

Creating a Web-Based Electronic Portfolio System: Lessons from One Teacher Education Program

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Abstract: Electronic portfolios are powerful tools for pre-service teachers to show growth and development over time, reflect on teaching, and demonstrate mastery of performance-based professional standards. As one part of P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, Purdue University's School of Education is developing a large-scale, web-based, electronic portfolio system for its prospective teachers. Building on local reform efforts and the national movement toward performance-based accreditation, this customized e-portfolio system provides a vehicle for candidates to document their work and progress. The system relies on a large database with a web-based interface for ease of access. Candidates can store files and create artifacts, coherent collections of files with reflective narratives that address specific standards. A template approach provides standardization while providing flexibility to end users. The program has proven to be easy to use for pre-service teachers, but somewhat more challenging for faculty. However, it has been a catalyst for change within the school of Education, sparking faculty growth and dialogue. Course integration and coordination across the curriculum have been keys to successful implementation.

Introduction

The national movement toward performance-based standards for teacher education has prompted considerable interest in the use of portfolios by pre-service teachers to document their knowledge and teaching performance (Barrett, 1999; NCATE, 2000; Read & Cafolla, 1999). Portfolios are purposeful collections of student work that demonstrate effort, progress, and/or achievement (Barrett, 1999; Russell & Butcher, 1999). They are relevant to the student, individualistic, and can show growth and development over time. They provide an opportunity for the pre-service teacher to demonstrate and organize his/her understanding of teaching and learning.

According to Danielson and Abrutyn (1997), portfolio developers engage in four processes: (a) collection - the gathering of relevant materials, (b) selection - identification of those materials that best demonstrate knowledge and capabilities, (c) reflection - thinking about one's own practices, and (d) projection - looking forward to consider what steps need to be taken to improve. Through this process, teacher candidates grow and develop. What results is a richer picture of their understanding than can be achieved through more traditional, objective measures. Of course, portfolios also provide one means by which pre-service teachers can be assessed.

With the powerful personal computer systems now available, much of the interest in portfolio development is now focused on the use of electronic portfolios (Barrett, 1999, 2000, 2001; Read & Cafolla, 1999). Electronic portfolios offer several advantages compared to their paper-based analogs, including: reduced storage demands, ease of back-up, portability, ability to create links, and development of students' own technology skills (Barrett, 2001). In the context of developing pre-service teachers' own technology skills, electronic portfolios have the potential to help address the shortcomings of teacher preparation with regard to the use of technology that have been noted in a number of national reports (e.g., Moursand & Bielefeldt, 1999; Office of Technology Assessment, 1995).

Background

After five years of reform planning by its faculty and administration, the School of Education at Purdue University recently completed a phased implementation of completely restructured elementary and secondary teacher education programs. These new programs, which were launched with students entering teacher preparation programs in the fall of 1999 and were fully implemented by the end of the spring of 2002, feature a cohesive set of courses and practical experiences that are anchored by four strands – technology, diversity, field experience, and portfolio assessment.

A Preparing Tomorrow's Teachers to use Technology (PT3) implementation grant, entitled P3T3: Purdue Program for Preparing Tomorrow's Teachers to use Technology, is helping to support the implementation of these new programs. The overall goals of the P3T3 project are to (1) prepare pre-service teachers to demonstrate fundamental technology competencies, using technology as a tool for teaching/learning, personal productivity, communication, and reflection on their teaching, and (2) prepare teacher education faculty in Education as well as colleagues in Science and Liberal Arts, to teach pre-service teachers in technology-rich environments, modeling approaches that future teachers should use themselves.

The project is meeting its goals via three complementary components: (a) a faculty development program leading to increased technology integration into teacher education courses; (b) the use of technology-enabled field experiences to link pre-service teachers to diverse and technology-using classrooms; and (c) development of a dynamic assessment system that provides pre-service teachers the tools and opportunities to select multiple ways of viewing their evolving teaching practice, reflect on that practice, and use digital representations to meet performance-based assessments. The latter is the focus of this paper.

