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The Development of Electronic Portfolios in Teacher Education Programs for Assessment of Student Teachers in Relation to Professional Teaching Standards

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Teacher preparation has emerged as a critical factor in the effective use of new technologies in education. Federal, state, and local agencies are investing billions of dollars to equip schools with modern computers and telecommunications networks. But these information technology investments will not pay off, unless future teachers become technology proficient educators who know how to use these new learning tools to improve learning (Carroll, 2000).

Preparing tomorrow teachers to recognize and harness the potential of technology within their content areas is seen as a vital and necessary role of teacher education institutions throughout the United States (NCATE, 1997; Presidents Committee, 1997). However, concerns continue to be expressed regarding the ability of teacher education institutions to fulfill this need. Both the National Council for Accreditation of Teacher Education (NCATE) and the International Society for Technology in Education (ISTE) report that schools of education are not adequately preparing pre-service teacher education students to effectively integrate technology in their future classroom. (NCATE, 1997; ISTE, 1999)

One response to the perceived weakness on the part of teacher education institutions to prepare teachers to integrate technology effectively has been the development of state and national technology standards. Technology standards

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have been incorporated into both NCATE and the Commonwealth of Virginia's accreditation protocols for colleges and schools of teacher education. Meeting such standards, NCATE (1997) notes, will require "a vision and a plan ... that will integrate technology into teacher education curriculum." Specifically, it is a vision that moves from treating technology as another "special addition to the teacher education curriculum" toward one that seeks to integrate technology within and through the entire education program.

Responding to this call, faculty members responsible for several secondary licensure programs at Virginia Tech (otherwise known as TESH: Teacher Education in the Sciences and Humanities) began in 1998 to realign our programs to meet new technology and content standards mandated by the Virginia Department of Education and our respective national organizations (i.e. National Council for the Social Studies, 1994; National Council of Teachers of English/International Reading Association, 1996; National Council of Teachers of Mathematics, 1989; National Research Council, 1996). The result was the design and implementation of web based electronic portfolios that assess, document, and connect to the Interstate New Teacher Assessment and Support Consortium (INTASC), the National Board of Professional Teaching Standards (NBPTS), and the professional standards for teaching and learning within each content discipline. This paper will introduce our rationale for the use of electronic portfolios, outline our development process, and detail key issues related to building a framework for organizing, supporting, and assessing the development of electronic portfolios that communicate pre-service teachers' understandings and competencies in order to meet specific performance standards and principles.

The Importance of Portfolios in Teacher Education

Portfolios provide a connection to the contexts and personal histories of real teaching and make it possible to document the unfolding of both teaching and learning over time (K. Wolf, 1991)

Currently, portfolios are widely used within teacher education programs to promote and assess student learning, professional development, and reflection (Barry and Shannon, 1997; Nettles and Petrick, 1995; Rafferty; 1994; Reagin, 2000; Stone 1998; Tierney, 1993). Results of the Teacher Assessment Project (TAP) at Stanford reveal that engaging in the process of portfolio development appears to encourage teachers to become more reflective about their instructional practices (Krause, 1996; Vavrus and Collings, 1991). In more recent history, the National Board for Professional Teaching Standards utilizes teacher portfolios as part of its assessment process to identify accomplished teachers. Shulman (1992) highlighted the importance and need for portfolios in pre-service teacher education when he contended that "teaching is like dry ice, it evaporates and goes away ... Student teachers are told to learn from experience but the experience doesn't stay put so one can learn from it." Portfolios are a strategy designed to allow beginning teachers to capture the complexities of learning, teaching, and learning to teach during their preparation program.

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One focus of the stated mission of TESH is to "provide multiple opportunities for prospective teachers to learn, practice, evaluate and reflect upon the profession of teaching" (http://www.tandl.vt.edu/TESH/). Portfolio construction can serve as self reflection process through which teachers can examine "critical incidents" (Carter and Gonzalez, 1993), select meaningful artifacts, and reflect upon their growth as beginning teachers as they move back and forth between their university based courses and field placements. In this process, teacher interns have the opportunity to re-define and direct their professional development as they consider evidence for meeting standards in their own professional practice.

