Technology in Education
Virginia Society for VSTE
www.vste.org

Electronic Portfolio Production for Performance Assessment of Undergraduate Learners

by Amy Keefe, Edward Kobrinski, Phyllis Keen, Ed.D., Christopher Mattia, and Christopher Moersch, Ed.D.

Introduction to Electronic Portfolios

For several years, teacher education programs across the nation have been turning to performance-based assessments for documenting learner performance. Performance-based assessment requires learners to provide an answer or create a product that demonstrates personal knowledge or skills, or better understanding of what is learned and put it into practice. The Interstate New Teacher Assessment and Support Consortium (INTASC) is in the process of developing standards that

> …are performance-based: that is, they describe what teachers should know and be able to do rather than listing courses that teachers should take in order to be awarded a license. This shift toward performance-based standard-setting is in line with the National Board [for Professional Teaching]'s approach to developing standards and with the changes already occurring in a number of states (INTASC, 2002, The Standards, ¶ 1)

Portfolios provide one way to meet the emerging national model of performance-based assessment. Recently, teacher education programs have begun expanding the prevalent paper portfolios in favor of electronic portfolios as culminating projects for pre-service teachers. Grant Wiggins, in an interview featured by the George Lucas Foundation (2002), suggests that technology be paired with performance assessment:

> Once we get beyond the idea that assessment is more than just quizzes and tests and that assessment is the documentation of whereby you make this case that the student has done something significant, this body of evidence, if we want to stick with that judicial metaphor, that proves that the student actually learned something, then technology is an obvious partner. (¶ 5)

Additionally, the national emphasis on the integration of educational

Electronic Portfolio, continued

technology in the K-12 classroom requires that teacher education programs prepare teacher candidates to use such technologies. In a recent survey conducted by the National Center for Education Statistics [NCES], the increase of computers in K-12 classrooms was readily apparent, with total student usage of computers rising from 59 percent to 69 percent in the four years between 1993 and 1997. Not surprisingly, the results of the survey further revealed that the average public school contained 110 computers in the year 2000 (NCES, 2002). Thus electronic portfolios are becoming an increasingly accepted vehicle for teacher candidates to showcase their technological skills. By demonstrating that they are able to effectively use technology, pre-service teachers are modeling what they'll eventually use in the classroom.

Barrett (2000) explains that teachers who effectively use technology are more likely to teach students who do the same: "If teachers develop electronic teaching portfolios, their students will be more likely to have their own electronic portfolios" (¶ 4). Because states are starting to implement technology standards for teachers and students, the next logical step for teacher education programs is to adopt similar technology standards. An electronic portfolio combines performance assessment and technological proficiency that is demonstrable to accreditation bodies.

Hicks, Carico, and Glasson (2001) described the integration of electronic portfolios in Virginia Tech's secondary licensure program. The electronic portfolios created by students in the program are designed to assess and document the INTASC, the National Board of Professional Teaching Standards (NEPTS), and professional standards for teaching and learning within each content discipline. The electronic portfolio model described also addresses technology standards, which have been incorporated into accreditation of teacher education programs by the National Council for Accreditation of Teacher Education (NCATE) and the Commonwealth of Virginia.

Although the Educational Studies Department at St. Mary's College of Maryland (SMCM) uses a slightly different framework for electronic portfolios than does Virginia Tech, it also uses them as a means of assessing student teachers.

What distinguishes the electronic portfolio from a paper portfolio is the container – electronic media rather than paper. In an electronic portfolio, which is published on the web or on a compact disc, students compile video clips, scanned images, audio recordings, sample presentations, and documents electronically. Essentially, the electronic portfolio shows rather than tells as college supervisors and, later, potential employers watch and hear the teacher candidate in the classroom. Martin-Kneip (1999), who discusses the use of professional portfolios in her book, Capturing the Wisdom of Practice, summarizes the effectiveness of a traditional portfolio as a reflective and display tool. Portfolios enable educators (pre-service and in-service) to improve upon, portray, and assess their work.

