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The use of electronic portfolios for preservice teachers

Abstract

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THE USE OF ELECTRONIC PORTFOLIOS FOR PRESERVICE TEACHERS

A Graduate Project

Submitted to the

Division of Educational Technology

Department of Curriculum and Instruction

In Partial Fulfillment

Of the Requirements for the Degree

Masters of Arts

UNIVERSITY OF NORTHERN IOWA

By

Kimberly Gobble-Sengstock

Summer 2003

This Research Project by: Kimberly Gobble-Sengstock

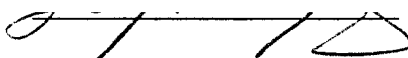
Titled: The Use of Electronic Portfolios for Preservice Teachers

Has been approved as meeting the research requirement of the Degree of Masters of Arts
in Education.

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Date Approved

Leigh E. Zeitz

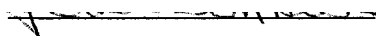


Graduate Faculty Reader

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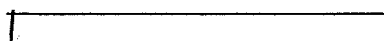


Graduate Faculty Reader

June 20, 2003

Date Approved

Rick Traw



Head, Department of Curriculum and Instruction

Abstract

This paper will discuss the results found in support of this CD-ROM project: *The Use of Electronic Portfolios for Preservice Teachers*, through the infusion of standards in the teaching and learning process and the competent use of technology as a tool for reflective practice, assessment and hiring purposes.

This project is a collaborative endeavor involving a graduate student in Educational Technology and the staff from the InTime Project and College of Education (COE) at the University of Northern Iowa (UNI). COE's Teacher Program requires students to complete a Teacher Education Portfolio to follow the Interstate New Teacher Assessment and Support Consortium (INTASC) Standards. This CD-ROM project provides best practices in portfolio development, tutorial guides, and student examples in developing their own electronic portfolios. This CD-ROM project was created in a Microsoft PowerPoint presentation, based on the equipment and software that we have available at the university.

In the summer of 2002, this project was demonstrated at three Russian Administrator Seminars and to a visiting Japanese group. This project was presented at these seminars to provide awareness and information regarding the concepts of electronic portfolios for preservice teachers. This CD-ROM project offers an explanation of the development of electronic portfolios and enhances the understanding of the potential benefits that technology brings to the classroom.

Introduction

The purpose of this research project was to explain the foundations of a student portfolio, the rationale for the use of portfolios, and the development of electronic portfolios for preservice teachers. This media production project involved developing instruction for creating an electronic portfolio for preservice teachers. The premise of this research project is to explain and explore the definition of an electronic portfolio, the purpose of a portfolio, and the components of a portfolio.

This paper is formulated upon reviewed literature and articles from scholarly journals about the development of electronic portfolios. This researcher has sorted through many articles about electronic portfolios and the composition portfolios. In the past months, this researcher has investigated credible on-line journals at University of Northern Iowa (UNI) Library using either EJ or ED sorting through descriptors to search electronic portfolios and portfolios for preservice teachers.

This paper discusses the development of this project that to provides easy to follow steps for students to create their own portfolios for coursework requirements or as a job-searching tool. Teaching today is a profession that requires a high level of competency and a solid understanding of our society, child development, pedagogy, technology, and the subject matter. Educational standards, which can be defined as expected learning outcomes that delineate the key aspects of the professional teaching role, must be met (Campbell, Melenyzer, Nettles, and Wyman, 2000).

In order to facilitate the students' understanding of the process of portfolio development, this researcher designed the CD-ROM project: *The Use of Electronic Portfolios for Preservice Teachers* as a resource manual to provide flexible guidance in

helping students to build their portfolios. This project was developed to offer documented examples from a student at the University of Northern Iowa (UNI) in the teacher education program for each Interstate New Teacher Assessment and Support Consortium (INTASC) Standards and the University of Northern Iowa teacher education standards. This project incorporates detailed guides in developing electronic portfolios. A glossary (Appendix A) is included to clarify technical terms.

Methodology

The power of the classroom and school settings in establishing the boundaries and shaping the practices harnessed to the culture of teaching explain, a great deal of teacher behavior and varied responses to classroom innovations in general, and technological ones especially. Though machines may be unimaginative initially; this evolutionary pace is still worthwhile (Cuban, 1986).

Literature indicates that there is a trend by teacher trainers to put more and more effort towards integrating technology in the teacher education curriculum (Kariuki & Turner, 2001). This project incorporates the purpose for developing portfolios, the components in portfolios development, and describes the development and guide of electronic portfolios as an alternative type of portfolio for preservice teachers at UNI. This project is a collaborative effort involving a graduate student in Educational Technology and the staff from The Integrating New Technologies into Methods of Education Project (InTime) and College of Education at UNI. UNI's College of Education Teacher Education Program requires students to complete a Teacher Education Portfolio to follow the eleven Renaissance standards, which are based upon the Interstate

New Teacher Assessment and Support Consortium (INTASC) Standards (COE Student Portfolio Manual, 2000).

This project also serves to provide awareness and knowledge about electronic portfolios to the faculty of the Teacher Education Program at UNI. This project has a role in UNI's Strategic Plan 2001-2006, "Focus on Excellence", in addressing the goal to provide intellectually stimulating and challenging experiences for students that broaden and deepen their perspective and awareness by supporting the preparation of UNI students to be proficient users of technology in their fields. Creating electronic portfolios may indicate a students' proficiency in technology (UNI Strategic Plan, 2000).

The portfolio also provides the student with the opportunity to set personal goals consistent with the Iowa Teacher License Standards used by the University's Teacher Education Program and to evaluate their progress toward reaching these goals. One specific standard states: *#10 Computer Applications: The practitioner understands and uses a variety of computer applications to encourage students' development of critical thinking, problem solving, and performance skills.* (COE Student Portfolio Manual, 2000). This CD-ROM project will provide the foundations and resources in the understanding of the purpose, components, and development of an electronic portfolio for preservice teachers. Technology opens the door to self-directed learning. Technology is used as an integrated tool and teachers continue to be the gatekeeper to advance technology use. The teachers involved with this project were open to the tool for instruction while still keeping control of the classroom structure.

Definitions of Portfolios

A philosophy of education often introduces the portfolio. What used to be accommodated by an application, letters of reference, and an interview has expanded to include evidence of teaching performance. The portfolios include evidence from all phases of the teacher preparation program and may develop to include artifacts from methods courses and student teaching (McLaughlin & Vogt, 1996). Preservice education portfolios are collections of authentic, learner specific documents that give evidence of growth and development toward becoming teachers. Portfolios also are acknowledgements that teacher development is an individualized process (Nettles & Petrick, 1995).

Students first learn the definition of a portfolio by learning the development of a portfolio. The portfolio is developed through the stages of the purpose, components, and organization. According to UNI's on-line COE student portfolio manual (2000), a Teacher Education portfolio is a collection of artifacts selected from a teaching major's total preparation period. It includes those professional samples required by the academic major department and by the professional education program, as well as those optional samples selected by the student that will serve to demonstrate and to synthesize his or her professional growth.

The preservice teacher may consider what type of portfolio would best exhibit the student's best abilities to meet the expectations of the audience. There are two main reasons for a portfolio for a preservice teacher candidate:

- Is required to develop a portfolio to document his or her professional growth and learning.

- Is seeking initial employment and choose to use a portfolio to enhance the job search and interview process.

There are two main types of portfolios:

- Exit portfolio: exit portfolios are a final selection of artifacts that provide substantial evidence of a teacher candidate's level of mastery related to performance standards and the goals of the program. These portfolios are usually evaluated by individuals affiliated with the teacher education program and are rated using scoring rubrics. Many colleges of education require teacher candidates to formally present their portfolios as a part of the requirements for successful completion of their teacher education program (Costantino & De Lorenzo, 2002).

