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What Is a Digital Electronic Portfolio in Teacher Education? A Case Study of Instructors' and Students' Enabling Insights on the Electronic Portfolio Process

Qu'est-ce qu'un portfolio numérique dans la formation des enseignants? Étude de cas sur les perspectives d'enseignants et d'étudiants concernant le processus du portfolio numérique.

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Abstract

Professional programs in postsecondary education have long been using electronic portfolios (ePs) for diverse purposes, for example, assessment, certification, showcasing, and learning. However, in our practices of using ePs in teacher education for the past several years, we have found that the question of "what is an eP?" requires substantial unpacking. This paper will offer insights on our evolving understanding on ePs in teacher education based on three interacting areas: (a) rich media reframing how we understand professional learning in a digitally linked world; (b) literature from the last 10 years in the use of ePs; and (c) insights from instructors and students using an eP process in one term of a teacher education program. We conclude with a re-visioning of learning in teacher education in relation to the emerging practices enabled by an eP process.

Résumé

Les programmes professionnels d'éducation supérieure utilisent depuis longtemps des portfolios numériques à des fins diverses, comme l'évaluation, la certification, la mise en valeur et l'apprentissage. Cependant, notre expérience des dernières années relative à l'utilisation des portfolios numériques dans la formation des enseignants révèle que la définition du portfolio numérique nécessite un examen approfondi. Le présent article offre un aperçu de notre conception, toujours en évolution, des portfolios numériques dans la formation des enseignants, basée sur trois domaines en interaction: (a) des contenus médiatiques riches qui restructurent la manière dont nous comprenons l'apprentissage professionnel dans un monde interconnecté par le

numérique; (b) la littérature des dix dernières années sur l'utilisation des portfolios numériques; et (c) les perspectives d'instructeurs et d'étudiants ayant utilisé des portfolios numériques durant un trimestre d'un programme de formation des enseignants. En conclusion, nous réimaginons l'apprentissage dans la formation des enseignants en tenant compte des pratiques émergentes rendues possibles par les portfolios numériques.

Introduction

The practice of using an eP in professional education has developed as part of a growing movement in multiple sectors of education (Bryant & Chittum, 2013) and offered great potential through digitizing learning to "academize" the web. Previously, Stiggins (1994) defined a portfolio as a collection of student work that demonstrates achievement or improvement**.** Yancey (2013) described portfolios for writing assessment as "a selected body of plural performances narrated by the writer in a reflective text and located at a particular point in time" (p. 16), highlighting the developmental and contextual nature of portfolios as a more authentic representation of students' work/success. With portfolios evolving into ePs, Barrett (2007) noted that ePs allow technologies to be used as a repository for students or teachers to collect and organize artifacts using many media types (audio, video, graphics, text) as evidence of identified outcomes, goals, or standards. Essentially, an ePortfolio process is recognized as an online database of students' program-related experiences (Strudler & Wetzel, 2011). In Hopper and Sanford's (2010) research on the development of an eP in a teacher education program, they concluded that an eP is more than a collection of showcased work, rather it was a dynamic website that may or may not be linked to a database and offers flexible, socially networked and indexed repositories of e-learning evidence.

This paper will offer insights on our evolving understanding of "what is an eP?" in teacher education based on the use of digital media by: (a) reframing how we understand professional learning in a digitally linked world; (b) reviewing literature from recent years on the use of digital ePs in professional programs; and (c) insights from instructors and students using a digital eP process in one 13-week term at the beginning of their program.

Paradigmatic Insights on Evolving EPs: Positivistic, Constructivist to Complexivist

In this section, we offer a paradigmatic frame of reference for our analysis of the eP. In particular, we outline how we see a more emergent learning process evolving from the use of digital media, both created and recycled, within an eP process. As noted by Barrett (2007), referencing Paulson and Paulson (1994), typically, over the early part of this century, the eP process has evolved into two main epistemological types. The first type is a positivistic portfolio, with the main purpose of assessing learning outcomes that are generally defined externally where "positivism assumes that meaning is constant across users, contexts, and purposes" (Barrett, 2007, p. 440); therefore knowing is in relation to a fixed and for-assessment purpose, measureable, with instruction-focused alignment to predetermined content or prescribed competencies. The second type of portfolio perspective is based on constructivist theories of learning where the eP creates "a learning environment in which the learner constructs meaning" (Barrett, 2007, p. 440). In this case, meaning varies across individuals, across experiences, and with purposes framed in relation to social groups. Constructivist type portfolios focus on process,