"They are collections of purposeful and specialized work, capturing a process that can never be fully appreciated unless one can be inside and outside someone else's mind. They validate current expectations and legitimize future

Electronic Portfolio, continued

goals" (¶ 1). Martin-Kneip speaks to the effectiveness of a traditional portfolio, yet her comments are equally applicable to electronic portfolios.

The Maryland State Department of Education has released state technology standards for pre-service and in-service teachers comparable to the International Society for Technology in Education's National Educational Technology Standards for Teachers (ISTE NETS-T). Both sets of standards provide benchmarks and guidelines for integrating curriculum technology and improving teacher efficiency through the use of technology. The electronic portfolios created by SMCM students indirectly address Maryland's technology standards while directly addressing teaching standards. Clearly, a student who creates an electronic portfolio is meeting the Maryland Teacher Technology Standards (MTTS) by demonstrating that she or he is able to, for example, "use productivity tools to publish information and organize, categorize, and store information for efficient retrieval" (MSDE, 2002).

With this in mind, the faculty of the educational studies department elected to require students to organize their electronic portfolios around the four domains of Danielson's (1996) framework for teaching: planning and preparation, the classroom environment, instruction, and professional responsibilities in addition to expecting that the electronic portfolios would demonstrate the Maryland Teacher Technology Standards. We have found that Danielson's domains in SMCM's electronic portfolios can, and do, accommodate various MTTSs, depending on which artifacts are chosen to illustrate the domains. Because Danielson's domains provide a framework for showcasing the essential elements of teaching, St. Mary's pre-service teachers have also been able to use their electronic portfolios during interviews in various states that use other teaching standards because the overall content is consistent.

The SMCM approach to the electronic portfolio organization and guidelines differs from that of Virginia Tech's Teacher Education in the Sciences and Humanities (TESH) electronic portfolio organization. TESH requires that student electronic portfolios include evidence of meeting standards set forth by the National Board for Professional Teaching Standards (Hicks et al., 2001). This gives pre-service teachers versatility to use their electronic portfolios nationally, but SMCM expects that their students' work will also be showcased internationally. While this may seem like an ambitious goal, one recent graduate took her electronic portfolio across an ocean to interview for a teaching job in Hawaii. Several SMCM students have completed their student teaching semester in Australia, Costa Rica, and Bermuda, indicating that our graduates will soon start seeking international employment. By requiring that teacher candidates follow the structure of Danielson's framework for teaching, their electronic portfolios showcase their universal teaching skills, including selecting and executing appropriate instructional strategies, managing instructional groups, and communicating effectively with students' parents. The necessity of such skills is not unique to Maryland or the teacher education program at SMCM, but essential to teachers in all locales, of all subjects.

Creation of the electronic portfolios

The Educational Studies faculty and staff at St. Mary's College of Maryland employ a best-practice approach to technology training. Learners in the teacher

Electronic Portfolio, continued

education program who decide to create electronic portfolios are first taught to organize and manage their digital assets. Students create an electronic "sandbox" to store their digital assets. This file structure is named a sandbox because this is where they "play" with their assets – editing, compressing, and manipulating them until they are ready to be put into the directory structure of their electronic portfolio sites. Student sandboxes are organized in the same way as their electronic portfolios: by Danielson's domains. Within each domain folder, students place their assets in subfolders named for the type of asset, whether audio, video, document, image, or presentation.

Storing assets in the appropriate folders is just the beginning of digital asset management. Students are also taught to clearly label assets so they can be retrieved easily. In addition to assigning a file name indicative of the asset, such as "readlessonplan.pdf," students are encouraged to include the domain, in case assets get misplaced. Following this standard, an item named "d1_readlessonplan.pdf" could be quickly identified as a reading lesson plan to be included in Domain 1 (note that some digital assets may be illustrative of more than one domain). After students have learned the basics of effective digital asset management, they are supported with "just-enough-in-time training" to digitize their assets. This style of training addresses the specific needs of students by providing learning experiences as they are needed and as individuals are ready for each new skill.