Many colleges of education require teacher candidates to formally present their portfolios as a part of the requirements for successful completion of their teacher education program. Performance-based assessment allows a wider variety of intelligences (Gardner, 1993) to be measured more effectively than traditional paper and pencil assessments. Portfolio assessment incorporates these theoretical tenets because it: requires performances that demonstrate students' meaning construction; is collaborative, necessitating interactions and support from others; nurtures students as inquirers; demonstrates students' progress over time, values increasing knowledge and application of what is learned; and requires students to self-reflect and self-assess, promoting reflectivity about practice (McLaughlin & Vogt, 1996).

- Interview portfolio: the artifacts in this portfolio are a subset of the best work from the working and exit portfolio. The intent of this type of portfolio is to limit

the number of artifacts to create a showcase of exemplary documents representative of a teacher candidate's best work and accomplishments for the purpose of gaining employment (Costantino & De Lorenzo, 2002).

The key concepts in portfolio development revolve around collection, organization, reflection, and presentation (CORP) (Wyatt & Loooper, 1999). The portfolio show's a student's growth, (developmental portfolio), best works (showcase portfolio), or a total output (comprehensive portfolio). It is a tool (like technology is a tool) for evaluation by the owner, in self-reflection, or by a prospective or current supervisor of the work that has been done by the student and is shown in the collection of materials. A portfolio can easily cover critical thinking, authenticity, hands-on learning, student centered instruction, reflection, and qualitative assessment (Wyatt & Loooper, 1999).

Electronic Portfolios

It is the teacher education programs that must meet the challenge of defining excellence and setting standards of professional competence that will meet the needs of education in the next century (Campbell et al., 2000). Many teachers and teacher candidates are encouraged to consider an electronic portfolio as an alternative to a paper-based portfolio. Teachers who can demonstrate their technological competence through an electronic portfolio have an advantage in securing a teaching position and are more likely to incorporate technology into their own classroom. Electronic portfolios have undoubtedly become a critical component of authentic assessment methodology in education today (Barrett, 2000).

The electronic portfolio, sometimes referred to as a digital or computer-generated portfolio, is typically published on the Internet or on a CD-ROM. This type of portfolio requires the reviewer to have access to a computer (Costantino & De Lorenzo, 2002). The advantages of electronic portfolios include convenience, interactivity, connectivity, and development of technology skills in the course of assembling the portfolio and demonstration of those skills to supervisors or potential employers. Electronic portfolios represent a medium that can store and organize substantial amounts of material. The new media, which might have required significant storage space in traditional formats, may now be placed onto a single CD, disk, or online presentation. Electronic portfolios also can be easily duplicated so that copies of originals may be shared with others (Bullock & Hawk, 2001).

Aided by technology, individuals can develop portfolios by electronic means and create, store, and manage both products and processes for inclusion in working, showcase, documentation, and process types of portfolios. New technologies make it possible to show, in ways that were not available before, what students and professionals working in the field know and can do (Costantino & De Lorenzo, 2002). These artifacts are captured, organized, saved, and presented electronically. The electronic portfolio generally contains digital images, scanned images, text files, audio, video, and combinations of these formats. These portfolios can be created in a variety of different ways (Bullock & Hawk, 2001). When effectively planned, designed, and developed, the CD-ROM portfolio provides valid and reliable information about an individual (Hirschbuhl & Bishop, 2000).

Electronic portfolios use multimedia in presenting credentials. The applicant must determine if the reviewers will be willing to take the time to review the portfolio or have the equipment necessary for that reviewing. A combination of a well-developed portfolio in any format and a successful completed interview increases the chance to be hired (Wiedmer, 1998).

Every college wants its students to be leaders in worthwhile innovation. A change to electronic portfolios would be a step in that direction. The guidelines will provide learners with a means to gauge the electronic professional portfolio that they have created during their learning experience (Campbell et al., 2000).

Purpose of a Portfolio

What is the purpose of a portfolio? The content and the form of the portfolio will depend on its ultimate purpose. It is possible for an electronic portfolio to meet many different needs but it must be designed so that these differing purposes don't conflict with one another and/or require different formats or strategies.

In better understanding the purpose of creating a portfolio, an individual may benefit from answering the following questions:

- Is the main purpose of the portfolio for assessment of the quality of student work by faculty, internal university sources and/or accreditation bodies?
- Is the purpose of the portfolio to encourage students to develop multiple skills (including the technical skills involved in the portfolio production itself) and to reflect on their own work?
- Will the portfolio provide a vehicle for students to market their skills to potential employers?

Another pertinence is the portfolio's value for faculty, students and employers. Proponents of portfolios suggest that the renewed interest in portfolios is based both on its ability to provide more meaningful assessment and the ability of the portfolio to motivate and involve students in their own learning. The choice of media and types of technology employed has varied and is dependent somewhat on the purpose of the portfolio (Leeman-Conley, 2002).

At UNI, students are asked to organize their portfolios according to the requirements of the state of Iowa. Eleven standards, based upon the Interstate New Teacher Assessment and Support Consortium (INTASC), were selected because of their general application to all teachers at all levels, Pre-K through grade 12. The students progress through the phases of the teacher education program and progressively complete a professional portfolio that will be organized according to these standards.

Further, portfolio assessment is consistent with the constructivist philosophy, which emphasizes what is important is the knowledge that students themselves construct (Heinich, Molenda, Russell, & Smaldino, 1999). Congruent with current theories of learning and teaching, the students make sense of their educational progress by connecting what they know and have experienced with what they are learning. They construct meaning through these connections when posed with problem solving, encourage student inquiry, value students' point of view, and assess student learning so that the teaching contextualizes it (Costantino & De Lorenzo, 2002).

As the power and availability of technology increases and the cost of hardware and software decreases, teachers will be expected to step up their knowledge and skills to meet the technological standards of the profession (Costantino & De Lorenzo, 2002).

This electronic methodology enables students to document performance over time and helps them see and hear their own personal growth through audio and video clips. Digital portfolios are more than just electronic file cabinets. The technological enhancements can add markedly to the value of a portfolio.

In addition, portfolio assessment allows learners to demonstrate the knowledge that they feel is crucial to their learning voyage. Through a well-constructed and thoroughly documented portfolio, students can demonstrate their learning metamorphosis, chronicle their moment of discovery and prepare themselves for a bright future. Portfolio assessment has opened a new world of resources for educators to employ to challenge students to develop vital critical-thinking skills (Wiedmer, 1998).

According to UNI's on-line COE Student Portfolio Manual (2000), there are three ways that prospective employers require portfolios:

- They require one to validate your teaching ability.
- They do not require one but will look at documents as presented by the applicant.
- They do not require one and do not wish to see one.

These are some significant questions to guide preservice teachers in preparation of their portfolio. The following is a suggested personal checklist:

- What is the purpose of my portfolio?
- What required items do I have to include?
- What optional items do I want to include?
- What artifacts do I already have that will support my portfolio?
- Do I need to collect additional samples or participate in other activities in order to complete the goals/competencies of the portfolio?

- Have I developed a plan for collecting artifacts?
- How will I organize my portfolio?
- How will I select representative artifacts?
- What are the length stipulations for the portfolio?
- What type of materials should I collect? (Wyatt & Looper, 1999).

Documenting educational experiences is vital to portfolio development. These past experiences shape philosophies, behaviors, and attitudes. The use of electronic portfolios is gaining popularity as educators and business people alike are discovering their benefits as a means of validating individual performances (Wiedmer, 1998). The process of designing an electronic portfolio offers opportunities to develop and refine important technology skills. When technology experiences are placed into context of valued activities, the acquisition of these skills occurs more meaningfully (Bullock & Hawk, 2001).