"a record of the processes associated with learning itself" (Barrett, 2007, p. 440). In this paradigm, Barrett (2007) and Yancy (2013) noted that digital tools can allow the eP to offer multiple forms of assessment that documents: (a) attainment of standards (accreditation portfolio); (b) digital stories of deep learning (a learning or process portfolio); and (c) digital resumes to highlight competence (a showcase of best works/marketing/employment portfolio). The intent of a constructivist eP is to collect and share a diversity of evidence, selected by the user and represented through rich digital media. Yancy suggests this allows for a form of constructivist remediation where every media is re/mediated on another medium so that a student "create[s] the new in the context of the old and based on the model of the old" (Yancy, 2013, p. 23). This constant ability to digitally revise, renew, and re-create allows a different sense of evolving evidence, where the eP is a mindtool for connecting and transforming thinking, as the user changes and knows more with hindsight.

Siemens (2005) acknowledges this type of constructivist learning as useful but critiques it, suggesting that the focus is still "on learning that occurs inside the person" and "does not address learning that occurs outside of people (i.e. learning that is stored and manipulated by technology)" or the type of learning "that happens within organizations" (Siemens, 2005, p. 3). In summary, the constructivist perspective, though needed as part of a reflective growth as a teacher, ignores the critical aspect of learning between people and structures they co-create.

Siemen suggests that connectivism learning theory, framed by chaos theory and a complexity worldview, offers a way of expanding our notions of learning, where connections between learners with a common goal becomes the key to sustained and meaningful knowledge development. In this third paradigmatic perspective of a complexivist worldview, we function in society as part of a web of complex systems that are open, recursive, organic, nonlinear, and emergent (Gough, 2011). In relation to teacher education, complexity invites us to understand that many of the processes and activities that shape us and the worlds we inhabit are nonlinear and, at times, chaotic. Furthermore, the generative characteristics of our educational practices we engage in are unpredictable and/or beyond our control, despite being taught in practices and theories underpinning university courses that imply the ability to predict and control. From a complexity view, order emerges through self-organization of agents bound to a common goal, "within richly connected systems that give rise to an emergent pattern which then feeds back into the system" (Siemens, 2005, p. 3).

Based on Siemens' ideas on connectivism we believe that the "digital" aspect of the eP offers richly connected systems for student learning within a global community of learners. Learning from personal experiences is important but is not enough for shaping how we need to act. Similarly, Davis and Sumara (2006) suggest that from a complexivist worldview we derive our competence from forming connections with people, with institutions, and with an array of interconnected technological processes that self-organize around common intents and needs. As such, connectivism learning evolves from "principles explored by chaos, network, and complexity and self-organization theories" (Siemens, 2005, p. 5) that reflect the social environments we participate in. In this way, learning becomes defined as "actionable knowledge that can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and that these connections enable us to learn more [which] are more important than our current state of knowing" (Siemens, 2005, p. 5).

In agreement, Hoban (2002) emphasizes that the "digital" nature of the eP process, both created by a user (electronic) and connected to other users' reflective artifacts within a system (connectivism), creates a network of shared learning. We see connectivism as operationalizing the ideas implicit in a complexivist world view. In time, and as advocated by this networked knowing, eP users can connect further to social media databases related to forming information sets enabled by web 2.0 (from static webpages to dynamic or user-generated content) and 3.0 (intelligent web that anticipates what user needs with machine-facilitated understanding of information) tools, which then become key components in both a personal and a professional complex learning system. With this perspective, professional knowing is based on a connection to a dynamic reality through reflecting on an experience in relation to what was known as well as new knowledge that emerges from the array of digital interactions. From a complexivist perspective, individual learning is an active process in relation to the environment and networked connections to others. As described by Capra and Luisi (2014), this is seen as a structural change in the person, a coupling between the person's capacity to learn and the aspects of the environment in which they are able to engage with, affect and be affected by, personally, socially, locally, and globally.

From a consideration of these perspectives, we focus on learning as the evolution of interactions for the individual within the professional landscape of teaching. Instructional processes and assessment embrace the idea of learning brought forth from recognized knowledge components (positivistic perspective), reflection on personal learning and associations (constructivist perspective), and also the interaction amongst learners that collaborate around a common intent, within a complex system, and are transformed through a network of interactions and feedback loops on actions (complexivist perspective).