Rather than teaching all candidates creating electronic portfolios the same technology skills, SMCM support staff spends time with individuals and small groups of students providing need-based instruction and guidance on a variety of technology skills. Some of the more common skills that pre-service teachers learn when creating their electronic portfolios are scanning, editing digital video, manipulating digital images, capturing digital audio, and using digital cameras. Teacher candidates use applications that are the product standard and preferred design process when working with their digital assets. Sample applications include Adobe PhotoShop, Quicktime, and Macromedia Dreamweaver.

The electronic portfolio templates were created using Dreamweaver. After compressing their digital assets to make them web-ready, students are taught to create asset pages using these templates. Assets are inserted in asset pages and linked to the appropriate domain page. Asset pages include captions or short explanatory narratives accompanying images, audio, and video. Similar to TESH's student electronic portfolios, SMCM electronic portfolios contain educational philosophies and examples of teaching and learning and are published to the web.

Teacher candidates' experiences with electronic portfolios in the field

The creation of electronic portfolios has had mixed success for students in the SMCM teacher education program. After learning skills necessary to create an electronic portfolio, students become extremely proficient using technology and are eager to apply their new skills in the classroom. Unfortunately, often the technological infrastructure in the schools where they student teach, and later are employed, does not support the same level of technology implementation.

Electronic Portfolio, continued

Formative data analysis further supports this observation. Each semester, students in the teacher education program take the Level of Technology Implementation (LoTi) survey designed by Moersch (2001). Through a web-based self-administered questionnaire, the LoTi estimates "the use of technology as an interactive learning medium" (Moersch, 2001) and assigns a LoTi score, 0-6. A score of zero indicates a teacher showing a "perceived lack of access to technology-based tools (e.g., computers) or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector)" (LoTi Breakdown, Non-Use, ¶1). A teacher performing at Level Six perceives technology as

> a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to an identified 'real-world' problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available. (LoTi Breakdown, Refinement, ¶1)

When a recent group (January 2000) of pre-service teachers took the survey prior to their professional semester of full-time student teaching, 45.5 percent of the students were performing at or above Level 3 as applied to their Current Instructional Practices component of the LoTi. In December 2000, after their student teaching experiences, the group took the survey again. Only 4.5 percent of the teachers were performing at or above Level 3. A teacher performing at Level Three typically meets the following description:

> Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and Internet use complement selected instructional events (e.g., field investigation using spreadsheets/graphs to analyze results from local water quality samples) or multimedia/web-based projects at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry). (LoTi Breakdown, Infusion, ¶1)

This decline was largely attributed to different standards for the technological infrastructure in the K-12 settings, including computers that are older and slower than what the students use on campus, fewer available peripherals than at campus computer labs, and sluggish dial-up Internet connections. Such trends are not unique to SMCM's student teachers and their experiences in local K-12 schools. Solomon (2002) describes the digital divide that exists nationally in K-12 schools:

Electronic Portfolio, continued

(Schools) that began purchasing computers many years ago or that have limited resources may be using older equipment with less capability. The sheer size of their investments in technology and infrastructure prevents them from tossing the old and bringing in the new in a time frame that would allow them to take advantage of recent advances. (p. 18)

In keeping with this statement, it is apparent that classroom technology integration is somewhat insufficient in Maryland schools. A recent Maryland State Department of Education Technology Inventory reported that only 70% of MD school staff demonstrates "intermediate" technology integration, being able to "integrate applications in some activities, and can help students use technology" (MSDE, 2002). Despite this discouraging finding, other data from the same report indicates that a lack of technology infrastructure is not the root of the K-12 classroom technology integration problem:

> The digital divide exists, but is less at the technology infrastructure level. The digital divide widens significantly with the progression from technology infrastructure towards effective use, application and full integration into classroom curriculum. Considering this information, more thorough training of pre-service and in-service teachers in appropriate classroom applications of technology will result in more effective and frequent integration. (MSDE, 2002)