Preservice education portfolios are collections of authentic learner specific documents that give evidence of growth and development toward becoming teachers. Portfolios also are an acknowledgement that teacher development is an individualized process. They reflect a student's progress over time, just as important, they help to document whether the faculty is succeeding in meeting the goals of preparing teachers (Nettles & Petrick, 1995).

The following list describes three ways to use portfolios:

- To evaluate the preservice teacher education program. This provides faculty with the opportunities to improve courses, assignments and syllabi.

- To enhance and document active student learning. Portfolios help preservice teachers become more active in their own learning. This gives them the control over their own learning, awareness of their own strengths and weaknesses, and the opportunity to make choices about how they wish to present themselves as professionals.
- To provide students with a personal marketing tool after graduation. Portfolios provide evidence of teaching skills, achievements, and abilities for prospective employers. They are more reflective of personal strengths and are more revealing about the preservice teacher than a transcript or test score. (Nettles & Petrick, 1995).

Administrators have noted that portfolios serve the dual purpose of documenting the candidate's potential teaching effectiveness and demonstrating his or her knowledge of innovative assessment practices for use in the elementary and secondary classroom. What has emerged is assessment that is authentic in nature, offers multiple indicators of student progress, encourages students to take an active role in their learning, affords teachers new roles in the assessment process, and encourages students to demonstrate what they know in ways that encompass their personal learning styles (McLaughlin & Vogt, 1996).

The educational reform movement is not only marked by alternative assessment, but also with a change from teacher-centered to student-centered learning and new and innovative constructivist learning. Due to the speed by which information changes in our society, there is a critical need to develop skills that will guide the student to become managers of information (Herman & Morrell, 1999).

Appropriate use of technology helps gain and maintain the learner's attention, increases active engagement in learning, and shifts the locus of control to the student, which results in increased levels of motivation towards learning (Kariuki & Turner, 2001). “The most significant advantage to our students is the upgrading of their skills in using technology to create the portfolio. These skills can later be used in their own classrooms. The CD-ROM is an ideal format for showing the preservice teacher working with students at a field site” (Campbell et al., 2000, p. 98).

Components of a Portfolio

The portfolio may be created using electronic portfolio software, multimedia software, or web page design software. Some important considerations in developing the portfolio would be the use and purpose for the portfolio and the audience(s) expected to view the portfolio (Bullock & Hawk, 2001). According to UNI's on-line COE Student Portfolio Manual (2000), these are the seven characteristics of a teacher education portfolio:

1. It is primarily a student responsibility.
2. It is designed so that it can be expanded to be used by various major departments.
3. Should be a teaching/learning tool as well as evaluation technique.
4. Involves both process and product.
5. Reflects the College of Education knowledge base requirements.
6. Should contain both artifacts (professional examples) and written reflections on meaning of artifacts.
7. Should be examined at specific times throughout the student's career.

Costantino and De Lorenzo (2002) state that these types of narratives will enhance the documents included in the portfolio:

- Introductions- are narratives that are usually found at the beginning of the portfolio or at the onset of each new section. They provide an overview of the forthcoming material.
- Explanations- are narratives that provide information about the artifacts presented. They provide a better understanding of each document that cannot be captured by the artifacts alone.
- Reflections- is a highly complex thinking process that is cultivated over time. Reflection involves systematic and insightful thinking about what the student is doing and the effects of instruction on student behavior and achievement. The intent of reflection is to develop the ongoing awareness of a teacher's own thoughts, feelings, teaching decisions, and student reactions.

A set of suggestions for increasing learner motivation comes from the work of Keller (Hirschbuhl & Bishop, 2000). Keller's general point of view is that the instructional designer must be proficient at motivation design as well as instructional strategy and content design. When effectively planned, designed, and developed, the CD-ROM portfolio provides valid and reliable information about an individual. The cognitive approach places an emphasis on active learning because it assumes people learn not only by observing but also by doing. This also demonstrates the importance of interactivity in multimedia programs, as interaction not only maintains attention, but also helps create and store new knowledge and skills, and facilitates comprehension.

(Hirschbuhl & Bishop, 2000)

When students use computers in education, they find their primary application involves accessing resources and/or communicating. Table 1 displays the use of a mixture of the two for the purpose and development of the multimedia project.

Table 1. Computers in Education.

Tools	Communication	Resources
Word-processor	Email	Learning materials
Spreadsheet	Mailing list	Websites
Database	Discussion forums	CD-ROMs
Presentation graphics	MOO's	Online journals
Statistical analysis	Video conferencing	Online abstracts
Programming	Chat rooms	Online citation indexes
Languages	Instant messaging	Online datasets
CAD drafting programs		
Etc.		

(Maier & Warren, 2000).

Considering standards when developing a portfolio will provide a natural alignment with standards-based assessment and evaluation. According to Campbell (2000), students document their professional growth in portfolios organized around the adaptations of the (INTASC) standards.

Portfolios are divided into sections, one for each of UNI's standards. Throughout their professional training; students collect, generate, and organize documents that give evidence of learning and competence in these standards. This makes possible the authentic assessment of the student performance. Furthermore, students begin to discern

how various courses, assignments, and experiences fit together. Professional portfolios for preservice teachers make the vision of the program visible to faculty and students alike (COE Student Portfolio Manual, 2000). This type of student portfolio accomplishes three other important outcomes: evaluation, student control of learning, and employment.

All three types of portfolios (process, product, and showcase) are useful to preservice teachers even if their education programs do not require them. The move toward performance-based assessment in teacher education programs across the nation is resulting in the increasing requirement of portfolios in teacher education programs (Bullock & Hawk, 2001). The process of designing an electronic portfolio offers opportunities to develop and refine important technology skills. When technology experiences are placed into context of valued activities, the acquisition of these skills occurs more meaningfully (Bullock & Hawk, 2001).

Organization and Development of a Portfolio

The authentic use of portfolio assessment should focus on the student demonstrating the ability to solve complex problems, analyze information, synthesize knowledge, and demonstrate a body of knowledge. The implementation of electronic portfolios for student assessment is an exciting educational innovation. From a heightened sense of responsibility, students will be motivated to accomplish greater feats in the future (Herman & Morrell, 1999).

The steps followed to develop portfolio assessment at the university level are as follows:

- Recognize the importance of curricular, instructional, assessment, and evaluation alignment.

- Develop course goals.
- Create authentic performance indicators.
- Incorporate reflectivity.
- Develop criteria for evaluation.
- Correlate evaluation with the university grading system.
- Manage the process.
- Use assessment results. (McLaughlin & Vogt, 1996)

The INTASC approach requires beginning teachers to demonstrate entry-level competencies of teaching through the development of a portfolio. The INTASC standards possess two important attributes:

- They are performance-based assessments in which teachers describe what they know and can do once they have entered the profession.
- They are linked to current views of what students should know and be able to do to meet K-12 standards for learning.

Students enrolled in teacher preparation programs create portfolios to demonstrate their knowledge, skills, and attitudes related to teaching. The purpose of these standards is to assess the knowledge, skills, and abilities of beginning teachers (Bullock & Hawk, 2001).

Performance-based assessment, a result of standards-driven programs, requires prospective teachers to be assessed on what they know and are able to do (INTASC, 2002).