Situated within the context of (a) discipline specific National Standards that embrace constructivist philosophies (NCTM, 1989; NCSS; 1984; NCTE/IRA, 1996; NRC, 1996), (b) on-going efforts to prepare tomorrow's teachers to seamlessly integrate technology within their classrooms, (c) Virginia's teacher education standards, and (d) a recognition that learning to teach is a socially constructed process of self organization and enculturation, TESH sought to harness and combine the potential of current and emerging technologies and portfolio assessment by requiring all secondary pre-service students to design, develop and present an electronic portfolio as part of their exit requirement for licensure.

The Potential of Electronic Portfolios

During the past several years, science, social studies, and math education faculty have been in the process of researching portfolio development (Glasson & McKenzie, 1999; Lloyd and Wilson, in press). This research, along with the development of the worldwide web and other hypermedia environments and the increasing availability of electronic resources and support in our University, made electronic portfolios seem particularly feasible for use in our teacher education programs at Virginia Tech.

The final decision to move toward electronic portfolios within TESH was based upon a pilot program in the 1997-1998 within the social studies and science methods courses to utilize electronic portfolios. The results of these initial efforts suggested that incorporating electronic portfolios into the assessment systems of pre-service teacher education programs offered a number of distinct advantages over the typical three ring binder portfolio, which had formerly been used:

1) Web based electronic portfolios are easier to store and are portable and more accessible than typical hard copy portfolios. Located on the Teaching and Learning server and or distributed via CD-ROM, our students' portfolios were easily accessible by committee members, cooperating teachers and future employers.

2) The process of developing electronic portfolios provides teachers with a strong 'real world' application of the knowledge and skills from which to subsequently draw as they enter into their own classrooms and seek to integrate technology. Follow up work with alumni has indeed revealed that many of the teachers who constructed electronic portfolios the year before felt more ready, willing and able to introduce and meaningfully integrate web based technologies into their own classrooms.

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3) The use of hyper text and other multi-media elements, such as digital photographs, videos, PowerPoint slide shows, and both scanned and pdf documents within their portfolios provide students with the opportunity to create and present a richly detailed, contextual, layered and reflective story of their growth as teachers. The non-linear capabilities of hypermedia make it possible for students to more tightly and flexibly link artifacts and reflections to specific and appropriate performance standards than is likely and, often, possible in a standard binder portfolio.

Propelled by convincing evidence from the previous year and our reading, the next step toward fully implementing web based electronic portfolio as a program area required the development of the following: a clear framework for organizing the structure and scope of the portfolios with regard to specific standards and principles within and through all our content specific programs; clear, consistent, and attainable indicators and established benchmarks of success available for students and faculty as they approached the portfolio development; and the development of guidelines to support and nurture the development of reflective and ethically responsible portfolios that were accessible on the world wide web. In addition to the work we faced together as a faculty, the development of a successful portfolio process required an important assistance aspect that we could not ourselves address: technology support for ourselves and for our students.

Support Structures for Faculty

Beneath most successful technology ventures are layered networks of support, many of which are often invisible. However, these layers represent important incremental processes and financial and technical resources that were critical in the development of a shared portfolio framework.

Our work was supported financially by a United States Department of Education Grant entitled, "Capacity Building for Preparing Tomorrow's Teachers to Use Technology: An Integrated Approach." Written by Dr. Patricia Kelly, Director of the Virginia Tech Center for Teacher Education, in collaboration with several faculty members, the grant supported our work with colleagues in Arts and Sciences and with local teachers to arrive at practical, long-term solutions to our challenge of preparing the pre-service teachers. In addition, the grant provided both material and human resources needed for technical training. Although some of the faculty were proficient at many of the technology tasks we would eventually ask our students to do, not all of us were, nor could any of us commit the time it would take to train students in technology skills on top of our responsibilities to involve them in a cycle of learning to teach, analyze and reflect.