Electronic portfolios, which can run the gamut from fairly simple to very complex, can be created using generic off-the-shelf tools or through a customized system (Barrett, 2001). Each approach has advantages. The off-the-shelf approach relies on commonly available tools such as office productivity tools, web page editors, hypermedia authoring packages, and so forth. The use of generic tools has a low infrastructure cost, because the tools are readily available, but a high cost in training users. Such systems really encourage students to develop their own technology skills and provide considerable flexibility. On the other hand, customized systems usually rely on a centralized database of student records with user access provided through a programmed interface, often web-based. This approach tends to have higher infrastructure costs but lower training costs because users do not have to learn to use multiple software applications. Such a system also may limit flexibility and students' skill development.

Purdue University, as part of its P3T3 initiative, is developing a large-scale customized electronic portfolio system. The rationale for this approach lies primarily in numbers. Purdue enrolls over 2000 pre-service teachers.

In order to accommodate this volume of students, and provide for reasonable consistency in how students and faculty deal with portfolios, a large-scale system with a consistent interface was deemed necessary. However, the electronic-portfolio system that is being constructed is also designed to help overcome some of the shortcomings of customized portfolio systems, such as limited flexibility. The system provides users with formatting options, while maintaining a consistent look and mechanisms for access.

The Purdue Electronic Portfolio (PEP) system consists of a database developed using Microsoft's SQL Server, a popular web-based database engine. The database is housed on an IBM four-processor server with about two terabytes of disk storage space, enough to give each user the equivalent of a CD-ROM for personal storage. Access to the database is provided through a web interface that uses Microsoft's Active Server Pages (ASP) technology. ASP supports dynamic interaction with the database through a simple-to-use web front end that is familiar to users. Because it is web-based, users can access the PEP system from any computer on the Internet that is equipped with a standard browser.

Candidates log in to the PEP system using their standard campus login names and passwords. Once in the system, they can manage their own account information, upload files, perform various other tasks, and create artifacts. Pre-service teachers can upload digital representations of anything that they wish -- word processing documents, photos, scanned images, Powerpoint presentations, web pages, even videos. Any individual item of evidence is stored in a file. In our parlance, an artifact is an individual file or collection of files that the student assembles in the e-portfolio system to address one or more professional standards. Thus, an artifact may be a single thing (e.g., a written lesson plan) or a set of related things (e.g., a written lesson plan, a grading rubric for use with it, a photo of the candidate conducting the lesson in a K-12 classroom). Students may classify artifacts according to three broad themes developed by Purdue's Portfolio Task Force (attention to learners, understanding curriculum in context, and commitment to professional growth) and according to the ten INTASC principles that undergird many teacher preparation standards. Artifacts, finally, are assembled to make portfolios. See Figure 1.

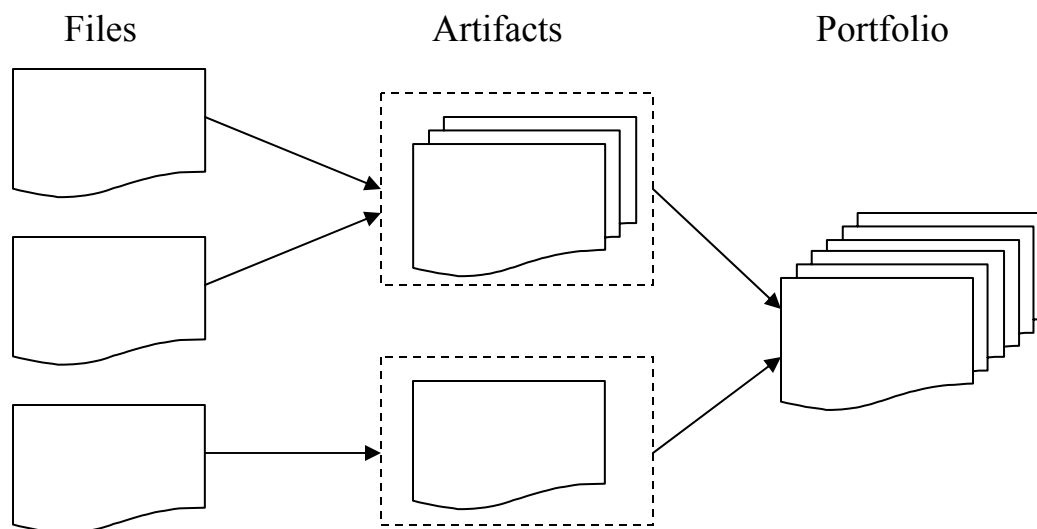


Figure 1. Organization of Candidates' Materials in the Purdue Electronic Portfolio System