The development of a portfolio is not a requirement of the Teacher Education Program at UNI. However, the decision to proceed with such a project may prove to be of great value to the student to begin the individual search for a teaching position and as

the individual enters the teaching profession. According to the UNI's on-line COE Student Portfolio Manual (2000), the eleven standards are based upon the work of the Interstate New Teacher Assessment and Support Consortium (INTASC). This organization has identified professional standards that have general applicability to teachers of all disciplines and all levels. The following lists provide some suggestions as to how and where the professional documents may be placed when organizing a portfolio around the eleven professional standards:

1. Student learning: The practitioner understands how students learn and develop and provides learning opportunities that support intellectual, career, social and personal development.
2. Diverse learners: The practitioner understands how students differ in their approaches to learning and creates instructional opportunities that are equitable and are adaptable to diverse learners.
3. Instructional planning: The practitioner plans instruction based upon knowledge of subject matter, students, the community, curriculum goals and state curriculum models.
4. Instructional strategies: The practitioner understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
5. Learning environment/Classroom management: The practitioner 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.

6. **Communication:** The practitioner uses knowledge of effective verbal, nonverbal and media communication techniques, and other forms of symbolic representation, to foster active inquiry, collaboration, and support interaction in the classroom.
7. **Assessment:** The practitioner understands and uses formal and informal assessment strategies to evaluate the continuous intellectual, social and physical development of the learner.
8. **Foundations, Reflection and Professional development:** The practitioner continually evaluates the effects of the practitioner's choices and actions on students, parents, and other professionals in the learning community, and actively seeks out opportunities to grow professionally.
9. **Collaboration, Ethics and Relationships:** The practitioner fosters relationships with parents, school colleagues, and organizations in the larger community to support students' learning and development.
10. **Content/Subject matter specialization:** The practitioner understands the central concepts, tools of inquiry and structure of the discipline(s); the practitioner teaches and creates learning experiences that make these aspects of subject matter meaningful for students.
11. **Computer application:** The practitioner understands and uses a variety of computer applications to encourage students' development of critical thinking, problem solving, and performance skills.

These are some of the reported benefits of portfolio development that an individual may consider in creating an electronic portfolio:

- Fostering self-assessment and reflection
- Providing personal satisfaction and renewal
- Providing tools for empowerment
- Promoting collaboration
- Providing holistic approach to assessment (Costantino & De Lorenzo, 2002).

Individuals may have different reasons for assembling a portfolio of their work, as seen in the list below:

1. To provide an opportunity for student self-evaluation and reflection.
2. To provide an optional process for student assessment and program evaluation.
3. To provide one method for monitoring student progress through an individual teaching program.
4. To provide a record of professional growth and development of students over time.
5. To provide a model for portfolio development that may be used throughout the student's professional career (COE Student Portfolio Manual, 2000).

These are some portfolio development issues that an individual may consider when creating a portfolio:

- Labor-intensive and time-consuming preparation: preservice teachers feel overwhelmed at the thought of having to develop a portfolio
- Presentation of documents: need to have available and access to superior technological resources and are able to easily assemble a visually pleasing and impressive product.

- Evaluation of portfolio documents: when used with other methods of evaluating teacher performance; portfolios can provide a broader perspective of a teacher's full range of professional competencies (Stone, 1998).

We are seeing an increasing interest in portfolios that are generally used with independent learning where students are given a set of learning outcomes and resources. They produce a portfolio that evidences how they achieved stated learning outcomes. The students use this developed portfolio to market their achievements and documents via utilizing technology and meeting the teaching preparation standards (Maier & Warren, 2000).

When an individual develops a portfolio, he or she may regard these main principles for portfolio development:

- Performance: to encourage students to apply their knowledge.
Portfolios offer to students a comprehensive, reflective record of their learning.
- Reliability: to provide students with goals toward which to work, while accommodating multiple indicators of their progress.
- Validity: to afford students a clear understanding that assessment and instruction are inextricably linked.
- Collaboration: to promote both professor-student and student-student interaction.
- Reflectivity: to foster student reasoning and self-assessment. (Costantino & De Lorenzo, 2002)

Wyatt and Looper (1999) noted that a fundamental suggestion is that an instructor must be cautious when using classroom-produced artifacts to protect the confidentiality and

privacy of the individual students. Portfolios will provide a representation of growth as an educator and establish a foundation for goal setting, reflection, and introspection.

It is clear that electronic portfolios provide valuable learning experiences for students and allow them to demonstrate the variety of skills and abilities that they have developed in their programs. The portfolio is also a valuable assessment tool for exit evaluation of individual students or for program evaluation (Alessi & Trollip, 2001).

Portfolios show what the student has learned, validates the credibility of the teacher education program, and increases the student teacher's self-confidence development of their students (McLaughlin & Vogt, 1996). Individuals creating electronic portfolios might want to recognize some of these development considerations when creating an electronic portfolio:

- Technology competency can be demonstrated through an electronic portfolio.
- Teachers who develop an electronic portfolio will be more likely to infuse technology into their classroom, requiring their own students to develop electronic portfolios.
- Electronic portfolios allow clear and immediate connections between standards and portfolio artifacts through hypertext links.
- CD-ROM portfolios are easily duplicated.
- Electronic portfolios have a large storage capacity and multiple modality presentation options.
- Electronic portfolios allow beginning teachers to market their skills or strengths in a more professional and compelling manner.

- Portfolio reviewers can experience a multimedia presentation. They can watch a lesson, hear real student interactions, and listen to a teacher's reflections rather than read about them. (Costantino & De Lorenzo, 2002)

In the United States, the National Board for Professional Teaching Standards (1989) has begun using portfolios as the assessment model for national certification. The development of portfolios on the teacher education continuum has emerged as a natural process and continues to evolve. This allows students both to learn about current instructional methods and to experience them first-hand, informing them as teachers and learners in the process (McLaughlin & Vogt, 1996). Providing students with support as they develop their portfolios is important to the premise of portfolio assessment (Campbell et al., 2000).

Portfolios can offer experience in the process through which preservice teachers make a transition from being a student learning about teaching to becoming a teacher engaged in learning about teaching. Electronic portfolios have undoubtedly become a critical component of authentic assessment in education today. Electronic portfolio development brings together two different processes: multimedia development (keywords: assess/decide, design, develop, implement, evaluate) and portfolio development (keywords: collection, selection, reflection, direction). Table 2 represents the development stages of an electronic portfolio; equal attention should be paid to these complimentary processes, since both are essential for effective electronic portfolio development.

Table 2. Stages of Electronic Portfolio Development.

Portfolio Development	Stages of Electronic Portfolio Development	Multimedia Development
Purpose & Audience	1. Defining the Portfolio Context & Goals	Decide, Assess
Collect, Interject	2. The Working Portfolio	Design, Plan
Select, Reflect, Direct	3. The Reflective Portfolio	Develop
Inspect, Perfect, Connect	4. The Connected Portfolio	Implement, Evaluate
Respect (Celebrate)	5. The Presentation Portfolio	Present, Publish

(Barrett, 2000).

The technology-related experience in creating a portfolio promotes discussion, reflection, strategic instruction, and technology. The following four comments were the most prominent from a study by Richards (1998). Students felt they learned:

1. How to develop an electronic portfolio to display their work, including some elements of design for constructing a portfolio
2. How to share their work with others in a new way
3. How to synthesize information to place in the portfolio

4. How to work with others in a manner that involved the sharing of resources.

The students' reactions were both informative and insightful. Additionally, 79% of the students agreed or strongly agreed that this entire activity was relevant and important to their future roles as teachers in any school setting. In conclusion, the technology experience proved beneficial to both students and faculty. Students were proud of their work and enjoyed sharing their portfolios. In addition, they supported one another in the effort to ensure that all students were provided a meaningful experience with technology, an added bonus that will positively affect future education students (Richards, 1998).

