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Starting a Program-wide ePortfolio Practice in Teacher Education:
Resistance, Support and Renewal

By Tim Hopper & Kathy Sanford

Abstract

This paper explains how the practice of developing an ePortfolio (eP) within a traditional teacher education program offers potential insights into how to create a self-renewing process. Adopting a recursive approach to examine the eP practice, three intersecting and repeating phases of actions have been identified that reflect the evolution of the five year project: (1) Technological; (2) Pedagogical; and (3) Formalizing. Finally, in line with reviews on eP development, three evolving themes have been noted in current reflections about the eP practice: (1) from resistance to awareness in the use of technology; (2) staff support above and beyond; and (3) shifting attitude to eP. The paper will conclude with how preservice teachers (PT) can take ownership for their learning as they take on the professional role of defining themselves as teachers. The paper starts with a short movie that highlights the evolution of the ePortfolio software from 2005 to 2009.

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Practice in Teacher Education:
Resistance, Support and Renewal

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I just wanted to let you know that I used my ePortfolio in a job interview!!! After all our complaining it actually came in handy, and the superintendent loved it, and took a copy to show to other people who are interested in making electronic portfolios.

(E-mail from graduated pre-service teacher (PT), Jan 2007)

In this paper we describe how electronic portfolios (eP) can value students' reflective, active and deep learning while creating a process of program self-renewal. As shown in the introductory movie "Evolution of eP" we have come to understand the eP to be a dynamic website that interfaces with a database of student work and related experiences stored as artifacts. It has been noted that within a teacher education program ePs offer the potential for a more deliberate and cumulative improvement of teacher preparation programs (Anderson & DeMeulle, 1998). However, adoption of ePs has been filled with challenges associated with paradigm shifts in assessment (Barrett & Knezek, 2003), technology challenges, and time to create an eP effectively within intense programs (Wetzel & Strudler, 2005). In our elementary teacher preparation program the electronic portfolio process has developed over a four-year period. EPortfolio development has allowed our teacher education program to support teacher candidates in collecting evidence of learning that addresses standards to be certified as a teacher. This current standards movement represents a shift from government control on teacher education through a period of institutional governance to the current state of professional self-regulation (Grimmett, 2008).

As described in Hopper and Sanford (2008), the traditional knowledge-as-object

assumptions about teacher education in our program has developed around the design of a set of discipline and content methods courses that are taught at a university and then transferred by teacher candidates (TCs) into practice in a school based practicum. Adopting a recursive process, this paper will examine how an eP, developed from a small pilot study to a program-wide innovation, shows promise for shifting program development from traditional knowledge-as-object to be passed on to knowledge construction through participation in contexts of productive learning and reflection on learning experiences as a teacher. The paper will conclude with a summary of initial reflections on the project from the faculty and staff involved. This paper will offer data from a narrative perspective that addresses the following question: "How has an ePortfolio practice developed within an elementary teacher preparation program?"

Portfolios have been identified as a tool for deep and durable learning, supportive of environments of reflection and collaboration; they are particularly effective for bringing about performance and learning-related change (Bork et al., 1997), with ePs encouraging deeper learning through the use of multi-media artifacts as richer forms of literacy to express understanding (Lambert, DePaepe, Lambert, & Anderson, 2007; Stansberry & Kymes, 2007). A critical outcome of professional teaching portfolios is that they create the situation where pre-service teachers can become more self-confident about their practice, developing the ability to critically reflect on their understanding of teaching and their practice (Darling, 2001). There is a real need to document the impact of ePs on teacher candidate development, as well as to use the eP as a vehicle for gaining insights on program renewal. Teacher educators have traditionally struggled with convincing students to work on their portfolios, competing against more traditional assessment demands and the habit of putting the portfolio together at the last minute (Dollase, 1996). We know that teaching ePs encourage self-paced learning, student choice over what is valued, student self-evaluation, response to teacher feedback, and publication of students' work for a "real" audience (Young, 2002). Zeichner and Wray (2001), reviewing teaching portfolios in US teacher education programs, reported that portfolios encouraged teacher candidates to think more deeply about teaching and content, be more conscious of theories and assumptions that guided their practice and that ePs helped them to develop a greater desire to engage in collaborative dialogues about their teaching.

Contextual Background:

Standards and eP Practice

In 2003 a group of faculty members explored the possibility of implementing a teaching portfolio in a form of an electronic portfolio assessment process within the elementary teacher preparation program, one that would be framed around a set of standards for professional certification into teaching. In 2004, the group successfully obtained a small internal grant focused on implementing an eP practice into the program for one cohort of students entering the regular elementary teacher education program (Temple, Hopper, & Sanford, 2004). Prior to that, support was obtained from the Teacher Education Council[1] to proceed with implementing the eP. Conversations were held with instructors involved in the program. A set of Standards drawing from government accrediting bodies in Canada and Australia, with consideration of the Association of Canadian Deans of Education Accord on Teacher Education, was developed and included into the program handbook (BCCT [British Columbia College of Teachers], 2004; COATS, 2004; VIT, 2004). These standards were called the *UVic Standards for Qualification as a Teacher*. The UVic Standards allowed students to enter evidence from life experiences, assignments and field experiences in an electronic form cross-referenced by sources. This created a way of mapping the Standards being addressed in courses or field experience in the form of a matrix. For each piece of evidence, students complete a STARR framework (situation, task, action, response, reflection) that students use to explain why the particular piece of evidence or artifact was chosen, what they have learned from including and reflecting on the artifact, and how the artifact addresses the Standard being considered. The teaching seminar courses are responsible for supporting and connecting students' learning in coursework and field experiences using the eP structure.