To display the artifact, the PEP system features the use of a template that the candidate can customize to present whatever he or she wishes. The template allows students to integrate a reflective narrative with links to various files that relate to the specific artifact (e.g., a written lesson plan, rubric, digital photo/video). The template provides some flexibility in determining how the artifact will look, while providing consistency and ease-of-use. Once completed, the artifact is "published" as a web page with links to the integrated files. After creating an artifact, the pre-service teacher must release it to an instructor for evaluation. Until it is released, an individual artifact remains private and can only be accessed by the pre-service teacher who created it. The system also allows students to make their artifacts public, which means that other individuals within the PEP system can view it. (Artifacts are never truly public, because access to the PEP system requires a login ID and password.)

Artifacts are usually major assignments within courses in the teacher preparation program. As such, they are submitted to instructors within courses for evaluation (grading). Once approved by an instructor, an artifact becomes "locked" as a record of the student's performance at that point in time. However, the teacher education student can continue to develop created work simply by creating a new artifact from previous work. This allows the PEP system to be used for candidate growth and development.

Overall portfolios are evaluated at four points, called gates, within the teacher education program. While gate reviews were originally expected to occur outside of specific courses, the faculty has agreed upon a review system that will have portfolio gate evaluations taking place within key courses.

Developmental and Technical Issues

Pilot testing of the PEP system was conducted in the 2001-2002 academic year with a total of about 800 students in Block I and Block II, the first two semesters, of the teacher preparation programs. Full implementation of the project went into effect in Fall 2002. Since the pilot testing began, many developmental and technical issues have been encountered with the new e-portfolio system.

Of the developmental issues that have been encountered, one of the most significant was determining how students should pass through the multiple assessment gates that correspond to the key assessment points of Purdue's reformed teacher education programs. Closely related to this issue was discussion of who would be in charge of assessment at those multiple assessment gates.

There are currently four gates that correspond to four key assessment points in Purdue's Unit Assessment System (UAS). Gate A takes place after the completion of Block I courses and for all intents and purposes only assesses whether the student has begun his/her portfolio. Gate B assessment occurs after the completion of the Block II required courses, and this assessment looks at students' work to date in their portfolio. Gate C occurs after Blocks III, IV, and V courses, while gate D is placed after Block VI, which is the student teaching experiences and so signifies the end of the program.

The gate review mechanisms, assessment rubrics, and procedures are being determined by the faculty through the Elementary and Secondary Education Committees. Additional input has come from a Block Council, which helped to coordinate implement of the Blocks in the new teacher education programs, and an Assessment Council, which is now providing oversight of the Unit Assessment System. The P3T3 staff works with these groups to implement their visions within the PEP system. The existence of the PEP system has served as a catalyst to stimulate much discussion of the UAS across the curriculum.

Since all students entering the teacher education program as of the fall 2002 were required to use the PEP system, they were expected to post assignments that demonstrated their knowledge and teaching performance for each required class in the teacher education program. However, the assessment gates do not directly correspond to the "blocks" of courses, since there are six blocks but only four gates. This lack of concordance caused some concern over who would be in charge of assessing student work at each of the gates. One alternative that was discussed was hiring an outside evaluator or assessment expert to conduct the assessments. However, in the end it was decided by the faculty on both the Elementary and Secondary Education Committees that Purdue's own faculty would conduct the assessments.

As faculty members everywhere can attest, there is generally considered to be more than enough work to go around. Taking this into account, along with the fact that the School of Education faculty would be serving as the "gatekeepers", an assessment system or process was necessary to assist the designated faculty with this process. This issue was especially problematic in that "gatekeepers" may not have played a direct or even an indirect role in a prior block of courses, for which they were to assume assessment responsibility. As such, the Elementary and Secondary Education Committees met to discuss the necessary standards, principles, and tasks to be addressed by each student passing through each gate. The Committees drafted rubrics to be used for assessing the specific standards, principles, and tasks that students would need to address in order to pass through each gate, and thus, continue their teacher education preparation. Instructors for each individual course would verify if the students met the requirement for their particular course, thereby assisting the gatekeepers in the work that would follow. In addition, students would be required to write a narrative, within the e-portfolio system, to tie together their coursework for each "block" of courses (essentially creating an artifact or webpage for each block of courses). Thus, when the e-portfolio for a student reaches a gatekeeper, he or she is able to see if the standards, principles and tasks, as well as the knowledge and performance, have been met by the individual student. While the outline of this process is now in place, the details are still to be developed.