The Project

This CD-ROM project provides best practices in portfolio development, tutorial guides, and student examples. As previously reported in the research that other universities have used, this approach is especially effective for education students developing a pre-service or teaching portfolio. This project was developed as step-by-step instructions for different elements of the portfolio based on the equipment and software that is available at the university. This CD-ROM project was created as a Microsoft PowerPoint presentation, which students can access as a resource.

As the development team determined the essential elements of the instructional design process, the following questions were considered:

- What is the goal of the project?
- Who comprises the intended audience?
- What will the preservice teacher be able to do after using the CD-ROM?
- What is the best format for learning the content?
- How will preservice teacher evaluation occur?

- How we can prepare pre-service teachers in their efforts to document their work as practicing teachers and infuse this within teacher hiring and evaluation system?

The last item on this list was considered the most critical question.

First, this project was initiated from meetings with an InTime Curriculum & Technology Project Specialist about a CD-ROM project that might create a connection with principles of student learning, integrating technology in teaching-preservice teachers, and required content standards. Next, this researcher spoke with College of Education (COE) faculty involved with the teacher education program and portfolio requirements for that program. Finally, this researcher spoke with her advisor who has background knowledge about the development of electronic portfolios for students.

According to McKenzie (1999), only 20% of teachers report feeling well prepared to integrate educational technology into classroom instruction, which seems to indicate that preservice education and extended staff training are needed. The development and use of electronic portfolios by preservice teachers may be one method to introduce the students to skills for teaching and learning in future classrooms (Wright, Stallworth, & Ray, 2002).

This research project's purpose includes the following concepts:

1. The blend of standards into the preservice teacher's teaching and learning process.
2. The competent use of technology as a tool.
3. A reflective component to enhance student learning and professional development.

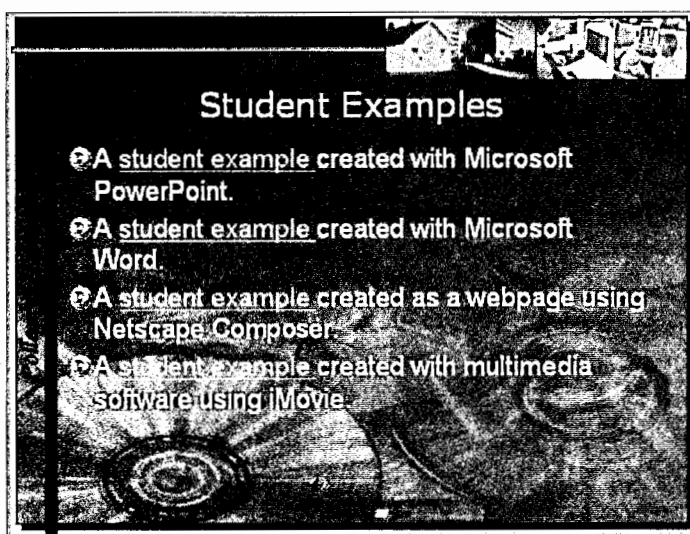
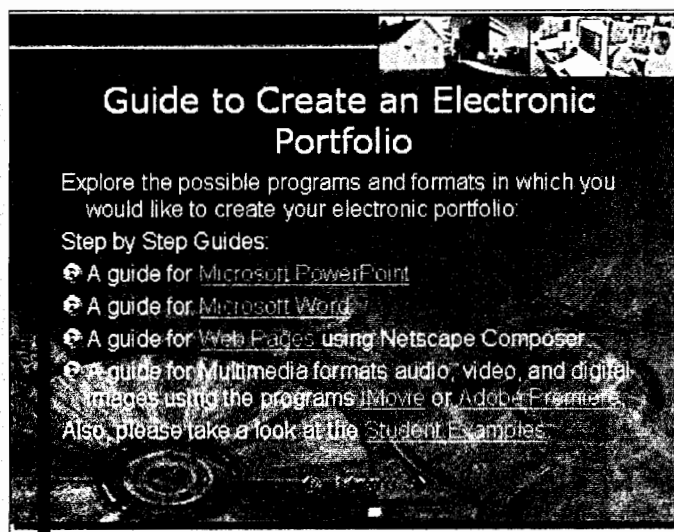
This research project's objectives are the following:

1. Implement the use of electronic portfolios to promote reflection of teaching practices that increase student learning.
2. Integrate electronic portfolios into the instructional practices of university faculty of the pre-service teacher preparation programs.
3. Demonstrate integration of InTime, INTASC, and UNI teaching standards in the electronic portfolios.

A major focus of this project was to integrate teacher preparation curriculum with technology and to collaboratively involve the preparation of tomorrow's teachers. A collaborative support from InTime and COE to facilitate the delivery and curriculum of teacher preparation, as well as, increasing the number of technology-proficient teachers. These teachers will be capable in infusing technology into their own professional development and as a reflective tool to improve student learning and achievement. Networking in the noted implementation of INTASC and other standards to insure all aspects of teacher development are an integral part. The CD-ROM project includes a completed student portfolio as a corresponding example as part of the teacher development program. The CD-ROM project was created to offer two parts:

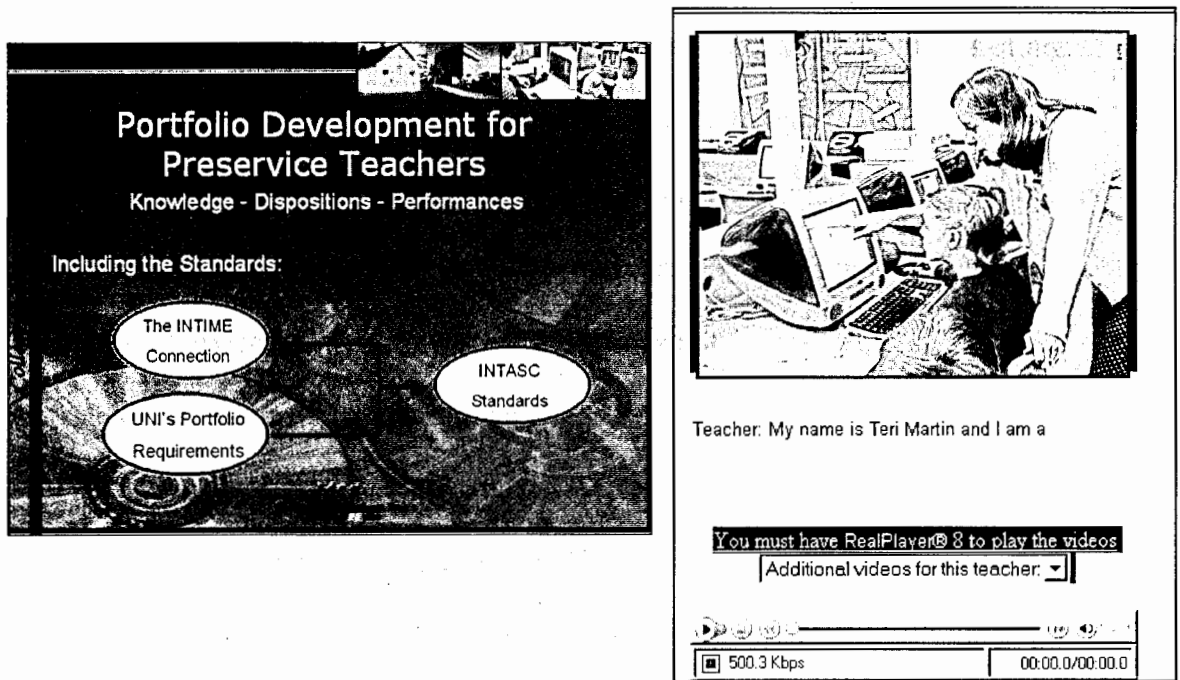
- A template for student teachers to use in making their own CD-ROM to have as part of their teacher work sample documentation and electronic portfolio for job searching. The CD-ROM may include short video segments about the standards along with student interviews and teaching examples for personal reflection of their experiences and teaching practices in the classroom (see Figure 1).