Understanding Electronic Portfolios as Learning and Assessment

Literature on ePs has identified three major types: assessment/credential, showcase/best work, and learning/development (Abrami & Barrett, 2005; Butler, 2006; Karsenti, Dumouchel, & Collin, 2014; Panke, 2014). In this study, we focus on learning/developmental ePs where we note three major focuses of use, with overlapping boundaries: (a) eP as a learning tool; (b) eP as a learning narrative of identity; (c) eP as a holistic assessment process. The following table summarizes some of the key themes from the literature in relation to these areas.

Table 1 summarizes key ideas in regard to conceiving eP as a learning tool beyond simply using eP for documenting learning.

Table 1

eP as a Learning Tool

Source	Key Ideas
Cheng and Chau (2013)	For cultivating students' self-regulated learning abilities; discovered a positive correlation between eP creation
Fitch, Peet, Reed, and Tolman (2008)	Highest form of knowledge and skill integration reaffirmed, showing that it is not important what students learn, but that they learn how to learn and that they are motivated to do so
Johnsen (2012)	The eP system made learning visible by enabling students to express their learning
Lin (2008); Masters (2013);	eP as a learning strategy and a scaffold for students' learning
Lopez-Fernandez and Rodriguez-Illera (2009); Meek, Riner, Pesut, Runshe, and Allam (2013).	eP was shown as a personal developmental learning tool and a transformational learning process through reflection
Chrzaszcz, Sporer, Metscher, Wild and Sigurðarson (2008)	eP as a space to integrate informal and formal learning in distributed environments, not limited to program requirements, and to connect professionals from novice to seasoned practitioners within the professional field

Since eP is also a personalized digital presence for its users, multiple scholars, shown in Table 2, have explored its potential for narrating professional identities in a community of learners.

Table 2

eP to Narrate Professional Identities

Source	Key Ideas
Clark (2010)	The potential of digital literacies in identity construction, and envisioned a new pedagogy based on digital rhetoric
Graves and Epstein (2011)	eP as a tool for constructing a narrative professional identity and guided students to extend this narrative into a personal development plan
Hughes and Purnell (2008)	The sharing function of eP can create a community of practice for pre-service teachers
Ehiyazaryan-White (2012)	Examining the dialogic potential of eP in formative peer-to-peer and instructor feedback and claiming that ePs can be used to create communities of learning and achieve learner-centred pedagogy
Zhang, Olfman and Firpo (2010)	ePs for social constructivist learning through communities of practice and knowledge sharing

Other scholars, included in Table 3, have highlighted the assessment function of eP and believed that it holds the potential for an authentic and holistic assessment process.

Table 3

eP as a Holistic Assessment Process

Source	Key Ideas
Wakimoto and Lewis (2014)	Students valued eP for its multiple functions, be it a form of summative assessment, a developmental tool for professional competences, an opportunity to gain technology skills, or a means to build communities of practice through peer-to-peer interaction
Trevitt, Macduff, and Steed (2014)	Both summative and formative uses of eP in assessment: critiquing the limitations of traditional assessment methods, they believed that there was an emerging interest in the potential of eP to realize both learning and assessment for postsecondary students where ePs were both product and process
McWhorter, Delello, and Roberts (2013)	eP as authentic evidence for accountability and institutional accreditation. eP could connect both the personal and professional sides of an individual's life

In summary, prior literature considers ePortfolios as an authentic assessment process that integrates both the summative and formative modes of assessment, utilizes self-assessment through reflection, and connects both the personal and professional identities of the learner. From this foundation, the ePortfolio practice that we describe in the next two sections show how we set up the use of digital ePortfolios in our teacher education program and then discuss the insights gained from student and instructor responses.

Setting Up an Electronic Portfolio Process in One Term of a Teacher Education Program

In preparation for developing a personal ePortfolio using Folioz software as a platform, videos regarding digital literacy skills and software tools related to aspects of the eP process were created by the research team, including creating profiles, connecting with friends, customizing page design, uploading artifacts, and linking to cloud storage and applications. A curated YouTube playlist of videos guided students in the use of Folioz eP platform (the YouTube videos can be found at http://bit.ly/folioz). In the information technology course within the elementary teacher education program, a "digital badges" system was created where students earned different digital badges for successfully demonstrating particular skills used to develop an eP.

Stages in Outlining Electronic Portfolios to Students

Below is an outline of the six stages we identified over the term to develop the eP.

