Multimedia Portfolios for Preservice Teachers: From Theory to Practice

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Over the last five years, educators have discovered the validity of portfolios for evaluating students in elementary and secondary settings. Another obvious trend in education is the increased use of advanced technology, particularly multimedia technology. This paper reports the results of a project undertaken to combine authentic assessment using a portfolio and multimedia technology by preservice teachers. In the first section, a brief overview of constructivist theory is presented, followed by a discussion of the relationship between constructivism and portfolio assessment. A review of current research on portfolio assessment and the use of technology are also presented. The second section presents the results of a project undertaken at Florida Atlantic University to implement multimedia portfolios for preservice teachers. This section provides a description of the process that preservice teachers follow in developing a multimedia portfolio and describes the hardware and software used in the development of this project. Information about the state-of-the-art multimedia technology used to capture student work for the portfolio is also provided. The paper concludes with a discussion of some of the challenges faced in developing the portfolios and gives an update on the projects current status and future directions.
THEORETICAL BACKGROUND

This section provides an overview of the theoretical underpinning of portfolio assessment. First, a discussion of the relationship between the theoretical foundations of constructivist theory and portfolio assessment is provided. This is followed by a discussion of the literature relating to educational reform and portfolios. This part of the paper concludes with a discussion of the literature relating to portfolio assessment in general and the use of technology in portfolio development.

Constructivist Theory

The preservice teacher portfolios developed by this project were based on a constructivist theory of learning, a paradigm that views the learner as actively involved in the construction of his or her own representations of knowledge. According to this view, learning is the process of building knowledge structure by connecting what is known to new information, ideas, and concepts and integrating them to form new understandings. The implications of this theory for teaching are numerous. Table 1 highlights some of the differences between constructivist theory and traditional paradigms of learning.

<table>
<thead>
<tr>
<th>Traditional Learning Theory</th>
<th>Constructivism</th>
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<tr>
<td>Mastering “the facts”</td>
<td>Constructing knowledge</td>
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<tr>
<td>Data centered curriculum</td>
<td>Learner centered curriculum</td>
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<tr>
<td>Product oriented</td>
<td>Process oriented</td>
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<tr>
<td>Teacher as expert</td>
<td>Teacher as mentor</td>
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<td>Working alone</td>
<td>Working in a group</td>
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If preservice teacher portfolios are to accurately reflect the personal and professional growth of prospective teachers, it is imperative that the portfolios be based on valid pedagogy. Constructivism rooted in the supposition that the learner is actively involved in the construction of his or her own representations of knowledge, is such a pedagogy. One of the key theoretical propositions of constructivism, that learning is the process of building knowledge by connecting what is known to new information, is particularly important. This proposition suggests that encouraging preservice students to
engage in self-reflection as they select the performance items for their portfolios is crucial if these portfolios are to reveal an accurate and complete portrait.

Research on Portfolio Development Educational Reform

A significant influence in the development of the multimedia portfolio is the literature regarding national and state educational reform, including standards for educators and technology (Northrup, 1996; Kahn, 1996; Kaplan & Sedelfelt, 1996; NCATE, 1995; Moore, 1993). The National Council for Accreditation of Teacher Education (NCATE) guidelines for teacher education programs include Standard II D, Indicator 39, which specifies that “...a candidates mastery of a program’s stated exit criteria or outcomes is assessed through the use of multiple sources of data such as a culminating experience, portfolios, interviews...” (NCATE, 1995). In this multimedia portfolio project, preservice teachers implement this standard by completing projects and incorporating multimedia from a variety of courses as documentation of their learning. The use of portfolios is also supported by additional guidelines or standards recommended by other professional organizations such as the Association of Colleges and Schools of Education in State Universities and Land Grant Colleges and Affiliated Private Universities (Lan, 1997), American Association of Colleges for Teacher Education (Fenstermacher, 1994; Edmundson, 1993), National Project on the Quality of Teaching and Learning (Patterson, 1994), National Board for Professional Teaching Standards (McKay, 1994), the Carnegie Forum, Holmes Group, and the Center for Educational Renewal (Baker, 1994). A review of the literature reveals the need for moving towards performance assessment and interprofessionalism among these groups for achieving national and state standards.