As one might expect, many technical issues were also encountered during the development of the PEP system. While none of these issues was overwhelming, we share them in hopes that other institutions interested in developing an e-portfolio system may be able to deal with these issues in the planning stages. For example, the PEP system is currently designed to allow candidates to include pieces of work other than those created within the context of courses for the purpose of showing them to prospective employers. However, the gate assessment system is now conceptualized as addressing only artifacts created within specific teacher education courses. How will such materials be handled?

This brings us another issue that was encountered early on and led to one solution by our programmers. We wanted the capability for non-Purdue individuals, such as prospective employers, to be able to review candidates' work. Our programmers created a mechanism for the creation of guest accounts in our secure system so that individuals such as prospective employers can have access to students' portfolios. Students are free to create a their own employment portfolio, separate from the portfolio that is assessed at the gates, by choosing whatever contents they would like to have viewed by the users of the guest accounts.

Another issue that our program staff has been discussing is how long we need to keep the students' portfolios on our server. Space is not really an issue for us at this point, with two terabytes of storage dedicated to maintenance of students' work. Nevertheless, we do not plan to keep the students' files indefinitely. One option that we've discussed is giving the students a copy of their files on CD-ROM when they graduate. This option would actually benefit them as well as simplifying our administrative responsibilities; students would be responsible for their own files and at the same time have easy access to samples of work that demonstrate their skills for the purpose of employment and permanent licensing later on. Another option considered is maintaining the files online for a period of two years, which corresponds to the length of Indiana's provisional teacher license. However, we are still contemplating what to do about students who enter the program, begin the e-portfolio system, but then take an extended leave from school. If we were to delete their files and they return at a later time, what implications would this have on their completing the program?

Lessons Learned

Our experiences with the electronic portfolio system to date have yielded some important lessons. Based on the pilot testing, we have found that students, for the most part, have readily adapted to the use of the system. Most students are comfortable with web interfaces, and few have had difficulty using the system. The faculty, on the other hand, are less comfortable with it. Not only are they less adept with the technology, and hence require more support, but they have struggled in some cases to come to grips with the changes demanded by this new way of doing things.

Nonetheless, the PEP has acted as a catalyst for faculty change. The demands of implementing this new system have forced the faculty to address the creation of appropriate artifact-producing assignments across the curriculum, procedures for gate review, and rubrics to be applied to all teacher education students. The ensuing discussions have been good. Faculty members are talking with one another about the business of teacher education, and, as a result, Purdue's programs have improved. In addition, many faculty members have sought to improve their own technology skills to keep pace with students who are creating multimedia electronic portfolios.

It is becoming increasingly clear that the integration of portfolio requirements into established courses is necessary to ensure the success of this endeavor. Established courses provide an important degree of stability. They provide a built-in structure and a form of accountability that is familiar both to the faculty and the students. As part of courses, portfolio artifacts become merely regular assignments rather than something that must be added on top of existing work.

However, coordination across the curriculum is necessary to create a portfolio that makes sense for an entire teacher education program. Some colleges of education have chosen to address portfolio requirements within the confines of a single capstone course. While that approach can work, the portfolio is not truly a part of the entire teacher education program. At Purdue, we have chosen to make it a part of our entire teacher education program. To do that, faculty members must work together to craft assignments that bridge individuals course to create a synergistic whole. This is a challenge, but one that we gladly accept.

As the dissemination process moves forward, we find that there are many institutions interested in developing an e-portfolio system for their own purposes. Some of these institutions have their own teacher education programs, and some have other programs such as business, nursing, and engineering that might benefit from portfolios. Systems such PEP system may be adaptable to other needs, or others may choose to follow their own paths. At the very least, we hope that others can learn from our experiences.

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