The *Standards* required that students demonstrate knowledge, skills, and aptitudes in three broad areas:

> **Professional knowledge** – referring to the type of knowledge a teacher is
> expected to know about subject-matter, child development, learner psychology,
> cultural understanding, curriculum documents and education systems, and

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[1] Teacher education council refers to a committee formed from members of the faculty of education who teach within the teacher education program. Typically, the council is made up of tenure-tracked faculty, director of programs, sessional instructors and a preservice teacher representative.

professional understandings behind different approaches to teaching.

Professional practice – referring to personal experience of different practices associated with teaching such as planning, assessing learning, analysis of teaching experiences, creating productive and safe learning environments and the ability to create meaningful connections to within schools, community and home.

Professional commitment – referring to the professional attitude of teaching as a life-long career with ongoing connections to professional groups and organizations to develop teaching ability, sustained and worthwhile connections with peers and community members, and ongoing practice of teaching as an ethical practice.

It is important to note that three formal practicum experiences are embedded in the both elementary education regular program (5 year degree with last 3 years in Education) and post-baccalaureate degree program (16 month program); each practicum affords course instructors an opportunity to review the development of the TCs' learning. The practicum experience is viewed as an opportunity for TCs to implement the learning that has been gained over the previous terms. Additionally, some of the courses leading up to the practicum offer field experiences through which the TCs can gain an understanding of their forming teacher identity and also students', teachers', and schools' needs; enabling them to critically reflect on their role as teacher in order to make best use of their formal practicum experiences (Hopper & Sanford, 2004).

In addition to the Faculty of Education preparing TCs to address the "standards" through programmatic experiences (coursework, field experience, seminars), the eP structure acknowledges that TCs have a wide-ranging set of prior and ongoing experiences that enable them to become professional educators and spaces are created in the eP to enter learning artifacts from experience prior and outside of the teacher education program.

Theoretical Framework:

Teacher Knowledge and Situated Learning In ePs

The development of teacher knowledge is critical in the enhancement of student learning in schools. Teacher knowledge is more than skills; it develops from the complex inter-action of teacher, learner, content and context. As Munby et al. (2001) note, teacher knowledge involves strategies, content, and understanding of how teachers' knowledge develops, and the extent to which teachers understand their own knowledge development. Research on teacher knowledge

has tended to focus on the teacher as an object to be researched, to be understood and taught to others. As suggested by Fenstermacher (1994), the "critical objective of teacher knowledge research is *not* for researchers to know what teachers know but for teachers to know what they know…for teachers to be knowers of the known" (p. 50). Typically in teacher preparation programs TCs learn strategies, content and theories on learning, but they rarely study their own learning; they do not think about their own thinking outside of a course, rather they tend to complete course assignments and move on. Too often students complain that courses seem to be taught in isolation to other courses, that types of "reflective" assignments such as journaling are repeated in course after course. As Goodlad (1990) has noted about teacher education courses, it often seems that each instructor "rush[es] to cram it all in into the limited time available" as if their course was the only course and appearing "to abort the emergence of sustained inquiry and reflection" (p. 256).

In teacher education literature, as noted by Schön (1987), Fenstermacher (1994), Munby et al (2001), and others, we need an epistemology of teacher knowledge that acknowledges both practical and formal knowledge as we draw on both propositional understanding and practical reasoning within a context of knowing. EPortfolios create the cognitive space for TCs to study their own teacher development as they shape their own learning, as they learn to draw on formal knowledge for teaching within practical experiences that professionally refine their beliefs about teaching.

Critiques of teacher education programs include concerns of fragmentation between courses, maintenance of a theory-practice divide, and use of research that does not connect to the "real world" of school (Cochran-Smith & Lytle, 1999; Munby et al., 2001). Innovation in teacher education programs are too often "nullified by the structural fragmentation and competing agendas that typify traditional programs of teacher education" (Wideen, Mayer-Smith, & Moon, 1998). From the university community focused on transmitting identified bodies of knowledge to a particular body of students, education courses are often seen to lack rigor, be impractical, segmented and lacking a clear direction (Tom, 1997). These criticisms are often voiced from a rather narrow perception of learning drawing on dualist notions of cognition. As Davis et al. (1999) note in regards to learning and teaching, "…learning is not seen as a "taking in" or a "theorizing about" a reality that is external to and separate from the learner. Rather, learning is coming to be understood as a participation in the world, a co-evolution of knower and known

that transforms both … learning is dependent on, but cannot be determined by teaching." (p. 64). The eP development process can address these criticisms by creating a space for instructors to participate in the whole education of their pre-service teachers. As noted by Carter and Doyle (1996) and Grossman (2005) about effective teacher education pedagogy, TCs' use of the eP process creates a pedagogical space for them to delve deeply into their participation in courses and field experiences, focusing on self as learner while at the same time attending to the learning needs of children they encounter. Grading practices at university focus the teacher candidate on how to be a good student and get a high mark rather than how the course experience has helped them develop as teachers. The eP values TCs' personal experience; it encourages them to develop their own theories on learning as they develop teacher knowledge that integrates professional knowledge with contextual experiences.

Theoretically, the eP project draws on social constructivist notions of learning, in particular situated learning, joint activity and semiotic mediation (Dewey, 1910; Lave & Wenger, 1991; Wertsch, 1985). Meaning is constructed by the learner, working with others in systematically and progressively developed learning experiences. Drawing on the insights related to cognition and learning of Davis et al., (1999) and Clarke et al's (2005) reflections in relation to teacher education, we have drawn on complexity science (Davis & Sumara, 2006), with its ecological emphasis on learning systems, as an analytical framework to explain what we observe happening with the eP practice. Complexity theory allows us to speculate on what might happen as this approach develops. As such, we have come to believe that learning is a process in which a student and a teacher become "capable of more sophisticated, more flexible, more creative action" (Davis et al., 1999, p. 73).