Another resource addressing national curriculum standards that serves to provide guidance for formulating portfolios is Best Practice: New Standards for Teaching and Learning in America’s Schools (Zemelman, Daniels, & Hyde, 1993). This book highlights an emerging consensus about how students should be taught in content areas. The suggestions in this book are based on national curriculum reports from organizations such as the National Council of Teachers of Mathematics, National Council of Social Studies, National Council of Teachers of English, Center for the Study of Reading, International Reading Association, National Association for the Advancement of Science, and the National Association for the Education of Young Children. All of these organizations provide a framework for teaching and learning in reading, writing, social studies, science, and mathematics.
Transdisciplinary studies with 13 interlocking principles, which include a more student-centered curriculum, collaborative learning, authentic learning, and more descriptive evaluation of student growth, including qualitative observations, are recommended. Research reported in this book serves as a reminder of the importance of viewing students in a more holistic manner and of incorporating cognitive and affective dimensions of the learning process. Therefore, information such as talents or special interests are also part of the Preservice Teacher Portfolio.

Many states have also developed or are developing their own standards. For example, in this project Florida goals, standards, and benchmarks were one source of guidance in the development of the portfolio format (Florida Department of Education Blueprint 2000, 1994). Other documents used to verify implementation of state goals and standards in the portfolio included Florida’s Sunshine State Standards (1996), Generic Competencies and Educator Accomplished Practices (1996), and the Electronic Curriculum Planning Tool (1997). Some research focuses on the implementation of these standards or goals in Florida universities and thus helps provide information about what needs to be highlighted or covered in the Preservice Teacher Portfolio (Stedman, 1994; England, 1995). Other state standards involving special interest groups such as Exceptional Student Education also play a role in the creation of portfolios. For example, in order to meet Exceptional Student Education needs, a section on Individual Education Plans (IEP’s) was added under the “Lesson Plan” portion of the portfolio. In this way, preservice teachers in special areas (Exceptional Education, ESOL, etc.) can be accommodated. Thus, preservice teachers majoring in many areas of education are able to demonstrate their teaching expertise in similar, yet unique ways fulfilling departmental and state goals.

**Portfolio Assessment and Evaluation**

In recent years, many educators have come to the conclusion that traditional assessments do not provide an adequate means of evaluating preservice student progress. Formal and informal assessment measures such as standardized and criterion-referenced tests fail to fully reflect the actual learning that takes place during instruction. In response to this disparity, state legislators and educators at the university level have begun to use portfolios to make decisions about goals and standards for excellence in teaching, to evaluate the accomplishment of these standards, to revise curriculum, and to plan professional development as they mentor preservice teachers into the teaching profession (Adams, 1995; Asimov, 1998; Calfee,
A preservice teacher portfolio is a developmental record; it seeks to capture an individual’s capabilities over time. Portfolios reveal growth and performance in areas such as planning, instruction, teaching strategies, classroom management, community service, self-reflection, cross-cultural experiences, and professional activities under a variety of conditions. Because they focus on process as well as product, portfolios can also be used to diagnose strengths and weaknesses, monitor student progress, and provide feedback on the effectiveness of instruction (Adams, 1995; Barry, 1994; Morin, 1995; O’Malley, 1995).

While there is an enormous amount of literature on portfolios, the research on preservice teacher portfolios is relatively new (Rogers, 1995; Taylor, 1995; Smyser, 1994; McKinney, 1995; Bushman, 1995). A review of the literature indicates emerging areas of emphasis such as attitudes, self-evaluation by preservice teachers, alternative assessment and evaluation techniques, the construction of portfolios, and implementing portfolios in methods courses and across the teacher education curriculum.

Attitudes toward portfolios and self-reflection qualities are emphasized by Barry (1994), and Morin (1995, 1996). Barry (1994) points out that there are specific activities that promote reflective teaching including: (a) teaching experiences, (b) journal writing, (c) peer observation, (d) receiving notes/feedback from peer observations, (e) self-assessment, and (f) consultation with the university supervisor. In this study, students reported that teaching experiences required the most thought and reflection. Morin (1995) recommends that the development of portfolios by preservice teachers encourage self-reflection since students must demonstrate their teaching effectiveness and growth. Matanzo (1996) used a pre- and posttest design to measure the preservice teacher’s perception of growth in a reading/children’s literature class. She notes that a vast majority of her preservice students felt they gained increased self-confidence in their abilities and knowledge to work effectively with elementary students. These articles stress that self-evaluation can be a powerful tool in helping preservice teachers gain insight into their own achievement. As a result, preservice teachers are encouraged to reflect on their teaching as part of the portfolio process.