In October of 1999, TESH faculty met for a full day with faculty members from the College of Arts and Sciences as well faculty from a local high school. These teachers were chosen because of their willingness to be involved in learning the same technology tasks in which their student teachers were engaged in learning, in order that both groups could work together to integrate technology into the curriculum during the internship experience. Grouped by content areas, our charge that day was to find correlations among state,

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technology, and content area standards in order to design tasks that would seamlessly integrate technology in our methods courses, in the student teaching experience, and, ultimately, in the portfolio process. Individual work as well as monthly program meetings followed this meeting over the course of the school year. During the following summer, TESH faculty attended a retreat for the purpose of designing portfolio tasks in each of our content areas.

Meanwhile, Dr. Kelly and other faculty and staff worked to build the technology component of the support structure. While the faculty focus during that year was the integration of standards and the design of tasks, we also submitted lists of the technical support we predicted we would need. Using our feedback as well as input from both our technology and clinical faculty colleagues, Dr. Kelly and many support personnel went to work on building several layers of support, including the following: (1) a technology-enhanced classroom in which we could teach our methods courses and model appropriate integration of technology: (2) installation of hardware and software at the field site to match the resources our students used on campus; (3) a series of training modules given on campus for students, campus faculty and clinical faculty; and (4) the development of a support web site.

Using Professional Teaching and Technology Standards as a Framework for Organizing the Electronic Portfolio

After considering all of the relevant standards, the faculty chose a design framework that would reflect the standards in each of our content areas, in national professional teaching organizations, and in technology. Because TESH uses an adaptation of standards from National Board for Professional Teaching Standards (NBPTS) and Interstate New Teacher Assessment and Support Consortium (INTASC) in student teaching evaluation, we chose those same standards to target in the portfolio as a framework for student reflection. The five NBPTS standards are complemented by the more specific INTASC standards within our portfolio evaluation form (Insert Figure 1).

As the NBPTS organization is affiliated with INTASC, the emphasis of the standards of both organizations is on the use of careful, systematic reflection to improve teaching. The practice of examining student work to inform teacher practice would, we believed, provide us with an opportunity to enhance skills of analysis and to reinforce the notion of student assessment as a way to inform instruction. Although we recognize the NBPST standards are written for experienced teachers, they form a concise framework within which to make decisions about portfolio construction and assessment while the INTASC standards provide more specific recommendations for beginning teachers. Within the portfolio evaluation, we also added standards related to the design, development and presentation of the portfolio itself, since student teachers do not use a ready made web page template but are expected to develop their own personal electronic portfolio. (see figure 1)

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On the left side of the portfolio evaluation form are specific categories of seven professional teaching and technology standards. In an effort to provide students with specific information regarding how these standards can be met, we included a column entitled "Indicators of Success" which are suggestions for portfolio tasks that reflect more specific performance indicators for each standard. Based upon our experiences with both traditional and online portfolios, the TESH faculty established clear benchmarks for success to be included on the evaluation form in anticipation of this year's portfolio presentations.

While initially developing three distinct evaluation categories: advanced, proficient, and unsatisfactory, we felt it was important to add a fourth 'distinguished' category that recognizes those portfolios that are truly outstanding (see figure 1). A "Technology Checklist" (Insert Figure 2), outlines specific competencies that are consistent with ISTE (2000) standards and the Commonwealth of Virginia's technology standards for instructional personnel (1998) and that, when met, fulfill Virginia Tech's current vision of preparing technologically competent and effective beginning teachers.

Examining all of the relevant standards and weaving them into one piece has been instructive and time-consuming. However, we are hopeful that the portfolio process will provide students with an integrated, coherent, educative experience that meets their needs as well as ours as a teacher preparation faculty.

To support the work of the students, TESH faculty worked together to develop our own TESH Portfolio web site, which outlines the entire construction process, including the documents shown in this paper. In addition to links to sample portfolios from the pilot year, articles and web sites on portfolio development, and all of the standards consulted in the development of the framework, the site provides clearly articulated guidelines and requirements for the development of electronic portfolios and student teacher reflections that are appropriate for non-secure portfolio web pages.