Our study of the eP is framed by a recursive approach to program renewal (Cochran-Smith & Lytle, 1999). Drawing on Kemmis and McTaggart's traditional notions of action research cited in and informed by Hopper and Sanford (2004) and Altrichter, et al. (1993), a group of researchers within a community came together with a commitment to systematically examine, understand and address common issues regarding the development of a teacher education program. In this project the focus of the group was on how an eP process could support and enrich the practice of the elementary teacher preparation program. As a group we believed that teacher candidates' ownership of their learning was critical to enhance the influence of the teacher education program and that situated learning, connected to formal knowledge taught

within a teacher education program, needs to be fundamentally valued within our teacher education program. As a group we believed that technology could offer an infrastructure to value such learning. To value situated learning we need to assess not the acquiring of information, but rather the participation in meaningful learning experiences. Therefore, based on Lave and Wenger's (1991) theory of situated learning, we needed to create an effective means to document and analyze students' legitimate engagement in the complex interplay of persons, activity, and ideas as they shifted from student identity to teacher identity while participating in school communities and university courses. It was our contention that the eP process would encourage students to select learning experiences and capture learning in multi-media ways including image, video, audio and text and by doing this would create the potentials to make connections across courses that would enable more in-depth analysis of personal development and learning. In addition, though this came after the initiation of the project, the eP process allows students to connect program learning experiences to the provincial licensure body (BCCT, 2004) embedded within the University of Victoria teaching standards.

Recursive Cycles for Developing an eP Infrastructure

The eP group, initially consisting of three Faculty members and one sessional instructor, expanded as the project developed, adding two technology computer services support staff (one from the curriculum library and one from computer labs), the field experience co-coordinator, and the information technology course instructor. Also, as the project started, one of the Faculty members of the group became the teacher education program co-coordinator, a position that allowed her to more directly support the implementation of the eP into the teacher education program. This group met on a regular basis to support the eP practice that was developing.

Data Collection

Data in the form of personal reflections, observations and anecdotal evidence generated at meetings from members of this group, surveys completed by pre-service teachers, and interviews were gathered. Notes from 19 meetings were taken over the three years, key events recorded, plans followed up with observations and reflections from group members, and further data was collected as the need arose. Data collection is summarized in Figure 1.

As can be seen in Figure 1, data collection evolved as the action research project adapted to the needs of the program. The PHP MySQL software was developed as research funding allowed programming expertise to be hired to shift the eP from the static html structure to the dynamic

database structure. Responsibility for guiding the preservice teachers through the use of the ePs was located in the Seminar courses scheduled in three separate and incremental seminars throughout the teacher education programs. The action research team met on a regular basis every two or three weeks throughout the term. PTs from the elementary regular program were focused upon because the three year period of their program coincided with the length of the research project. However, presently at any one time there are over 1000 TCs using the eP software when all elementary, middle and secondary programs are considered. Six TCs exiting the elementary program that used the html platform were interviewed and 12 TCs were interviewed as they entered the program and will be interviewed again when they exit the program at the end of 2009. Surveys were given to 90 TCs in the elementary 3-year program who consented to be part of the research project. Other anecdotal information was gained from staff, instructors, participants at orientations to the platform, and at PTs' exit interviews. Though not reported here, in depth interviews of seminar instructors have been conducted and are currently being analyzed.

Data Analysis

Analysis was conducted by one researcher who re-read the data, noting recurring topics and issues, connecting those to actions and then mapping the progress of the project. A summary report was circulated to the group members who then added, edited and critiqued the ideas expressed. Below is an overview of three phases that characterized the development of the action of plan, act, observe, reflect, then re-plan and so on. It should be noted that these phases overlap and are ongoing, each phase taking precedence at any one time as situations and needs arose. In the final section of this paper we note what, at the time, were the prominent themes that characterize the development of an eP practice into our teacher preparation program.

Technological Phase of Action

As teacher candidates entered the program in 2004 a survey completed by the students indicated their very low confidence in computer skills (97% rated themselves with minimal abilities), especially in relation to creating and developing a website. In addition, TCs also perceived that they lacked access to web-editing software they could use. The first plan of action was to address the lack of computer skills for the majority for the students. The TCs did not get an Information Technology course until their fourth year in the regular Elementary program or their second term in the post-degree program. To enable the TCs to develop an eP, an eP

template was created and a series of computer workshops was set up for each seminar class and additional drop-in session created where TCs could go to get individualized assistance. Microsoft Frontpage® software was selected for the web-editing role because of the perceived ease of use and availability in the computer labs on campus. However, later in 2005 a free software package known as NVU (see http://kompozer.net/ for current version) became available and this was adopted as a web-page editor because it was free and available for both PC and Mac computers. A graduate student was hired from the internal research grant for drop-in sessions, working with the TCs for over 30 hours during the spring 2005 term.