Figure 1. Guides to Create an Electronic Portfolio.



- A model for the COE faculty to learn more about creating standard-based (include standards: INTASC Standards, InTime Model, COE portfolio requirements) electronic portfolios in a presentation and digital video formats (see Figure 2). This sample model was shared with the faculty to increase knowledge and appeal to faculty about integrating new technology into curriculum and to show examples of the professional development of their students.

Figure 2. Portfolio Development slide and RealPlayer student video example.



Portfolio Development for Preservice Teachers
Knowledge - Dispositions - Performances

Including the Standards:

- The INTIME Connection
- UNI's Portfolio Requirements
- INTASC Standards

Teacher: My name is Teri Martin and I am a

You must have RealPlayer® 8 to play the videos
Additional videos for this teacher: ▾

500.3 Kbps 00:00.0/00:00.0

UNI is the lead institution for the InTime Grant, which provides the necessary new learning resources to support the systemic change. The UNI Strategic Plan 2001-2006 has a major goal, which supports individuals learning new technology:

Goal 1.0

- Objective 1.1: Prepare UNI students to be proficient users of technology in their fields.

Goal 7.0

- Objective 7.1: Enhance technologically appropriate teaching and learning facilities and equipment.
- Objective 7.2: More fully integrate modern technology into the everyday lives of UNI students, faculty and staff.

In the summer of 2002, this project was introduced at three seminars to provide awareness and knowledge regarding the concepts of electronic portfolios for preservice teachers. Since the late 1980's, UNI has collaborated with select institutions of higher education in Moscow and St. Petersburg (Moscow State Linguistics University and Russian State Pedagogical University in St. Petersburg) involving student, faculty, and administrator exchanges. As part of these endeavors, specialists in Information Technology Services (ITS) have visited Moscow and St. Petersburg to conduct workshops and seminars on Educational Technology (ET).

Russian educators and students alike have articulated the need to integrate technology into the curriculum and placing greater emphasis on the American notion of individual and student-centered learning. These seminars demonstrate administrative applications of technology for higher education and explain various resources and services that UNI has established to support faculty, staff, and students as they use technology to enhance teaching and learning. The focus is on learning that encourages both teacher and learner to experiment with learning process and to use strategies and technology that achieve best results.

The opportunity to present the CD-ROM project provides educators an avenue to compare the research for best practices, increased student learning, and use of technology in instructional settings to seek reflection, assessment, and hiring purposes. This CD-ROM project provides best practices in portfolio development:

- Learning management systems and other electronic tools: extending the classroom beyond the walls.
- Preparing preservice teachers to use technology effectively in the classroom.

Participants' who complete the seminars gain an enhanced understanding of the potential benefits that technology brings to the classroom.

To ensure that technology is used to facilitate quality education, its key elements need to be matched with a set of state standards for its appropriate uses. The UNI Teacher Education Faculty has developed the Preservice Teacher Technology Competencies, which are performance-based competencies modeled on several national standards documents. The competencies serve as a taxonomy to guide understanding of this area. They have three sections:

1. Basic technology equipment operations and concepts.
2. Technology resources and tools for information literacy.
3. Technology resources and tools for content areas. (InTime, 2002).

According to Alessi & Trollip (2001), designing effective learning environments requires knowledge of your target audience/learners and the combining of various media and methods in creative ways. This project provides a set of tools, resources, and activities to facilitate learning. The process of the learner building the program is a constructivist one: either the multimedia presentation used as a live demonstration for the Russian administrators' seminar and Japanese presentation or multimedia portfolio report on a variety of learning activities.

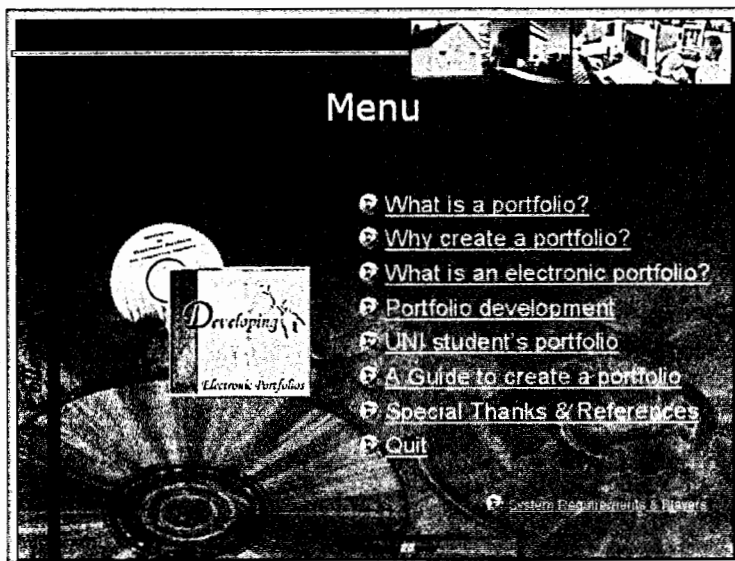
With the widespread acceptance of the portfolio as a viable method of chronicling and assessing student progress and the increased availability of multimedia computers in classrooms, it's only natural for educators to marry the two. Virtually any kind of product including student's word-processed documents, scanned images, video clips, and audio can be incorporated into the portfolio, which is created using Microsoft PowerPoint. The

typical digital portfolio is built around an engine that provides teachers and students with multimedia authoring capabilities (Milon, 1995).

Computer presentation software such as Microsoft PowerPoint can be used due to the fact that it is simple to use and allows the developer to easily add, edit, and rearrange slides as they think through what they want to present. This presentation format was developed in Microsoft PowerPoint as the choice of hardware platform. Additionally, separate PowerPoint files were made to compensate for the conflicts with the changes in the content format in Macintosh and PC PowerPoint.

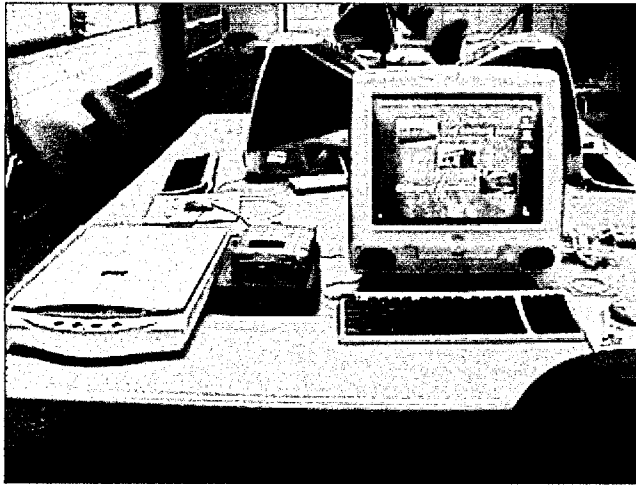
Since the main menu of digital portfolios provides viewers opportunities to examine a portfolio by clicking on buttons, the individual creator must decide the most effective ways to allow the viewer to see, hear, and review the artifacts that illustrate the creator's performance (Hirschbuhl & Bishop, 2000). As shown in the following screen shot of the main menu (see Figure 3), this project illustrates an effective way to present the purpose of the concept in portfolio development. The viewers then function as designers using the technology as a tool for analyzing their educational learning and accessing information as well as interpreting and organizing their personal knowledge and representing what they know to others via the electronic portfolio.

Figure 3. Main menu slide of CD-ROM project.