Developing Guidelines for Development of Electronic Portfolios and Reflection on Teaching Practices

Reflective practice can be defined as "behavior which involves active, persistent, and careful consideration of any belief or practice in light of the grounds that support it and further consequences to which it leads" (Dewey, 1933). An essential ingredient within teaching is the conscious ability to observe one's own behavior in order to uncover underlying processes, issues, causes and results, and to then make connections between theory and practice, which in turn influence future decisions and actions. Electronic portfolios provide the opportunity for students to seamlessly link their analytical reflections to specific artifacts and principles as they communicate their understandings and abilities to teach. However, many students' initial reflections of their own teaching and learning lack the sensitivity, discourse and level of thoughtfulness of more experienced teachers as they try to reconcile their own vision and philosophies of education with their experiences in the field. Within such reflections, not only

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are students critical of themselves, but they can be critical of their cooperating teachers, students and the schools within which they are placed. Recent experiences with reflections and electronic portfolios reveal that such examples of reflection, while regularly read in papers and field journals or brought up within class discussion or online threaded discussion, are not appropriate for non-secured web sites. Within the methods classroom, reflections such as these can be unpacked and explored and treated as part of the process of learning to teach. Publishing such reflection on the World Wide Web, however, can be harmful for ongoing relationships with partner schools and cooperating teachers on the one hand, and potentially destructive for the future career of student teachers on the other. In framing the direction of our electronic portfolios, it became very clear that issues of privacy, ethics, and representation would clearly impact the nature of the reflections that could be allowed on unsecured web pages.

In seeking to address these sensitive issues, TESH faculty developed a series of guidelines relating to the development of electronic portfolios and types of reflections and artifacts that could be placed on the web. The following guidelines are made available to all students as they enter our programs and begin to think about developing their portfolios and the types of artifacts and reflections that are appropriate:

Guidelines for Development of Electronic Portfolios

1. Each portfolio should be designed for electronic access on the web. For more information on portfolio construction and accessing Virginia Tech web servers, see the TEEPS support website:URL for site http://dsianez@www.tandl.vt.edu/teepshelp/teeps3/index.htm

2. Each portfolio should include a table of contents and an opening narrative that highlights how your portfolio meets the professional standards.

3. A personal statement of educational philosophy and a current resume are also the required elements for every portfolio. Seminar and class discussions, papers, and teaching experiences should assist you in shaping the philosophy statement.

4. The portfolio should contain evidence of your teaching and learning that you feel represents you as a professional educator in terms of the five propositions of the National Board for Professional Teaching Standards and professional teaching standards in your field. Examples may include lesson and unit plans, digitized photos or video/audio clips, self-assessments/reflections, evaluations and assessments, professional development activities, class organization and management information, research, and the integration of interactive technologies into the classroom.

5. Each piece of work or evidence should contain a caption, annotation, or short narrative to explain how this piece connects to your learning and the professional standards.

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6. Note that the electronic portfolio is not an electronic scrapbook or a fancy multimedia presentation. Your portfolio should demonstrate that you have the knowledge, skills and perspectives to be an effective beginning teacher and that you are capable of translating pedagogical knowledge into practice. The portfolio should contain thoughtful responses about each item that connect with your teaching philosophy in relation to professional standards.

Guidelines for Reflection on Teaching Practices.

1. Focus on your own teaching and learning and student learning in relation to professional teaching standards. Do not focus on the teaching of your cooperating teacher. Your focus should be on how you helped students learn in the context of the school culture in which you are teaching.

2. Because your written reflections will be public, you have a responsibility to communicate to your audience in a professional manner, avoiding judgements and comments about other teachers, administrators, parents or students which may be construed as hurtful or derogatory.

3. Use pseudonyms for students, teachers, and schools when reflecting on your experiences.

4. Any written analysis of students, classroom, or the school community should be approved by the program advisor before it is added to your web page.