Stage 1: Orientation to ePortfolio. Students were introduced to the eP platform in a workshop. The reason for developing an eP was explained based on five rationales: (a) controlling their digital profile as demonstrated by a search of themselves by name and location

and what comes up to represent them; (b) a way to connect learning across courses and life experiences that relate to the BC Ministry of Education standards to be certified as a teacher in BC; (c) a way to share resources and insights with professional colleagues and friends; (d) a means to develop and show ability to use digital technology to represent their learning; and (e) a way of showcasing their learning to potential employers/mentor teachers.

Stage 2: Submitting a public profile page and a page for peer feedback. The students created a public profile that featured personal information about themselves that they wanted to share in relation to their future role as a teacher. This visual profile included a short video entitled "Who am I?" in relation to becoming a teacher, personal statements in regards to their philosophy about teaching, and links to online resources that supported their philosophical beliefs. Students also personalized their public page with background images (called skins), page layout, and links to friends in the eP network.

Stage 3: Developing criteria for assessing ePortfolio pages. After receiving feedback from friends and the instructor, the students then co-constructed feedback on criteria for developing an eP in relation to artifact selection and explaining the connections to teacher certification competencies. In addition, feedback was also given on how to present information for different audiences and how to use the technology effectively.

Stage 4: Submitting pages to address BC Ministry of Education standards for instructor and peer feedback. In this stage, students created three ePortfolio pages that addressed the broad categories of (a) professional competence, (b) knowledge, and (c) commitment, in relation to provincial certification competencies. These pages were submitted for feedback from one or two peers before being revised and then submitted to the instructor to be approved.

Stage 5: Students submitting nine artifacts with reflections. Artifacts that relate to courses taken during the term were selected by students and reviewed by peer before the instructor checked to give approval to sign up for an exit interview**.** For the final submission, the students selected preferred artifacts from their experiences and arranged them into collections organized by subject areas or key themes. Students were informed that a professional colleague (principal, teacher, other course instructors, or administrative officials) and one of their peers would be interviewing them in the last class in relation to their ePs. With peer feedback and their instructor's final review to approve as ready for the interview, the students were then allowed to sign-up to engage in the culminating event, the exit interview.

Stage 6: Exit interview. Students were assigned in pairs to one of 12 interviewers from the education field (principals, superintendents, senior teachers) and given an outline of three question prompts focused on: (a) describing the development of their digital literacy skills; (b) sharing of two or three most significant artifacts; and (c) explaining how the eP helped to shape their forming teaching philosophy. These interviews lasted 15 minutes, with questions and feedback coming from both their peers and the interviewer. Each interview was recorded using the screen capture capacity of Quicktime on iMac computers. To complete the course

requirements, students submitted the interview with their final reflection in their eP on a template page created by the instructor.

Case Study on the Use of Electronic Portfolios in a Teacher Education Program

In this section we focus on the encouraging outcomes of the eP process and its potential to transform teacher education, as other papers have highlighted institutional barriers (Hopper & Sanford, 2010) as well as instructor and student resistance to assessment-for-learning and technology use (Hopper, Sanford, & Bonsor-Kurki, 2012; Sanford, Hopper, & Starr, 2015). This case study uses as its data source interviews with instructors and students who used ePs in their courses. Instructors engaged in a video recorded interview before their courses, responding to conversational questions focused on asking "why use eP?", "hopes about what will be achieved with an eP?", and "how to assess the eP?". After their courses, instructors were asked about what happened, challenges, and new insights. For students, two-minute interviews immediately following the exit interview with a sample of the students were conducted by research assistants who did not teach in the program to capture the summative moment or the "aha" moment of self-realization ignited by their interviews.

Participants. A cross-section of students in the Post Degree Professional Program (PDPP) and from a cohort in the BEd elementary program participated in this study. The eP was a central piece for the integration of the course material in all of these cases. All students in both the elementary program (N=29) and the PDPP program (N=70) were invited to participate in the study of the eP practice with the opportunity to comment on the eP and the exit interview after they completed the latter. Those students who signed consent forms (15 secondary and 14 elementary) were video recorded, offering their insights on the process and what they understood the eP process to be. In order to protect their identities, all students are represented with pseudonyms in this paper, along with five instructors who were interviewed and also remain anonymous.