Since the portfolio is on a CD-ROM, the same hardware and software but also a CD writer are necessary. This allows students to write their portfolios to a CD and continue to add to them as they progress through their programs. UNI has adequate computer labs for use by teacher education classes: TML, CET, IRTS, StudioIT, and general student computer labs (see Figure 4) are available. UNI has in place a strategy for systemic change, which is required by the Iowa Department of Education as a component of the move to performance-based assessment.

Figure 4. Technologies Methods Lab (TML) workstation.



Essential equipment to supply two different types of stations, needed for electronic portfolio development is: a workstation and a multimedia production station. Educational institutions have chosen CD-ROMs as cost-effective and efficient means of producing and storing electronic portfolios. An entire multimedia workstation, which includes all the hardware, and various software packages (e.g., HyperStudio, Microsoft Office, Macromedia Dreamweaver, and Adobe Photoshop) are shown (see Figure 5).

Figure 5. Screen shots of the slides System Requirements and Required Program Players.

Required Program Players

In viewing this CD you will need to have some application programs to view certain files and documents. Listed below are:

1. Program installers available on this CD.

Macintosh - RealPlayer One / Macromedia Flash 6 / Microsoft PowerPoint 97-00
 PC-Windows - RealPlayer One / Macromedia Flash 6 / Microsoft PowerPoint 97-00

To Find Program players on this CD:

Macintosh - close presentation -> click & open CD icon -> **epofolio** -> find and click on installers folder -> click on which program installer you need.

PC-Windows - close presentation -> click & open My Computer on the Desktop -> Right click on C: Drive icon -> **epofolio**, choose Explore -> find and click on installers folder -> click on which program installer you need.

Websites to the download free players/viewers versions that you specifically need.

Adobe Acrobat Reader: <http://www.adobe.com/products/acrobat/readstep2.html>
 QuickTime: <http://www.apple.com/quicktime/4/download/>
 RealPlayer ONE: <http://www.real.com/>
 Macromedia Flash: <http://www.macromedia.com/download/>
 Microsoft PowerPoint: <http://www.microsoft.com/office/downloads/default.asp>

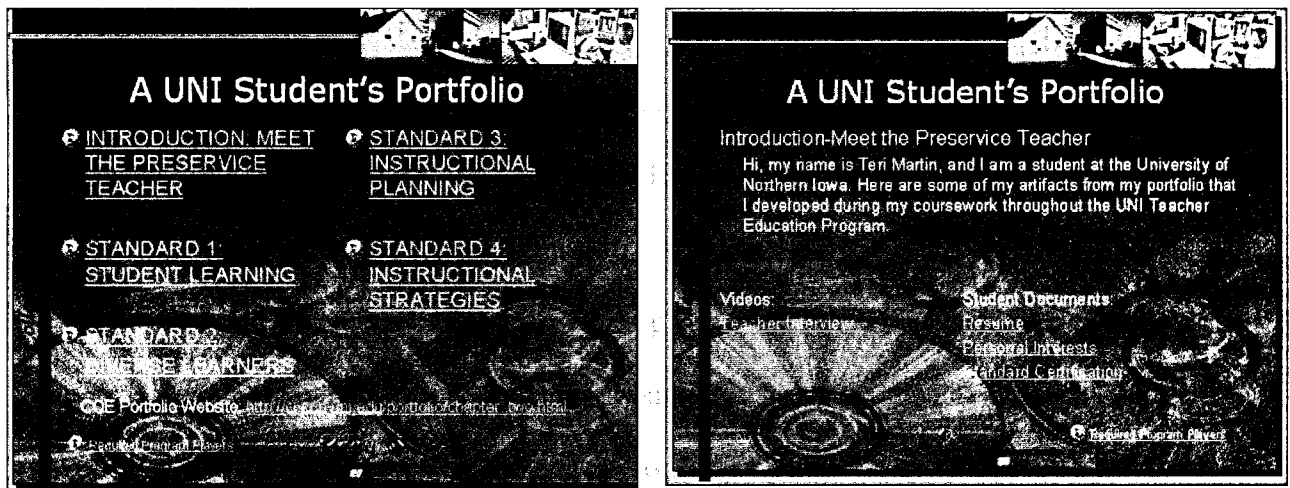
System Requirements

In viewing this CD you will need to have some minimum computer requirements:

- **Macintosh:**
 - Mac OS 8.1 or later
 - 64 MB RAM
 - Virtual Memory (minimum, set to 128MB)
 - 654 PowerPC (233 MHz or better)
 - 28.8Kbps modem Internet connection (for on-line files)
 - Browser support: Microsoft Internet Explorer 4.01 or later or Netscape 4.05 or later
 - Real Player 4.0 Beta
- **PC-Windows:**
 - 386 or higher Pentium processor or equivalent (2MB of RAM)
 - 24 or 32 bit OS (for on-line files)
 - 16MB (hard disk) and 16MB RAM
 - 100 or 1600Kbps modem Internet connection
 - Windows 95, Windows 98, Windows 2000, Windows NT 4.0, or Windows XP
 - Internet Explorer 4.01 or Netscape 4.05 or later
 - Real Player 4.0 Beta

CD-ROMs offer portfolio compilers the chance to include digital versions of the usual artifacts, such as assessments, awards, certificates, evaluations, pictures, projects, and testimonials (see Figure 6). Indeed, many of the items that appear in a standard portfolio can be enhanced by the skillful use of video and audio clips (Costantino & De Lorenzo, 2002). The CD-ROM format provides an ideal medium for storage and display of electronic portfolios. A CD-ROM can store up to 650 megabytes, weighs practically nothing, and is small enough to put in an overnight delivery envelope.

Figure 6. UNI's Student Portfolio examples.



A cross-platform process using a Macintosh Toast CD-ROM creator program with a partition selector was required in finalizing this project. The cross-platform development process ensures that work and data stored in an electronic portfolio can be viewed and reviewed on either Macintosh or PC hardware (Hirschbuhl & Bishop, 2000).

The electronic portfolio is a multimedia approach that allows the teacher to present teaching, learning, and reflective artifacts in a variety of formats (audio, video, graphics, and text). Hypermedia links are used to connect standards or goals to artifacts as opposed to section dividers or tab (Costantino & De Lorenzo, 2002). Today's technology makes creating electronic portfolios easy and inexpensive. This project includes hypermedia, which creates links within the presentation to digital videos and Internet websites for resources. CD-ROMs are inexpensive and have almost 500 times more storage capacity than floppy disks. Students gain a myriad of technology skills preparing their portfolios. Students select their own individualized documents to include in the portfolio to make the portfolio more meaningful.

In addition to showcasing students' development as practitioners, developing a multimedia portfolio will require that students develop the skills (e.g., scanning, digitizing, digital video and audio production, and web page development) necessary to create it. The portfolio integrates instruction, learning, assessment, and it puts a special emphasis on the use of the technology itself.

The desired outcome of the CD-ROM project was that the educator develops a personal professional electronic portfolio through this active learning experience. As a result of the exploration process and creation of their portfolio, they built a strong body of knowledge. Through their learning journey they personally experienced the advantages of portfolios. The students were excited about the opportunity to learn the technical skills involved in developing the portfolio and they saw the portfolio final product as something, which enhances their prospects for career advancement.

It is essential for the developers and designers of CD-ROM portfolios to take the time to ensure that stakeholders draw accurate conclusions about the following issues:

1. What the portfolios show and how they are representative of performance.
2. How the portfolios employ clear criteria to represent what is valued in a model performance.
3. When portfolios provide more authentic views of what individuals know and are capable of performing.