Assessing preservice and beginning teachers by using traditional and alternative instruments tends to provide a more accurate picture of the competency of future teachers. Adams (1995) suggests the use of portfolio artifacts in a variety of categories would also include a written rationale or justification for each artifact in the portfolio. This is demonstrated as students...
decide which artifacts to include in the portfolio. This kind of selection process requires students to sift through many work samples and choose only those that portray their best work. Reisetter and Fager (1995) explain how a goal based university program, which actively involves preservice teachers in a multifaceted approach to assessment such as portfolios, can be effective. Taylor and Nolen (1995) center on the notion of validity as an important aspect of portfolios. To answer these questions, they compared preservice teachers using portfolios with students in more traditional measurement courses. The results of their research support the usefulness of portfolios. Faust (1995) explored the portfolio evaluation process of students by having teachers themselves develop portfolios of their own to evaluate their teaching. This qualitative research project indicated that teachers used diverse and sometimes conflicting purposes for evaluation. He discovered that in the process of developing portfolios, both learners and teachers discovered ways to come to a consensus about rubrics used. Standerford (1994) investigated employing formative and summative evaluation of elementary students by preservice teachers who in turn engage in formative evaluation of themselves. She concluded that her interactions with her preservice teachers and their engaging in formative evaluation with elementary students helped them become reflective practitioners. Thus, if teachers develop their own portfolios first, constructing student portfolios appears easier to accomplish. In sum, these studies point out that both traditional and alternative assessment and evaluation are necessary because they allow for a multidimensional view of students.

Currently, articles that deal with implementing preservice teacher portfolios in methods courses appear to be the most plentiful. Anderson (1996), Dillon et al., (1996), Gambro (1995), McKinney and Ohlhausen (1995), Slater (1995), and Wickliff (1995) all touch on developing portfolios in literacy, children’s literature, educational psychology, physics, and writing courses. Hoag (1995) describes a project that involved preservice teachers in a methods course with training and experiences in authentic performance based assessment in conjunction with an elementary school. Students learned about rubrics, diagnosis of oral reading, word recognition analysis, and how this performance could be evaluated as part of a student’s portfolio. Such items can also become part of the student work samples included in a preservice teacher portfolio. This cross-educational collaboration model shows how a university and elementary school benefit each other in the development of portfolios for preservice teachers and elementary students. McFadden (1994) discusses using portfolios across the curriculum to encourage reflections. Portfolios are used in the liberal arts, applied science,
and teacher education programs at his university. McFadden points out a variety of models and specific items such as essays, teacher conferences, and need for reflection as part of a preservice teacher portfolio. All of these authors discuss how they successfully organized and integrated their course objectives using preservice teacher portfolios. They also point out that students assessed by portfolios feel less anxious about learning course content, which contributes to a more intrinsic motivation for learning. Instead of ranking students, the focus is on how students think and come to know something. Student individuality is prized, and the portfolio demands thorough information than a test score provides. The guidelines provided by these authors suggest that portfolios can be used successfully with preservice teachers and that there are many ways to implement them.

Another area of emphasis in the literature is constructing preservice teacher portfolios by incorporating professional teaching standards. Guillaume (1995), Rogers (1995), Shakelford (1995), and Tracz (1995) all recommend that incorporating national, state, and college goals fosters the development and improves the evaluation of portfolios. Shakelford focuses on faculty portfolios and the importance of shadowing in mentor preparation. Pedras (1994) presents the portfolio design used at his university, and notes that they include a teaching resume, educational philosophy, lesson plans, and many other items. By noting standards to address in the construction of portfolios, Guillaume, Rogers, and Tracz explain how careful construction of portfolios by paying attention to quantitative and qualitative data serves to guide future directions of portfolios at their institutions.

Technology and Portfolio Assessment

The literature reveals limited information about the use of technology to support alternative assessment, including portfolios. Employing technology, however, offers tremendous possibilities for preservice teacher portfolios. Campbell (1992) notes how CD-ROM’s can be used in portfolios, as well as the importance of parents, staff, and students working together in the development of portfolios. Palmer (1995) suggests the use of integrating disciplines and creating video portfolios of student work. It is clear that there is a need to use technology if we are to move ahead in education, and that developing preservice teacher portfolios is an authentic performance activity for assisting students in attaining meaningful goals.

Most of the research literature on preservice teacher portfolios is primarily descriptive, although some experimental studies have been completed. At this time, the primary research areas of interest include the changing
attitudes and self-evaluation of preservice teachers, the construction of portfolios, implementing portfolios in methods courses, and the validity of performance assessment. There is little information about college-wide management of portfolios and the use of technology in the development of preservice teacher portfolios. Both of these areas must be addressed if we are to move forward to make portfolios effective and efficient in teacher education. A thorough review of the literature reveals only one study that reports on attempts to utilize multimedia technology in developing portfolios. In this study, Hale and Kieffer (1995) concluded that there was a need for more work with multimedia technology and portfolio development. In the next section, a brief overview of multimedia technology is presented.