Data Analysis. Videos of student interviews and instructor interviews were uploaded on a private YouTube channel and transcribed using the annotation feature on YouTube. Annotated text was copied and pasted into a separate Google Doc with text hyperlinked directly to the timestamp in the specific YouTube videos. This created a rich source of data that could then be coded in NVivo (2016; a qualitative data analysis computer software package retrieved from https://www.qsrinternational.com) with any text hyperlinked back to the video recorded interview. The hyperlinked text in NVivo was then coded into nodes of related material to explore emerging patterns, and nodes were organized into trees of associated material within emerging themes and common ideas. For the purpose of this paper, instructor interview themes connected with "student learning" and "instructor teaching" were selected to illustrate how digital ePs build the conditions for the transformation for constructivist and complexivist dimensions of learning. The shorter post-eP interview data with students was similarly uploaded to YouTube, coded with transcribed annotations then pasted into Google Docs. These annotations were clustered into emerging categories of responses with the different interviewees identified, then uploaded into NVivo. Clips from the emerging themes were then used to produce a short video by simply following the links of the coded data back to the original YouTube video. As a summary, and to clarify context, a 10-minute video was created to show eP setup and student responses. With permission from students, the video is linked here http://bit.ly/WhatiseP

with video summarizing intent and student response to eP process.

Findings

The findings are divided into two clusters of themes. The first is from instructor interviews, divided into four themes based on instructors' insights after completing the eP process with student teachers. The second cluster is from student interviews after the eP exit interviews and is divided into three themes.

Themes From Instructor Interviews

Centring on four themes, the instructors commented extensively on how digital ePs created conditions for students' professional learning that starts to address recurring critiques of teacher education programs in relation to their fragmentation of knowledge, lack of connection between theory and practice (Darling-Hammond, 2006), and how to become a creditable teacher through an initial teacher education program (Russell & Martin, 2016).

Cross-curricular possibilities. Instructors emphasized the potential of ePs to bridge courses and create connections. One instructor noted that, "the eP is a place where they can bring all of their learning and assignments from all of their courses, take a step back and reflect and see how they can connect." Furthermore, digital ePs allow students to bring in experience from outside the program into their professional learning, creating an intertwined complex picture weaving of their learning. Referring to the exit interview at the end of term, the same instructor was convinced that her students valued the eP beyond the course as it provided students the opportunity to "reflect on the connection of the ongoing process of thinking and practice," of becoming confident in the role of being a teacher.

In addition to being a space of cross-curricular interactions for students' learning, digital ePs also offered opportunities for instructors to reflect on their own practice. Another instructor commented, "even if I don't know the content of other courses, I can see what they are putting on their portfolios and refer back to it." This observation has helped the same instructor to connect to other materials which has in turn led to changes in her own practice. While compartmentalized courses in existing teacher education programs have caused increasing concerns (Hopper et al., 2012), digital ePs can provide what this instructor called "the string that ties it all together."

Ongoing processes of identity building. Apart from building connections between discrete courses in a teacher education program, digital ePs have also become an ongoing process for students to build their professional identity. Noticing that students have weaved their personal life experience into their digital ePs, one instructor reflected that "the digital portfolio allows this link between prior experiences they chose to have and this career path. This is a combining of multiple selves into this commitment of becoming a teacher. It is a way of making these connections that you wouldn't normally do." Similarly, another instructor believed that "it [digital eP] really is them shaping themselves as professionals" and that "the process is a critical aspect of thinking about self as professionals, seeing the work they are doing in connection to other work they are doing." Therefore, the instructors find digital ePs to be a powerful constructivist tool for students to build their identity, not just from the beginning of the program

but also from their prior and ongoing lives.

Networked peer learning. The Folioz eP platform allows for easy sharing among users. Students and instructors can select what pages to make accessible to their chosen audiences, allowing others to view their portfolio pages and make comments. By "friending" people, students can pick up on what others are doing. One instructor commented that students "cross fertilize each other but they also customize it all the time." She continues,

> the potential for sharing is really critical. The whole cohort model is about supporting each other, so they can see each other's assignments and respond to them. They are then benefiting from each other's experiences in the schools and learning collectively. As they learn to do this, they can actually contribute to their peers learning and not just their own.

Likewise, another instructor noted that digital ePs "can shift their thinking to more collective consciousness and to really appreciate it in their learning, so that they'll develop it in their class, but also be able to contact others when they themselves face struggles." With digital ePs becoming the link between individuals, each person can realize what the strengths are of everyone else in the group. Those who tend to minimize their work have to reach up to the group standard, and by interaction students realize what a meaningful digital eP looks like. As one instructor commented, the sharing function of digital ePs helps to create a "cross contamination of ideas" and a "collective intelligence." As such this creates a complexivist learning model, self-organizing around the task of becoming a teacher.