The developers of electronic portfolios have an obligation and a professional responsibility to make sure that the story their portfolios tell reflects reality, that it represents a clear and accurate picture of performance. They must be careful not to use the high-tech format to distort reality (Wright, Stallworth, & Ray, 2002).

The potential is the mass production for the CD-ROM project for all students as well as faculty to develop and utilize electronic portfolios in teacher education program. The elements of the project may be incorporated with the current InTime projects developed for current educators as valuable technology resource. This research project has been an interesting experience and it is the researcher's hope that it can be incorporated into the College of Education Teacher Education Program in a meaningful way in the future.

Hirschbuhl and Bishop (2000) concluded that CD-ROM portfolios represent in multimedia format professional growth activities and processes and serve as impressive and comprehensive vehicles for ongoing authentic assessment and continued professional growth. This was true with this project.

Conclusions and Recommendations

The portfolio may be thought as a tool to assist in blending theories and practices of teaching and learning. This project's appeal towards the target audience (individuals creating electronic portfolios) is to directly enhance more self-directed learners and initiate the infusion of technology in the development of their own e-portfolios. The use of this technology tool encouraged individuals to pursue their own goals and become responsible for their own learning.

The minimum level of knowledge and skills necessary for considering the development of an electronic portfolio is basic computer literacy. Basic computer literacy requires that one understands the fundamentals of computer hardware and software and know how to use a variety of software programs. One needs to know how

to use the computer to create Microsoft Word documents and incorporate computer graphics.

The nature of teaching is helpful when understanding the complexity and dimensions of introducing new technology to the students successfully. It is very important to encourage teachers to appreciate and use technology. The most common approach for encouraging teachers to integrate technology has been to provide them with opportunities to increase their knowledge about technology through workshops, courses, or technology-rich experiences. Efforts should be made to simplify technology by developing applications that teachers can use without excessive training. Electronic portfolios provide educators an opportunity to demonstrate their technology skills and knowledge. An alternative would be to provide teachers with educational applications that demonstrates explicit connections to their needs and are easy to use. Teachers also need opportunities to better utilize their skills in real classroom applications.

CD-ROM based portfolios have many advantages over their paper-based counterparts. One important advantage of CD-ROM portfolios is their compactness. An important consideration is the large amount of content and examples of artifacts that need to be presented by preservice teachers. The added flexibility of being able to store and tailor individual discs for viewing by prospective employers or university evaluators provides an attractive option for busy students seeking employment. The new technologies make it possible to show, in ways that were not available before, what students and professionals working in the field know and can do. Electronic portfolios can also be developed to connect an individual's work to meet specific standards or to present a particular work sample to a selected viewer, like a prospective employer. The

manipulation of electronic portfolios increases the chances of more individuals developing electronic portfolios, as well as, outlining the increased correlation that is available through CD-ROM based portfolios.

After reflecting about this project, this author has summarized a few recommendations for future applications:

- The CD-ROM format was selected because this project included a number of video segments and examples of artifacts provided by former preservice teachers who had developed portfolios. Portfolios are diverse and can be developed in a format flexible for pre-service teachers, faculty, and new teachers in their first and second year of teaching. There is a possibility to enhance the project by changing the format to a DVD thus expanding its use to the audience that has access to the information.
- This research project was developed in Microsoft PowerPoint because the target audience was already familiar with it. UNI faculty and students already use this program for lectures and class assignment presentations.
- This project provides the accessibility for new connections with the current CD-ROM projects: teacher standards and an InTime CD-ROM for educators. This project can be revised to offer actual demonstrations to students and faculty through a two-part CD-ROM set. The first disc would contain the background information about portfolios and development, and the second disc would include the student examples and guides to create electronic portfolio. The format is flexible to add and delete required educational standards when updates occur and

adapt format changes to any other state standards that maybe different from Iowa's teaching standards.

- This project thoroughly exhibits and explains the gained benefits corresponding with the positive research results (validating learning, new confidence in the use of technology, and development of a professional work sample) from preservice teachers developing electronic portfolios. Synthesis of learning is enhanced as the student works through the question, "What will best show that I understand and can apply my learning?" The research findings and experiences derived from this project have convinced this author that portfolio use in elementary and secondary methods courses provides a positive, powerful learning experience for the majority of preservice teachers. The CD-ROM portfolio leads to portability of their accomplished learning, and perhaps this is the most gratifying aspect of the process. This author recommends that CD-ROM portfolios should be promoted and developed in all teacher education programs. This is the recommendation for future developments.

Barrett (2000) emphasized that as a result of the exploration process and creation of their portfolio, students will build a strong body of knowledge. Because of this experience, they will be able to incorporate them authentically into their curriculum and assess their students more effectively. Active learning affords the learner with a better learning experience and aids him/her in greater knowledge retention. This project validated this belief.

Creating this project developed an understanding of how to produce digital multimedia resources. The selection of the software can determine how the project will

be delivered and how it can be incorporated pedagogically toward a cohesive learning environment for the student learning the software for the first time. This should be an environment that produces students as well as the teachers who understand the criteria for successful portfolio development. This project was an attempt to provide guidance to encourage hesitant educators to embrace these new technologies for classroom curriculum.

The CD-ROM project copies were sent to the attending participants to use as a quality resource and example of best practice. There has been continued communication with the seminar participating universities. These communications may develop into an interactive process, especially considering advancements in technology. The portfolio development project has been useful not only for preservice teachers but for first year educators already working but who want to enhance their professional portfolio. It also has been presented to other colleges/departments on campus to facilitate the development of e-portfolios and the foundation for their own portfolio criteria for those students.

I try to relate what the teacher does to my training position. An instructor needs to know the tools as well as the audience (students) to have a success with interaction and goal achievement for any instructional program. The portfolio development project is an effective tool for learning to make an impression on prospective employers and evaluating preservice teaching programs. The use of the portfolio development project has assisted preservice teachers in reflecting on their strengths, limitations, growth and individual characteristics.

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Appendix A

Glossary of Terms

Artifacts- each set of standards supporting documents in evidence of student performance for each standard and educational experience.

CD-ROM- compact disc read only memory. An electronic media storage that contains data that can be read by a computer compact disc drive. This storage format can store more information than a floppy diskette and can store large file formats (video, graphic & audio).

Constructivism- the learning philosophy approach which views learners as active participants of knowledge, who learn by observing, experiencing, and interpreting by being immersed in the learning environment.

Cross-platform- the method which you can open a computer file in either a PC or Macintosh computer.

DVD- digital video disc: an electronic file format for storage of media that has a large format to hold video, graphics, and audio.

Electronic portfolio- materials from traditional formats transferred and presented on an electronic medium, which stores and organizes a substantial amount of materials. Created on software for multimedia or web page design software. Generally, contains digital images, text files, audio, video or combination of these formats. The production can be saved on CDs; zip disks, floppy diskettes, on the hard drive of the computer, or transferred to an equipped server.

Hypermedia- programs of this methodology consist of a database of information with multiple methods of navigation and features to facilitate learning.

InTime- The Integrating New Technologies into the Methods of Education, a Catalyst Grant to the University of Northern Iowa's College of Education from the United States Department of Education.

KB- kilobyte. A term that describes the possible storage unit of space capacity of a computer.

MB- megabyte. A disk storage unit capacity to measure the memory.

Portfolio- documents or materials assembled by the individual to demonstrate their knowledge, skills, and attitude related to their professional or educational acquired performance. This type of activity has been known as a performance-based assessment to evaluate the student's knowledge and reflections of the criteria of a teacher education program.

Pre-service teacher- individuals actively pursuing educational credits and experiences in a teacher education program toward a Baccalaureate degree.

Multimedia- a type of technology medium that may contain digital images, graphics, scanned images, text files, audio, and video, or combinations of these formats.