Figure 1

Chart showing data collection as project developed research cycles

Research Aspect	Summer	2004-06		Summer	2006-08		Summer	2009	
		Term 1	Term 2		Term 1	Term 2		Term 1	Term 2
Developing PHP Database software				X	x	x	X	x	x
HTML ePortfolio	x	x	x	x	x				
Seminar courses responsible eP			Ed P 250		Ed P 300				Ed P 400
Action Research team meetings	x	xxxx	xxxx		xxxx	xxxx	x	xxxx	xxxx
Pre-service Teachers (PsT)		6 (2005-06) →			30 x 3 (2006) →				
Survey Students		x	x			x			
Staff training	X			X			X		
Database data					*	*	*	*	*
Interviewing (PsT)			+ (6 exit)		+ (12 enter)	+			+ (12 exit)
Faculty Orientation			Faculty meeting		Term orientation			Term orientation	
Interviews seminar instructor						+			+
In seminar course conferencing			X		X	X		ED-P 410. Exit interviews	

Key

* - Frequency of pre-service teachers entries in ePortfolio
\+ - Interviews with pre-service teachers
X - Key event
x - Ongoing event

During the spring term of 2005 each cohort of TCs in the initial seminar course received a 90 min workshop with three additional workshops scheduled outside of class. From these actions the following observations became apparent. Seminar instructors were reluctant to give up time

in the seminar for the eP, feeling their courses, some of which were integrated in schools, could not afford to give up time for teacher candidates to be in the computer lab. However, the seminar leaders did take on the responsibility of checking that the TCs had entered at least three artifacts and a home page by the end of the first term. Due to limited opportunities to view the students' ePs on the computer, they were asked to submit paper copies of each of their artifacts for the seminar leaders and practicum coordinator to view. The completion of the three artifacts was achieved to some degree, but not by all TCs, and the checking was not consistent across all sections of the seminar. The TCs' progress was again checked when the students returned in fall 2005, and those who had not successfully completed the minimum standard were given additional assistance to get caught up.

As TCs uploaded their ePs to the Faculty server it was clear that there was a need for a fast and reliable storage space. This resulted in the development in the spring of 2005 of a secure server space for each student as the Faculty purchased new server hardware. This secure server allowed students to access their ePs from home via a secure Virtual Private Network (VPN) log-on or on campus computers via their network ID. Course instructors could view each student's eP. Only the students had access to edit and update their own eP.

The website template, though easy to use, was difficult to edit and had a complex file structure. Some TCs complained bitterly about having to do the eP, saying that it was yet another job to do on top on an intense program. However, other TCs embraced the idea of the eP, seeing it as offering a better way to value their learning and they started to use images and videos as a means to document their understanding. Some added evidence from their practicum experience after the term was completed. One student even created an on-line tutorial on how to develop the eP.

In the summer of 2005, the eP idea was introduced to the new cohort of post-degree teacher candidates. One individual from this group offered to create an alternative framework incorporating the official University template. From this design and in consultation with TCs and eP workshop leaders, the eP template was then further re-designed in a new simpler format and built using Dreamweaver® software; this was then piloted by some of the TCs. In this framework the focus of the eP shifted from entering artifacts by courses each term to an overview of courses by standards based on the matrix structure.

During the Fall of 2005, as the new eP was adopted, on-line guides for completing the eP

were developed by the Computer Users Head technician and developed further with visual guides over 2006. The library Computer Users staff member offered ongoing support for eP development from the curriculum library, allowing TCs to drop in and solve computer problems with their ePs. Both the technician and the library staff member embraced the eP practice, reflecting that to them it realized their mandate to promote the use of technology skills in the Faculty. These ongoing supports supplemented the eP workshops that were offered in the seminar classes. As TCs took the Instructional Technology course, the need for computer support became less, but there was still ongoing demand right through 2006 as students struggled to master the webpage editing software. By the end of the Fall term in 2007 the two technology support staff and one Faculty member between them had led 56 sessions for TCs in three different years of the program, a significant commitment to the project and done as an addition to their workload. The eP practice made it obvious that technology skills needed to be taught earlier in the program and in subsequent revisions to the elementary program the eP group successfully made the strong case to implement the IT course in the first term of the program, allowing teacher candidates to develop the skills to create their own ePs.

In 2007, the eP was awarded external research funding that has allowed more sophisticated software programming to be developed building on the learning from the adapted software. Hiring professional programmers the project has now developed a Structured Query Language (SQL) database using MySQL open source software with a php interface. This software allows teacher candidates to retrieve, add, edit and delete elements from their personal record set. The new system also allows TCs to customize their own web interface, examine ongoing record of changes noted, export a fully functional html copy of their current ePortfolio and allows systematic examination of personal reflections. The software generates summary quantitative reports for all TCs showing type of entry, when entered, standards addressed and sources of evidence. This new platform allows an array of new data to be generated that can inform TC and program development. All these innovations address TCs and instructors concerns, creating an adapting technological interface for creating TCs' ePs.

Pedagogical Phase of Action

This phase refers to the implementation of the eP as a reflective tool in order to help TCs develop as teachers. Through 2005 and 2006 the eP was taught to seminar instructors through professional development workshops with instructors encouraged to integrate the eP standards

into their course objectives. These workshops were scheduled the week before term started and widely advertised.

Initially, it was observed that seminar instructors, largely made up of retired teachers and a few graduate students, saw this as an imposed initiative. Even one of the research team who taught a seminar class in the program found himself resistant to adding eP sessions. The eP sessions forced him to change a course structure that had work well in the past. Initially, the eP

Figure 2

Images showing how the eP matrix evolved from 2005 to 2007 then to 2009

2005 ePortfolio Matrix

2007 eP Matrix

2009 eP Matrix

was squeezed into courses as add-on sessions in the computer labs led by Computer Users technicians. Here PTs were instructed in ways to include assignments and practicum experiences into their ePs.

Discomfort with technology resulted in seminar instructors adopting a variety of strategies to cope. One was to ignore the eP, other than when computer lab time that was scheduled; another strategy was to carry on developing a hard copy portfolio instead of the electronic version; and a third strategy was to start learn how to use a computer in order to understand the eP development. The resistance to technology can be traced back to the generation of seminar leaders. As most were retired teachers they had not used computers within their practice as teachers; one had even managed to continue working at the university without using an e-mail account. Technology was threatening because relying on it meant that seminar instructors perceived, understandably, that they were put in situations where they could not help their TCs. However as the term progressed, two seminar instructors (retired teachers) purchased new computers to professionally develop themselves with technology so that they could start to access the ePs from home.