Particularly, instructors also created conditions for peer feedback to allow this collective intelligence to emerge. One instructor noted that "(t)heir feedback became criteria for what a good eP is. They create their own criteria, their own pages and giving feedback to each other. So, in the end there is no negotiation with me about what an eP should look like. They know. All I did was checking them off again. The assessment was more at the mastery level." The same instructor also noticed that through peer feedback and assessment, he "got less student type of questions: 'what should I put in?'. They [students] also seem to like the idea of being teacher-like in the task expectations."

The exit interview with a professional from the field was a culminating chance for students to speak about their digital ePs and listen to each other, making connections through talking about their ePs with each other in preparation for the final interview. The added element of an unknown professional from the field, a potential principal, colleague, or mentor, provided a dimension of professional authenticity that raised the importance of the eP to help the students interview well. One instructor summarized this networked peer learning phenomenon, as she described, "(l)ots of what happens is sort of anarchist. Based on their peers' work, the group is setting the standards. Peer assessment is important. Examining others is when they are critically self-assessing and comparing their own. You see people making changes after going to look at other people…" This sense of professional standard framed by external witness and internal recursive appraisal ensures diversity with quality. Students often help each other to show artifacts in the best possible way and encourage peers to share artifacts they never previously considered.

Appreciative assessment. One more aspect of transformative practice that incorporates the complexivist paradigm of learning is reflected in the assessment of digital ePs. Rather than grading students' digital ePs through rigid criteria and differentiating good from bad products of digital ePs, the assessment process was anchored in enabling multiple feedback loops among peers, instructors, and students themselves. One instructor believed that "the exit interview led them to perform to the best of their ability. That's the assessment. (I am) trying to shift the emphasis from grading to participating in a professional community." Referring to feedback, the same instructor emphasized that he aimed at providing "helping-you-grow feedback", rather than "feedback finding fault." The traditional grading system that ultimately functions to compare and rank students has also been critiqued by the instructors, as one instructor reflected that "for a grade, students may work, but they won't take risks. My class creates a place where they can take risks, getting outside of their comfort zone without being threatened." Voicing the opinion of all the instructors, one instructor commented that eP assessment is "an asset based assessment, going from where you're at to where you could go, rather than where you're at compared to him or her, which is saying that someone is less valuable. The immense variety of talents that people have is more likely to come out in this way.*"* The rationale is consistent with the previous theme of networked peer learning. By examining others' digital ePs, students are critically self-assessing their own and matching, or even topping, on the standards of the whole group. For all the instructors with this shared sentiment, "it was a bigger picture assessment" and "it is good for them to see that assessment can be done differently."

Themes from Student Interviews

Student interview comments are shared below under three themes: change, holisticness and identity. These three themes demand an interrelated understanding of the digital eP as a complex emergent process, where the various themes are deeply interconnected to inform a teaching philosophy of ongoing learning rather than final assessment. A unique aspect of this study is that the participants identify all three components in their eP learning process. This would be closest to what Strudler and Wetzel (2011) referred to as hybrid ePs.

Change: Digital eP as a reflective process - light bulb moments. The literature refers to reflection as a key component in a transformational learning process (Lopez-Fernandez & Rodriguez-Illera, 2009; Thomas & Lui, 2012).The interviews demonstrated this reflective process on both self and identity as occurring in multiple stages of the eP process. Several students revealed that the active process of building an eP caused them to reflect on their learning by documenting their growth. Jessica, for example, described the eP as a place to pull together pieces of learning and to thematize them. She felt the eP was "an organic platform to reflect." Likewise, John felt it helped him to reflect on his teaching philosophy. He felt that it was "nice to show evidence of that change over time." Jeremy also believed that "It was pretty good to look around and see the knowledge I built up over the semester." Clearly, the eP helped students to reflect on, acknowledge, and make sense of their learning over the term.

Another piece to the reflective element was the process of talking about their ePs in the exit interview. Many students felt that it was not until they spoke about their artifacts that they became conscious of just how much they learned. As Beverley noted, "There was a light bulb moment when I realized how my past experience was essentially prep for teaching and how many lesson plans I have already done in the past. I never thought about it before until I was

talking with someone else." Susan elaborated on this point too: "When someone is asking you questions, you are expanding on what you've actually learned and reflecting on all your different projects." For others, the interviewer played an important role in eliciting a deeper reflection on the meaning of their experiences. Jayne drew on her sporting and coaching background. Her interviewer dug deeper and she began to realize the depth of her prior learning and the connections it had to what she learned in class: "I realized I really do have a lot of experience with this…how can I connect it to my courses, what in my courses can I take back to coaching, I really started a new dialogue with myself."

