that is based on experiential learning where the adult student can demonstrate both skills and knowledge in an authentic (as opposed to course-based) context.

Another key consideration is the importance of metacognition or high level thinking about teaching and learning which can occur through the development of a PLAR e-portfolio. The processes of artifact selection, categorization, and description can either be reported in a mechanical way, or can be structured into a process that prompts deeper reflection [19]. Students can be asked to think about how they define authentic learning and assessment, how these learnings are represented in their portfolios, and whether or not they can identify where they experienced dissonance or change during this process. As the case study presented here illustrates, the participant was able to articulate the growth from the reflective aspects of the e-portfolio process.

The USEM model prompts students to consider employability skills as well as practices in authentic contexts [10]. Other research indicates that deeper thinking can be prompted by asking students to reflect on critical incidents, or connecting past experience to present learning [20] or allowing the process to be more open, student-led and less prescriptive.

6. CONCLUSION

This paper has attempted to address some of the important considerations regarding when and how higher education institutions can employ e-portfolios as PLAR. In the world of work, the ability to discern and employ one's transferable skills is a valuable personal resource. Universities can, and should, begin to find ways to become more comfortable with acknowledging different types of professional knowledge and develop processes to enable adult learners to identify and explore their skills. While there is general agreement on the potential of the e-portfolio process in multiple disciplines, including engineering education, much is still to be learned about the optimal design of this e-learning.

Recognition of prior learning experiences needs to be included in policies in the best interest of students. Technology affordances such as web design and just-in-time virtual coaching should be incorporated into the recognition of prior learning policy and process design. Applicants who have work experience demonstrated that they can successfully use websites and multi-media to showcase their prior learning but this early research also indicates that they saw a need for a responsive form of mentorship, even though the content and design are user-generated [21].

In addition, it appears evident that learning in this self-directed mode has layers of meanings. In that sense, this study hints that the e-portfolio potentially has more learning potential and predictive validity for success in graduate school than has been previously acknowledged in the literature. While the present study was based on a single cohort, and this paper on a specific case study, more research is needed to provide broader claims about learner efficacy and persistence with PLAR e-portfolios in tertiary education and graduate school.

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With the permission of the participant in this research, this e-portfolio as PLAR may be viewed online @ https://sites.google.com/site/beaujameseportfolio/home.

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