In 2006, the faculty made a commitment to use the eP to address the BCCT requirements to show how the standards were being addressed in their teacher education programs. It was then mandated by the teacher education program Director that the instructors of seminar courses take responsibility for checking that TCs were putting artifacts into their ePs. For TCs to achieve certification they had to show that they had addressed the standards through learning experiences in the program. Each term a simple form indicating the number of artifacts to be entered into the portfolio was circulated and seminar instructors were directed to only give credit for TCs in their courses if they had entered the required number of artifacts with supporting reflective comments. This meant that each reflection on an artifact by the TC had been read and passed by the seminar instructor to say that it showed evidence of addressing the UVic standards. However, seminar leaders were initially challenged by this directive as they were worried by the need to use the technology medium. In each term as the workshops were led by the Computer Technicians, the seminar leaders came to realize that they did not have to learn the technology, just guide TCs in how to select artifacts and give feedback to enable them to better reflect on their learning represented by the artifacts.

Led by the field-experience coordinator, seminar instructors developed a conferencing process of meeting with TCs and discussing their selection of artifacts, the learning demonstrated through each of the artifacts, and the potential areas they needed to examine. Gradually, the seminar leaders started to draw on the STARR model to help TCs to reflect on their learning across the program in relation to the standards. As the seminar instructors encouraged TCs to personalize and own their ePs, the instructors themselves started to feel comfortable with the eP practice and started to embrace the eP process as part of the their teaching practice. By the Fall term in 2006 and Spring of 2007 the seminar leaders made time in their courses for PTs to prepare their STARR artifacts before going to the lab, enabling TCs to identify significant artifacts, pair up with another TC to share and edit, and then to share in a large group. The fundamental shift in attitude to the eP came at the end of the Fall term in 2006 when the first cohort of 57 post-degree program TCs completed their practicum and completed an exit interview in preparation for the next phase of their careers.

A panel, consisting of one faculty member, a seminar leader and school-based administrator, interviewed each teacher candidate. All panelists expressed their agreement that the exit interviews were a resounding success. In the seminar classes the TCs were given the exit interview protocol and given guidance on how to prepare for the interview, how to dress and how to assert themselves in a professional situation (eye contact, handshake, etc). The inclusion of school-based administrators on the interview panel added authenticity to the interview. The interviews were conducted with a computer set up with easy access for the TCs to call up their on-line eP for reference during the interview.

Teacher candidates responded to the panel members' questions, recounting stories from their experience, showing materials they had created and linking to resources in their eP. For example, one TC, when asked to describe how he incorporated the Ministry of Education's Principles of Learning (active, individual development and social) into his teaching practices, responded with an example of how he had got his grade 3 students to write a haiku on autumn. Using words they had brainstormed as a class, then using leaves collected on a field trip to create a pastel drawing, he got the students to combine the artwork with the haiku. Finally, working in small groups he helped the class to develop a peer assessment process based on criteria developed in class to improve the haiku. His example captured the idea of learning that was active, allowed for a variety of levels and incorporated both individual and group involvement.

This and many other examples from different TCs, such as salmon dissecting, drum-making, carving a totem pole, creating videos with their pupils, game making, creative dance, etc., showed a real celebration of thoughtful and exciting lessons being developed in schools and linked back to ideas taught in their teacher education program. For example, as shown in the video, one TC on her eight-week practicum in a grade 1 class drew from her university math class the idea of creating a large 100s chart mat (see Figure 3).

Figure 3
Image of math 100s floor chart

In her eP reflection the TC stated "One of the math units I taught on my final practicum was Numbers to 100. I wanted a fun and memorable "hook" to this fundamental unit. By using this jumbo 100s chart I hoped to incorporate movement into their mathematical learning." She reflected "There was a moment (for example, in the wee hours of the morning, as I was writing 71 and realized I still had 29 more numbers to go) where I wondered why I was putting so much of my time into this resource." However, as can be seen in Figure 4, math became something wonderfully exciting for the children. As her final comments in her eP show,

…watching the students counting with their bodies and hearing them speak about

their learning, "that's like hopping by 5s on the big chart," made my efforts worth it…this approach solidified the students' learning by allowing the opportunity for students to see these numbers on paper as well as use their bodies to represent numbers, patterns and more. I found this teaching strategy extremely valuable and I will definitely use this in the future.

Figure 4

Children engaged in movement and math on 100s floor chart

The interview panel acknowledged each TC as being a credit to the program. The interviewers left the interviews excited by what they heard and inspired by the experiences shared by the TCs. The TCs, most dressed formally, came out of the interviews feeling like teachers. As one TC commented when she was given a letter acknowledging her completion of the program, "Is this it?…I am so happy. I cannot believe I have actually done it…I'm a teacher, well almost. I need to go out and celebrate."

The pedagogy of the eP practice was one of re-constructing learning across courses, experiences and personal beliefs as it legitimized pre-service teachers as ready to enter the teaching profession. In the past when many of the teacher candidates returned to the campus they

were treated like students even though demonstrated their ability to teach in their previous practicum experiences. However, when this group of TCs came back to the university they were treated like new teachers; they were acknowledged as having acquired teacher knowledge, as having learned how to 'be' a teacher. The interviews seemed to mark their entry into the profession.