Finally, a number of students spoke to the reflective nature of the eP process itself as a representation of ongoing learning, in contrast to traditional, summative models of evaluation. Jeanna referred to testing as "in one ear out the other", while viewing the reflective process as "really important." Likewise, Susan recognized the importance of reflection in learning and how this was facilitated in the eP process: "It gave me the chance to look back at things that I've done at the start and make connections to everything that I have learned, so I could look at it as more of a journey. Not just assignments that I submitted and got a mark for."

These comments highlight the value of the eP as a learning process. These are pre-service teachers who have been exposed to the eP for just one term, and they are already able to both see the learning that they have developed more clearly, and also reflect on the reflection process itself, thus becoming more able to clearly articulate the value of this process from a personal and a professional perspective. Jill articulated this clearly when she said, "you reflect and you reflect on your reflection." Too often, teacher education involves a "do as I say, not as I do" approach to teaching, and the eP process embodies the type of learning and teaching that the program advocates to be used in classrooms.

Holistic meta-learning. Another theme that emerged is most closely characterized by what Strudler and Wetzel (2011) refer to as learning portfolios, where students collect artifacts and document their learning. An important element that can be added to this, which perhaps comes from the integrated nature of the programs the students were in, is their ability to de-compartmentalize subject matter. Students' ePs effectively made connections between courses and subjects that are often isolated from each other. We label this theme as meta-learning because of the rich integration of experience, subject areas, and cross pollination with other students' learning.

The integration of past experiences with their identity as teachers comes across as an important piece for participants as they begin to think of themselves as teachers and realize that their teaching program started long before they entered the program. As a hereditary chief, Sean brought this importance to light really well:

> … integrating my knowledge as a First Nations leader, community member and native artist. I know a lot about my culture. I'm [a] hereditary chief, where I come from I think it's important to know a lot of my culture and who I am and where I stand today and to take some of that and integrate it into some of the things we are doing.

For many, this realization of learning came through the eP process. Jing spoke about her autoethnography that includes all of the texts that have influenced her since grade four. She said this "really helped me think about my life and teaching together which I had not really thought about before this." Andrea spoke to "how well rounded we all are" and how her passions are integrated into her becoming a teacher and connecting with students. Jessica revealed the richness and breadth of the experiences that students integrated into their portfolios by capturing this meta understanding of her learning and identity as a teacher: "I used artifacts from other places–videos, podcasts, other people's blogs that I have read both before this term and over this term that have completely changed my perspectives on teaching."

Another piece of the meta-learning process is learning from peers. This is referred to by Jessica above, but Jill found it important to speak to a specific example: "(Jaella's) page had this idea about sign languages and using them as a basis for all kids and I found that very insightful. I would never have thought of that." Jamil felt that the process of doing an interview with a peer at the same time really helped him to learn, "Having three portfolios laid out side by side is a really great way to see how we have had the same experiences and where they were different ... having together all of our similar but unique perspectives creates something new."

The meta-process of learning across courses is highlighted by a number of students, who see the eP as a place to bring all of their work together and make connections between their work and their future classrooms. Andre, for example, referenced assignments from multiple courses and explained that the eP process made the learnings more realistic. Likewise, Jill valued having all of her work together, "so when you put that page together you see the actual plan that you make, and there is the video of you trying to teach and the modification so it really just brings everything together and you see everything on one page." The above comments are clear evidence of how digital ePs facilitate holistic learning for the students.

Change: Identity construction. As students build and connect their learning to their sense of being a teacher, they develop as teachers, but this process also contributes to their self-confidence as they begin to see themselves as professionals. The showcase portfolios at the end of term cannot be considered a separate kind of portfolio, but rather, a stage in the ongoing recursive and complex process of building an eP. This also speaks to the assessment process as being owned by the students, who view the showcasing of their ePs with pride, rather than as a required task for a grade. Jay referred to the interview as a celebration, "honouring the process that you have been in, and sitting with those successes and that experience and recognizing that it was worth it" and you "should be proud of yourself." John said this in the final interview: "To see the enthusiasm of my interviewer, just to see her enthusiasm of how I developed as a teacher and a person, that really helped me feel valued as an educator." It is worth noting that many of the students like John are clearly proud of themselves and have begun identifying as professional teachers. Susan reflected on how the eP helped her to feel "proud of my work." Jacques saw this as empowering: "we see where we have grown and the power that we have as teachers to do good things." This empowerment and understanding of self-growth is important in building confidence, as Jiya pointed out: "Coming into the program I wasn't sure what kind of teacher I would be…a good teacher I hoped, but at the end of it I am feeling really confident that I will be a successful teacher." All students interviewed were able to feel this sense of pride as they reflected on their learning, and then in turn reflected on their reflection. When speaking to their learning, they continually used terms like growth and passion and they viewed themselves as

educators who, like Jiya, "really want to take what I've learned and put it into practice." At the end of the term the students were able to look back at their progress and development with a meta-lens and compare where they came from to where they are now. They were ready and eager to enter the classroom.