5. Photos or videoclips of individual students should not be posted on the web. Photos of student teachers or backs of students are acceptable.

6. Students may have the option of linking their electronic portfolio website to the TESH or other program websites.

Plans for Longitudinal Performance-based Assessment of Pre-service Teachers.

The TESH faculty is committed to document the performance of student teachers in relation to state and national standards each year. In accordance to NCATE and state requirements for performance-based assessment of student progress, faculty will collect and score data from the "Portfolio Evaluation" (see figure 1). In addition, the electronic portfolios will be analyzed for compliance with professional standards by examining and comparing artifacts in all of the portfolios that provide evidence for meeting teaching standards. Artifacts such as lesson plans, reflections on videotaped instruction, and assessment of student achievement will be systematically evaluated to provide faculty with information to improve the teacher education program. The electronic format of the portfolios will provide for easy access and retrieval of information in the evaluation process. In effect, the use of electronic portfolios in the Virginia Tech teacher education program is essential in providing evidence for our compliance with NCATE and state standards for teacher education licensure programs.

Electronic Portfolios, continued

Creating an environment conducive to integrating technology into the education and assessment of beginning teachers is for us an evolving process that requires considerable investments of time, resources and energy. Developing a shared vision of our expectations for the electronic portfolio has been necessary for us as a faculty to be able to provide consistency in our instruction and in order to be satisfied with the direction of an endeavor that would require much from us and our students. Establishing specific standards-based assessment criteria with accompanying indicators and benchmarks for success and providing guidelines for the presentation of online reflections has been critical, not just for program coherence and integrity, but for our students' success at creating meaningful work. Finally, developing ongoing support and assessment systems while utilizing current technologies has been vital for creating a strong foundation from which to begin to effectively prepare tomorrow's teachers for 21st century classrooms.

As a faculty, TESH will have the opportunity this spring to use the assessment of our students' portfolios to further critique our framework. And the process will continue.

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Electronic Portfolios, continued

Figure 1: Teacher Education in the Sciences and the Humanities (TESH)

Portfolio Evaluation

This evaluation is modeled after recommendations from the National Board for Professional Teaching Standards (NBPTS), the Interstate New Teacher Assessment and Support Consortium (INTASC) and the standards from the International Society for Technology in Education (ISTE). Please complete the evaluation using the following scale and descriptors:

3 – Distinguished: exceeds expectations for providing evidence ((i.e. artifacts and annotations) for meeting professional standards in all areas

2 - Advanced: provides clear and coherent evidence that makes a compelling case for meeting the professional standard

1 - Proficient: provides sufficient evidence that standard is met

0 - Unsatisfactory*: provides little or no evidence that standard is met

Standards Indicators of Success

____I. Teachers are committed to all students and their teaching.

+ The teacher intern understands how students learn and develop and can provide learning opportunities that support a student's intellectual, social, and personal development.
+ The teacher intern understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
+ Teacher reflections on diverse life experiences, cultures, and experiences with diversity in field settings (e.g. teaching philosophy, autobiography, shadow study, self study)
+ Lesson plans designed to meet the needs of a diverse student population (students with different abilities, ethnicity, socioeconomic backgrounds, languages, special needs, gender)
+ Selection of teaching resources and materials designed to meet the needs of a diverse student population

Electronic Portfolios, continued
Figure 1

____II. Teachers know the subjects and how to teach those subjects to students.

+ The teacher intern understands the central concepts, tools of inquiry, and structures of the discipline he or she teaches and can create learning experiences that make these aspects of subject matter meaningful to students.
+ The teacher intern plans instruction based upon knowledge of subject matter, state and national standards, students, and the community.
+ The teacher intern understands and uses a variety of instructional strategies to encourage student development of critical thinking, problem solving, and performance skills.
+ The teacher intern uses knowledge of effective verbal, non-verbal and media communication techniques and appropriate technology to foster active inquiry, collaboration, and supportive interaction in the classroom.
+ Lesson and units designed and taught according to professional standards in teaching field
+ Research and investigations within academic discipline
+ Reflections on audio taped and/or video taped instruction as evidence for meeting professional teaching standards
+ Planning logs