Throughout 2007 and 2008 the exit interview has become a critical feature of the elementary and middle school program. Though some TCs feel the interview is just another hoop to jump through, it is noticeable that after going through an authentic type interview, and being awarded a letter of temporary certification, every TC feels a sense of accomplishment, celebration and acknowledgment. Prior to the exit interview process, TCs just finished their last course and left the program. The exit interview, supported by the ePortfolio, allows the TCs to navigate their learning, relive their challenges and coherently articulate their teaching philosophy. Since 2008 local school district hiring boards have included computers at interviews to allow applicants to show their eP in order for the hiring committee to have greater insights into the applicants' potential as a teacher.

Formalizing eP Practice Phase of Action

Initially, the eP practice relied heavily on volunteer support. Over the two years of implementing the eP, one of the single greatest achievements was to educate every elementary TC on how to edit and link their eP using a web-page editor. The computer support team (two Computer Users Technicians and one Faculty member) taught, assisted and solved problems with every TC about how to upload their eP onto a server, scan documents, convert files, and link into their portfolio images and video clips. In 2005 the computer support team did three eP workshops, through 2006 with multiple years starting or continuing the eP, they did 26 sessions with six drop-in sessions also supplied by a graduate TC. By the end of the spring of 2007 term, the computer support team had done an additional 20 sessions.

Professionally framing the eP practice has been a critical element in setting TCs up to see the process as useful and necessary. Initially in 2005, TCs were told they could see themselves as either "guinea-pigs or pioneers"; that this was an innovation that would be developed through trial and error and their support. Many of the TCs committed to the eP as an innovation and important practice; however a vocal minority kept complaining and resisted the challenge despite efforts to support their learning. Consistent and caring counseling by the field experience co-

coordinator calmed the complaints, but there was for some TCs an undercurrent of refusal to go along with using technology to express and connect learning. It became critical to send out a consistent message to TCs to help set-up the eP purpose and to reinforce that they could only graduate if the eP was completed. This resulted in each cohort of teacher candidates who entered the program receiving a program orientation that addressed the eP and the provincial professional standards. In addition, the Director and the elementary program co-coordinator visited the first seminar classes that TCs took in the program to frame the eP practice, reinforce that it was a program requirement, and emphasized that TCs had a wide scope to personalize how their eP developed. It has been noticeable that each term these briefing meetings got less problematic with TCs becoming keener and more interested in developing their ePs, often commenting on how excited they are to begin the process for themselves after hearing what more senior colleagues had done with their ePs.

Finally, as the first wave of TCs completed the eP practice through their program, it became paramount that every TC had to complete the eP structure, showing at least one artifact for each standard, before having their application forwarded for teacher certification. It was critical that this firm but fair message was communicated to all TCs.

Summary of Reflections on Project

Three main areas have been noted by the group reflecting on the project and responses from TCs and colleagues in the faculty: (1) from resistance to awareness in the use of technology; (2) staff support above and beyond; and (3) shifting attitudes to the eP.

From resistance to awareness in the use of technology: Initially TCs' fear of using computers beyond word-processing and e-mailing, perceived lack of time and lack of instructor comfort, led to very vocal and resistance to the eP. With repeated computer orientations, peer support and consistent leadership, TCs started to see the potential and took pride in their work. Within the eP they included artifacts such as narratives statement of teaching goals and philosophies, lesson and unit plans, samples of their students' work, supervising teachers' notes, journal excerpts, photographs, video and audio clips, action research projects and student assessments. Though challenging to develop, TCs have been encouraged to use the STARR analytical framework to explain and examine their own learning and refine their theories for practice. Some TCs still struggle to unpack the significance of their artifacts, some struggle to separate evidence from artifacts, to make meaningful sense of the artifacts as representations of

their learning in relation to certifying provincial and program standards. For many of them this personal in-depth reflection is a new and unfamiliar experience but points to the need for teacher education programs to help TCs to take ownership of their own learning and recognize their own continued growth as teachers. However, initial evidence is very promising, many TCs indicating that the technology has enabled them to develop a newfound appreciation for the teacher education program they experienced.

Staff support above and beyond: technology support staff and field experience coordinators have embraced and made the eP a priority within their working day. They have helped refine the eP framework, have created on-line tutorials and maintained website support (see eP website http://www.educ.UVic.ca/EPortfolio/). In short, they have sustained an on-going eP process that could not be created by faculty or instructors. In addition, the field experience coordinator has led, encouraged and insisted that seminar instructors become comfortable with the use of the technology and has supported the re-design of seminar classes to fundamentally incorporate the eP into classes.

Shifting attitude to the eP: initially, faculty was unfamiliar with the eP and many TCs either delayed completing the eP or simply included artifacts with minimal reflection. However, the ongoing and sustained support caused several TCs to create model ePs that they shared with pride and confidence. As one teacher candidate, a qualified psychologist who had decided to become a teacher, stated when he was invited to share his eP at a Faculty of Education meeting, "Completing my portfolio allowed me to realize how much I have learned from many of

the people sitting here and how many different things many of my colleagues had learned

at the same time. This has been a very worthwhile program…thank you."

The attitude of passive resistance was also evident from TCs in the program. In the current program they often complained of too much work, of too many demands from the sometimes numerous courses in the program. With ongoing support, this resistance has gradually been replaced by an awareness of the potential for the eP to represent a new way of valuing learning. Initially, TCs framed the eP as a vehicle for getting a job, using it to show at an interview. However, over time the reflective process of creating an eP has allowed TCs to realize that it represents a way of understanding their teaching knowledge, has become a form of mind tool for their sense of confidence as teacher, for realizing the teacher knowledge they have gained from multiple sources. At the exit interviews in December 2006, it was evident that the eP became a

form of celebration for what the TCs had already achieved as beginning teachers in their final practicum experience. Most of the TCs referred directly to their ePs during the interviews and it was evident to the interviewers that they became more animated and focused as they explained artifacts presented through the electronic medium.