Additional Insights

Though data reported here is from the students and instructors who were willing and keen to talk about their experiences with the eP process, other voices that may have offered negative perspectives on the eP process may not have been as forthright. For example, some students, in end of term course experience surveys that happened before the exit interviews, made comments like "I do not understand why we have to do an ePortfolio" or "I feel it was unreasonable to make us have to learn this Folioz system–I wanted to learn how to use more apps." Both these perspectives speak to a different worldview, focused more on acquiring content rather than reflecting, networking, or developing skills with digital media. However, one student did comment on her doubts at the end of the interview process by saying "I was a little skeptical at first, but it was a really great opportunity and I feel like it's great for creating context as well and ya, just a really good experience." All five instructors commented on how they felt the exit interview caused the students to reflect on their learning differently, to make connections they might not have otherwise made. However, the digital ePortfolio process still remains a temporary process, driven by a few innovators, not a process taken up across the teacher education programs.

Conclusion: Understanding the Digital in the Electronic Portfolio Process

In this paper, we framed our understanding of "what is an eP?" in teacher education based on the complexivist paradigm of knowing and learning (Hoban, 2002) and by exploring multiple potentials of digital technologies, especially Siemens's (2005) notions of constructivism learning networks. The themes that emerged from instructors' perspectives focused on the space that digital ePs created for cross course/curricula connections and cross student interactions that happened through the opportunity to share in each other's learning. The ePs also allowed the instructors, through appreciative assessment, to nurture the students' common goals of becoming worthwhile teachers by helping them to unpack and revise insights of what they had learned from artifacts selected by them to address: (a) provincial standards to be certified as a teacher; and (b) their beliefs about teaching and learning. For the students, the ability to note change in their own thinking, the light bulb moments in the exit interviews, emerged from a recursive elaboration of past experiences into artifacts that addressed forming aspects of their professional identity. This reflective process, both in creating the eP and then in sharing with peers and professionals from the teaching profession, created a catalytic space, the authentic initial space before going on a practicum, to reflect on multiple learning experiences in a holistic manner in becoming a teacher, creating what Cambridge (2007) describes as enabling their "lifelong" and "lifewide" learning.

We now view our current use of ePortfolios as more than electronic, in essence, more than simply a collection of digital artifacts compiled by the user. We see digital as signifying access to the ever-growing resource of digital artifacts (e.g., websites, videos, papers, blogs, cloud-based apps like Prezi and Google Slides) related to a teacher's professional practice. The

digital signifies the connecting, curating, and re-presenting of professional knowledge through an eP hub. Essentially, the eP is a mindtool, to recall previous learning, for ideas to bump up next to each other in surprising ways, and for users to learn to be part of a sharing community with other teachers, as they become part of the global professional network committed to the advancement of teaching and learning. Drawing on our findings, we add to the former three types of ePs a fourth type–a networking ePortfolio, and we offer the following definition for our digital eP practice within a teacher education program.

- A dynamic electronic learning tool for students, who actively construct their professional identity through the collection of digital artifacts, both personal and global, that inform students' reflections on their professional practice and engagement with local and global communities of practitioners;
- A powerful digital teaching space for instructors, who, through encouraging the use of an array of rich media tools, endeavour to create conditions that enable students, both as individuals and within a community, to develop critical, reflective, and relational learning to become a professional;
- Assessment processes that are both a summative product as evidence of professional competence and a formative meta-process of becoming a professional;
- An interactive space for instructor professionals and student professionals that allows an interactive two-way learning process between users to improve the learning environment of the course/program and contribute to ever evolving professional knowledge.

We conclude that the digital eP is a living and emerging complex process serving multiple purposes and existing within a living learning system that is continually changing as it grows. As we have advocated elsewhere (Hopper, Sanford, & Fu, 2016), digital ePs can be viewed as the connective tissue of constructivist and connectivist teacher education system because of its ability to create local and global interactions and networks. The digital eP process has potential to transform professional learning programs through a complex and continual process of reflecting and integrating learning throughout an entire program.

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