____III. Teachers are responsible for managing and monitoring student learning.

+ The teacher intern uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
+ The teacher intern understands and uses formal and informal assessment strategies, consistent with instructional goals, to evaluate and ensure the continuous intellectual, social, and physical development of the learner.
+ Teaching philosophy
+ Classroom management plans
+ Authentic assessment system (e.g. rubrics, performance assessments)
+ Examples and analysis of student work
+ Contributions to listserv or web forums

Electronic Portfolios, continued
Figure 1

____IV. Teachers think systematically about their practice and learn from experience.

+ The teacher intern is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.
+ The teacher intern responds well to constructive feedback.
+ Reflections on video or audio tape of teaching in relation to professional teaching standards
+ Analysis and reflection of student work
+ Analysis and reflection of teaching
+ Planning and Reflection Logs

____V. Teachers are members of learning communities.

+ The teacher intern fosters relationships with school colleagues, parents, and agencies in the larger community to support students and well being.
+ The teacher intern demonstrates a professional attitude toward the community by leaning and adhering to school policies
+ Membership in professional organizations
+ Attendance or presentation at professional conferences
+ Participation in team meetings, department meetings, or faculty meetings at school sites
+ Synopsis of professional readings
+ Evidence of communication with parents (e.g. newsletter, logs of phone calls)
+ Interactions with web mentor

____VI. Electronic portfolio is designed, organized, and presented in professional manner.

+ Opening page with clear overview of purpose and navigation links
+ Consistent site layout (evenness in depth of sections)
+ Legibility of text and font
+ Overall site balanced to navigate with clear connections to opening page
+ Clear captions and explanations that facilitate navigation and understanding of portfolio contents
+ Accuracy in spelling and mechanics

Electronic Portfolios, continued
Figure 1

_____VII. Artifacts chosen for electronic portfolio provide evidence for purposeful uses of technology and reflection on standards for teaching and learning.

+ Digital photos of student work
+ Powerpoint, hyperstudio or other multimedia presentations
+ Conceptual maps of curriculum planning
+ Scanned documents of student or teacher work (e.g. graphs, journal entries, observations, reports)
+ Audio clips of student dialogue
+ Short (15 sec) video clips
+ PDF Files
+ Web resources and link in content area
+ Analytical pieces
+ Instructional activities
+ Annotated external links

Scoring:

20-21. . .Distinguished
14-19. . .Advanced
Total Score:_____

7 –13 . . .Proficient
0-6 . . . Unsatisfactory*

*Students must score a minimum rating of "proficient" on all categories and a "proficient" or higher rating on the total evaluation in order to pass.

Comments:

Electronic Portfolios, continued
Figure 2

Technology Checklist

We are gathering some baseline information about the kinds of technology/ software competencies that students demonstrat through their portfolios as well as a personal self-assessment of the types of technology that student teachers know. Competency in using this technology is a requirement for state licensure in Virginia and is consistent with standards from the International Society for Technology in Education (ISTE).

In the first column, please check the technology components that were used in your portfolio. In the second column, please indicate where you used the particular technology elsewhere.

Technology Components	Evidence Used in **Portfolio**	Evidence Used **Elsewhere**
Used Composer or other web page tool	_____	_____
Image scanned	_____	_____
Image with digital camera	_____	_____
Sound:		
Importing from tape or CD	_____	_____
Using own voice	_____	_____
Video:		
Used short original clip	_____	_____
Used links to part within the portfolio	_____	_____
Used links to other educational web-sites	_____	_____
Multi-media software (1 requried):		
Powerpoint	_____	_____
HyperStudio	_____	_____
Other_____	_____	_____
PDF files	_____	_____
Web resources for your content area	_____	_____

Signature (Program Advisor) _____
Date_____