It should be noted that until the TCs engaged in the exit interview, the value of the eP as a vehicle for reflective growth was not fully realized. TCs that got employment contracts before completing the program still only saw the eP as something they would show to help them get hired. When they were hired without showing their eP they seem to dismiss the eP as just another assignment. However, as the quote that opens this paper indicates when the eP was acknowledged by hiring boards the TCs were elated and felt that they were being hired for what they valued as a teacher. When TCs were questioned, they all acknowledged that the eP had help them learn and apply technology skills; however, until the TCs were put in the place of a teacher being interviewed, they did not readily recognize how the eP process had helped them develop as a teacher. This indicates that we still have a long way to go to develop the pedagogical aspect of the eP, to explore how 'role' and 'knowing' are inter-connected and can guide the shift from student to teacher, helping TCs to systematically take ownership for their personal development as teachers.

Discussion

It is obvious from the exit interviews that these ePs create a platform that helped TCs become more aware and confident about how their practice had developed as teachers. To some degree this was the case before the eP process was introduced, however, importantly the eP allowed TCs to connect their practice back to the courses and not just to the experiences they had had in schools on their practicum. These connections disrupt the normalizing notions in teacher preparation, as noted by Munby et al., (2001) and many others where pre-service teachers perceive that they learn everything useful on their practicum, implying that most of their teacher preparation courses are not as valuable as school-based experience. The eP structures, over time, facilitated PTs in making meaningful connections across courses. As advocated by Schön (1987), Fenstermacher (1994) and Moony et al (2001) we feel that these connections encourage PTs to articulate their teacher knowledge as both practical and formal as they learned how to draw on both propositional understanding and practical reasoning.

As noted by Zeichner and Wray's (2001) review on teaching portfolios, the initial evidence

on the eP practice shows that the teacher candidates thought more deeply about teaching and content and became more conscious of theories and assumptions that guided their practice. It was noted recently that when a teacher recruitment officer interviewed graduating TCs from our program, all six were offered positions at the interview. The recruiting officer noted that he was particularly impressed by their reflective comments. As he stated "They were thoughtful, especially around philosophy. They really get the big picture." The recruiting officer made plans to return later in the year to interview the next graduating cohort. In addition, as noted by Zeichner and Wray (2001), the eP encouraged TCs to share insights they had gained from experience and caused them to suggest to each other artifacts they could use for different standards, helping PTs to develop a greater desire to engage in collaborative dialogues about their teaching.

A critical characteristic of the eP practice at UVic is that it has evolved over time, initially with one cohort of elementary education TCs and then to the whole teacher education program. This gradual evolution allowed technological problems, instructor insecurities, PT technophobia and general program overload to be addressed practically and thoughtfully with ongoing consultation. With program revisions, TC support and faculty awareness the eP practice is set to develop further as it creates a space for instructors to gain insights on the whole program and for TCs to examine their own development over time as they learn to attend to the needs of the learners in their classrooms. Already the eP exit interviews have promoted TCs' personal experience and their articulation of their own theories on learning to teach as valuable to their development and future success as teachers. As noted by Davis and Sumara (2006) in regards for the conditions for the emergent of complex systems such as teacher education programs, the ongoing adapting eP software offers a way to create: (1) a self-organizing system where teacher candidates' selection of artifacts allows their diversity of learning experiences to be acknowledged whilst allowing coherence from aspects of the program to shape those experiences; (2) the certification standards to be framed as 'enabling constraints'; and (3) technology that allows ongoing interactions between TCs and instructors. The eP allows a valuing of learning beyond the course grade and creates a new space to value teacher knowledge, for TCs to become teachers who know what they know and know how they know it (Fenstermacher, 1994). Agreeing with Barrett and Wilkerson (2004), we believe the eP creates a catalyst to move away from knowledge-as-object based on positivistic ways of measuring

learning. Such ways are associated with graded courses or prescribed evidence for a defined body of knowledge. Instead, the eP values learning in credit/non-credit courses, that are informed by professional knowledge and experienced practitioners, focused on embodied learning, on inquiry through knowledge construction and on in-depth personal development as a teacher.

As we look back now at the evolution of the eP project, we realize we are in a process of reinventing teacher preparation by focusing on what the program does well. The eP software has expanded with new capabilities associate with peer-to-peer feedback and "Facebook" like interface. News of the success of the software has spread with the Schools of Nursing and Social Work using the software in their programs and a neighboring university purchasing a server to support this software in their own education program. In addition, working with our university Learning Systems unit we are now integrating the eP as open source software package into the Moodle® platform (a suite of open source community-based tools for learning). In a rhizomatic manner the eP is spreading around our local community. This means that learning systems at the university will support the eP software (now called eP), allowing bugs to be addressed and updates to be made as new, user driven innovations in the software are developed. In this way we feel confident it will be sustained as the project moves on, no longer reliant on the research funding to progress and develop.

It is critical in teacher education that we acknowledge and understand the development of teacher knowledge. We believe that the eP as a program initiative will help us, with our TCs, to better understand their development as teachers as it creates an infrastructure to connect pedagogical practices across courses and assignments. The eP practice allows informed perceptions on the program, offering richer insights into pre-service teachers' learning as well as allowing ongoing insights on their reflections on our teacher education program. In a time of increasing government dictates on teacher education, we need to offer evidence of teacher candidates' gaining teacher knowledge that incites their commitment, voice and understanding. The eP offers a way to invite teacher candidates to do this as they gain the confidence to take ownership of teacher certification.