At SMCM, students in the teacher education program are taking advantage of opportunities to practice integrating technology in the K-12 classroom. With the help of a United States Department of Education Grant, Preparing Tomorrow's Teachers to Use Technology, (U.S. Department of Education Grant#P342A010037) the second group of student teachers to go through the St. Mary's program found innovative ways to integrate the technology they had learned while creating electronic portfolios in their K-12 classroom lessons. Each student was issued an Apple iBook laptop to use during their student teaching semester beginning in August 2001, and an additional Instructional Technologist was hired in the educational studies department.

These resources resulted in advanced scores on the LoTi component of Current Instructional Practices, with the new cohort scores jumping from 37.5 percent to 50.0 percent assessed at or above LoTi level 3. It is the expectation of the Educational Studies Department at the college that their students' LoTi levels will continue to increase over time. Beginning in the Spring 2002 semester, students applying for student teaching during the following fall semester were given the option to enroll in a Technology in the Classroom course to learn ways to effectively use technology in the K-12 classroom, including creating WebQuests and selecting and integrating age-appropriate software. Most of the students opted to take the course and were issued an iBook for the semester to support their classroom efforts.

It was during this same semester that the majority of students enrolled in Technology in the Classroom took courses that required approximately five hours of classroom visits in the classroom where they were placed for student teaching. When students visited the K-12 classrooms, they were able to see the potential

Electronic Portfolio, continued

application of instructional techniques they were learning in Technology in the Classroom. Several students from this group also elected to take a summer 2002 independent study course focusing on the creation of electronic portfolios.

Creating electronic portfolios has had positive outcomes beyond increasing pre-service teacher integration of technology in the K-12 classroom from the standpoint of graduates of the teacher education program at St. Mary's College. These pre-service teachers have found that they are more marketable to potential employers because they can serve as technology resource personnel in K-12 schools.

Often, classroom teachers are called on to provide technological support and aid to other teachers in their schools, and these pre-service teachers who have learned the skills necessary to construct electronic portfolios can do this. They are also prepared to be advocates in the school system for adopting and procuring appropriate classroom technology in the K-12 school. When one recent graduate of the program took her electronic portfolio to an interview with an elementary school principal, she reported that he was "blown away by my ePort! He was just as interested in how I'd made it as he was in the content of it." Additionally, new teachers who have created electronic portfolios are already meeting new technology standards, such as the Maryland Teacher Technology Standards as a result of learning the skills necessary to construct an electronic portfolio.

Teachers who create electronic portfolios are likely to utilize more performance-based assessment with their learners. Although all K-12 students may not be ready to create electronic portfolios using Dreamweaver, they can still learn to create multimedia presentations using applications such as Hyperstudio and PowerPoint. As with teachers' electronic portfolios, students' multimedia presentations are not dependent on Internet access. Schools that do not have high-speed Internet connections are just as able to support multimedia production stations for student and teacher use. Teachers and learners can use a variety of multimedia applications and hardware to create presentation portfolios, publishing them to the Internet when their school becomes connected. At SMCM, students creating electronic portfolios view them in an Internet browser during the production stage, but do not publish their electronic portfolios on the Web until they are finished. Some choose never to publish them to the Internet for privacy reasons, using compact disc copies of their portfolios to share with potential employers.

Other uses of electronic portfolios

The use of adaptations of electronic portfolios for assessment has spread across campus at SMCM to include seven departments and approximately 20% of the student body. Although the project started as a means for student teachers to showcase their teaching skills and philosophies, it has reached a variety of disciplines on campus. SMCM students and faculty in several disciplines have adapted the original templates to meet their needs, deviating from Danielson's (1996) domains as appropriate. The college administration is even considering the adoption of electronic portfolios as an alternative to traditional paper portfolios as an evaluative tool for faculty promotion and tenure. The ePortfolio structure and

Electronic Portfolio, continued

templates were adapted to be used as a platform for collecting Writing Center tutor and student writing samples.