References

Altrichter, H., Posch, P., & Somekh, B. (1993). *Teachers investigate their work: An introduction to the methods of action research.* London and New York: Routledge.

Anderson, R. S., & DeMeulle, L. (1998). Portfolio Use in Twenty-Four Teacher Education Programs. *Teacher Education Quarterly, 25*(1), 23.

Barrett, H., & Knezek, D. (2003). *Eportfolios: Issues in Assessment, Accountability and Preservice Teacher Preparation.* Retrieved from ERIC [ED476185].

Barrett, H., & Wilkerson, J. (2004). Conflicting paradigms in electronic portfolio approaches: Choosing an electronic portfolio strategy that matches your conceptual framework. Retrieved August 28, 2008, from http://electronicportfolios.org/systems/paradigms.html

BCCT. (2004). Standards for the education, competence and professional conduct of educators. Retrieved July, 4, 2004, from http://www.bcct.ca/standards/default.aspx.

Borko, H., Michalec, P., Timmons, M., & Siddle, J. (1997). Student Teaching Portfolios: A Tool for Promoting Reflective Practice. *Journal Of Teacher Education, vol, 48*(5), 345-357.

Carter, K., & Doyle, W. (1996). Personal narratives and life history in learning to teach. In J. P. Sikula, T. J. Buttery & E. Guyton (Eds.), *Handbook of research on teacher education: A project of the Association of Teacher Educators* (pp. 120-142). New York: Simon & Schuster Macmillan.

Clarke, A., Erickson, G., Collins, S., & Phelan, A. (2005). Complexity science and cohorts in teacher education. *Studying Teacher Education, 1*(2), 159-208.

COATS. (2004). Council on Alberta teaching standards Retrieved July, 4, 2004, from http://www.teachingquality.ab.ca/

Cochran-Smith, M., & Lytle, S. (1999). Relationship of knowledge and practice: Teacher learning in communities. In A. Iran-Nejad & P. Pearson (Eds.), *Review of research in education* (pp. 249-305). Washington: American Educational Research Association.

Darling, L. F. (2001). Portfolio as Practice: The Narratives of Emerging Teachers. *Teaching and Teacher Education, 17*(1), 107.

Davis, B., & Sumara, D. (2006). *Complexity and education: Inquires into learning, teaching and research*. London: Lawrence Erlbaum.

Davis, B., Sumara, D., & Luce-Kapler, R. (1999). *Engaging minds: Learning and teaching in a complex world*. Edmontono. Document Number)

Dewey. T. (1910). *How we think*. Boston: D. C. Heath.

Dollase, R. (1996). The Vermont experience in state-mandated portfolio program approval. *Journal of Teacher Education, 47*(2), 85-98.

Fenstermacher, G. (1994). The knower and the known: the nature of knowledge in research on teaching. *Review of Research in Educational Research, 20*, 3-56.

Goodlad, J. (1990). *Teachers of our nation's schools*. San Francisco: Jossey-Bass.

Grimmett, P. (2008). The professional governance of teacher education in Ontario and British Columbia: Culmination of three decades of research and policy in Canadian teacher education or harbinger of a different direction? In T. O'Donoghue & C. Whitehead (Eds.), *Teacher Education in the English-Speaking World*. Charlotte, NC: Information Age Publishing.

Grossman, P. (2005). Research on pedagogical approaches in teacher education. In M. Cochran-Smith & K. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 425-476). Washington, DC: American Educational Research Association by Lawrence Erlbaum Associates, Inc.

Hopper, T., & Sanford, K. (2004). Representing multiple perspectives of self-as-teacher: Integrated teacher education course and self-study. *Teacher Education Quarterly, 31*(2), 57-74.

Hopper, T., & Sanford, K. (2008). Using poetic representation to support the development of teachers' knowledge. *Studying Teacher Education, 4*(1), 29-45.

Lambert, C., DePaepe, J., Lambert, L., & Anderson, D. (2007). ePs in Action. *Kappa Delta Pi Record, 43*(2), 76.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate periperal participation*. New York: Cambridge University Press.

Munby, H., Russell, T., & Martin, A. (2001). Teachers' knowledge and how it develops. *Handbook of research on teaching*, 877-904.

Schön, D. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.

Stansberry, S. L., & Kymes, A. D. (2007). Transformative learning through "teaching with technology" electronic portfolios. *Journal of Adolescent & Adult Literacy, 50*(6), 488.

Temple, V., Hopper, T., & Sanford, K. (2004). *Developing the EPortfolio in the Elementary program* (Grant). Victoria: University of Victoria.

Tom, A. (1997). *Redesigning teacher education*. Albany: SUNY Press.

VIT. (2004). Victoria institute of teaching professional standards - Australia.   Retrieved July, 4, 2004, from http://www.vit.vic.edu.au/content.asp?Document_ID=23

Wertsch, J. (1985). *Vygotsky and the social formation of mind*. London: Harvard Press.

Wetzel, K., & Strudler, N. (2005). The diffusion of electronic portfolios in teacher education: Next steps and recommendations from accomplished users. *Journal of Research on Technology in Education, 38*(2), 231-243.

Wideen, M., Mayer-Smith, J., & Moon, B. (1998). A critical analysis of the research on learning to teach: Making the case for an ecological perspective on inquiry. *Review of Educational Research, 68*(2).

Young, J. R. (2002). "EPortfolios" could give students a new sense of their accomplishments. *Chronicle of Higher Education, 48*(26), 31-32.

Zeichner, K., & Wray, S. (2001). The teaching portfolio in us teacher education programs: What we know and what we need to know. *Teacher and Teacher Education, 17*(5), 613-621.