Biology students utilized the electronic portfolio templates and wireless iBooks to document their research projects at Turneff Atoll, Belize during the spring of 2002. Each of the 5 groups (2-3 students each) designed, conducted and documented a field experiment to investigate various biological and ecological processes. A class website was established on an instructor iBook and made available to all of the students via a wireless base station in the field. All data collected by each group was entered into the electronic portfolio templates on the group's iBook and posted on the class website. Digital images, video and audio of the terrestrial and aquatic environments were collected and posted on the class website in the field for utilization as study aids by the students. The field Web site was subsequently transferred to the main campus web servers upon return to campus.

Visiting students from Shanghai, China (summer 2001, 2002) created electronic portfolios to document their progress and experiences during a six-week intensive study of English as a conversational language. Students were expected to use the target language, English, while learning how to enter and manipulate text, images, audio and video electronically in the electronic portfolio templates. Each student portfolio was continually updated and posted on the campus web server to provide friends, family and colleagues back in Shanghai an opportunity to monitor the progress of the students.

By using Danielson's Framework for Teaching as a basis for the organization of electronic portfolios, pre-service teachers at St. Mary's College of Maryland exemplify both their classroom competencies as well as their ability to create a performance-based assessment tool in a way that has universal appeal. They also demonstrate their technological talents as they showcase their work in a multimedia format. As these students move into the professional world as classroom teachers, they will likely integrate performance-based methodologies in their lessons and assessments.

References

- Barrett, H. (2000). Electronic portfolio development process. Retrieved July 2002, from http://www.helenbarrett.com/portfolios/EPDevProcess.html#ben
- Danielson, C. (1996). Enhancing professional practice: A framework for teaching. Retrieved July 2002, from http://www.ascd.org/readingroom/books/danielson96book.html#chap1
- Hicks, D., Carico, K. M., & Glasson, G. E. (2001). The development of electronic portfolios in teacher education programs for assessment of student teachers in relation to professional teaching standards. VSTE Journal, 16(1), 37-52. Retrieved July 2002, from http://www.vste.org/communication/journal/index.html

Electronic Portfolio, continued

- Interstate New Teacher Assessment and Support Consortium. (1992). Model standards for beginning teacher licensing and development. Retrieved July 2002, from http://www.ccsso.org/intascst.html
- Martin-Kneip, G. (1999). Capturing the wisdom of practice. Retrieved July 2002, from http://www.ascd.org/readingroom/books/martin99.html#ch1
- Maryland State Department of Education. (2002). Technology inventory summary. Retrieved July 2002, from http://msde.aws.com/results/statesum.asp?cid=29
- Maryland State Department of Education. (n.d.). Maryland teacher technology standards. Retrieved July 2002, from http://www.smcm.edu/msde-pt3/
- Moersch, C. (2001). Level of technology implementation. Retrieved July 2002, from http://www.learning-quest.com/technologyassessment.html
- National Center for Education Statistics. (2001). Digest of education statistics. Retrieved July 2002, from http://nces.ed.gov/pubs2002/digest2001/ch7.asp#et
- Solomon, G. (2002). Digital equity: It's not just about access anymore. Technology and Learning, 22, 18-26.
- The George Lucas Educational Foundation. (2002). Grant Wiggins on assessment. Retrieved July 2002, from http://www.glef.org/

Acknowledgements

PT3 Implementation Grant #P342A010037 supported the electronic portfolio projects described in this paper. The total amount of federal funds for the grant is $285,336. 49.62% of the project is financed by federal funds. 50.38% of the project, or $289,677 is financed by nongovernmental sources.

About the Author

Amy Keefe, Ed Kobrinski, Phyllis Keen, and Chris Mattia are members of the PT3 project team at St. Mary's College of Maryland. Christopher Moersch is the external evaluator for the grant. You can contact the lead author, Amy Keefe, at adkeefe@smcm.edu.