IMPLEMENTING THE MULTIMEDIA PORTFOLIO

Rather than taking a traditional linear, book-like approach to portfolio creation, this project opted to use emerging multimedia technology as the media. Preservice teachers completing this project would have their entire multimedia portfolio on a read/write compact disk, commonly called a CD-ROM. Because every school in Florida has, by law, at least one multimedia computer, a prospective teacher will be able to bring the CD-ROM to a job interview with reasonable assurance that the school would have the equipment needed to view the portfolio. As multimedia computers become commonplace in schools nationally, preservice teachers should be able to present their portfolios easily.

The multimedia portfolios were designed to use various types of media including computer graphics, photographs, scanned documents, recorded sound, and digital video. The portfolios also integrate the concept of hypermedia, which allows certain text or graphics to act as hot links or buttons. Using the mouse to select highlighted text or an icon can link you to other parts of the portfolio. This means that the portfolio would not necessarily be presented in the exact same order every time it was used. The interest of the user, in this case a prospective employer, determines the order.

The goal of utilizing multimedia presented several challenges. Each of the types of multimedia described above can be stored on a computer in many different file formats. This makes it difficult to ensure that the multimedia will work on a variety of computer platforms. While it is known that most schools have multimedia computers, there is no way of knowing what type of computer it is. Therefore, it became necessary to find a way to create multimedia hypertext portfolios that could be read by the largest number of computers.
Fortunately, this problem is quite similar to the one faced by the designers of the World Wide Web (WWW). Faced with the task of allowing many different types of computers to share multimedia elements, the Web designers developed the WWW based on a language called the HyperText Markup Language (HTML). This allows one to describe the appearance and function of what is referred to as a Web page. It then uses special software called a browser to create, or render, the page.

Therefore, this project was designed to create the multimedia portfolio using the WWW standards. This decision had several implications for the project. First, since it is created in the language of the Web, it can be placed on the Web without modification. In fact, several of our students have indicated that they will make provisions with their Internet service providers to take advantage of this feature. It is expected that all of the multimedia portfolios will be placed on the Web in the near future.

**Developing the Portfolio**

Preservice teachers are provided with a blank template of the multimedia portfolio (see Figure 1: The Multimedia Portfolio Template) which they copy to their Zip disk. When viewed by a Web browser, the portfolio is divided into three sections.

![Figure 1. The multimedia portfolio template](image)
The top section includes the logo of the institution developing the portfolio. This image also serves as a hyperlink to return to the main page. Since this top section never changes, you can navigate to the main page with a single click from anywhere in the portfolio. The lower left portion of the screen contains the main menu. As you navigate through the portfolio, the appropriate submenu replaces this menu. The rest of the screen is the main portion of the portfolio, which will contain the information about the preservice teacher. It is this portion of the portfolio that the preservice teacher modifies to create his or her own portfolio.

To modify the portfolio, the student participates in five seminars. The first seminar introduces the preservice teacher to the creation of the multimedia portfolio. Students are instructed in working with HTML files, gathering student samples, obtaining graphics (photographs, illustrations, certificates, etc.), locating demonstration teaching videos, and developing sound recordings. At the second seminar, students use the multimedia portfolio program and import their text files and artifacts collected. In this way, any new information can be added as the portfolio develops. Seminars three, four, and five are devoted to importing the video and audio components of the preservice teacher multimedia portfolio, adding new text, and recording the final version onto a CD-ROM.

As each text and multimedia element is developed, it is added to the portfolio. To accommodate this, preservice teachers are provided with specific filenames that they must use when transferring the files to their Zip disk. Thus the new files, created by the preservice teacher and containing their information, replaces the blank place holder in the template. Figure 2: Multimedia Portfolio with Picture Replaced shows the result of this process.

Figure 2. Multimedia Portfolio with Picture Replaced
Our experience has shown that the process of developing preservice multimedia portfolios can be long and tedious, especially if there are numerous students who have not collected teaching artifacts for a period of years in an organized fashion. A portfolio notebook has always been required at the end of student teaching; however, the entries focused primarily on the student teaching experience. New students involved in orientation programs, selected courses, and meetings with advisors, are being exposed to the portfolio in a more aggressive manner. The goal over the next two years is to refine this process so that all students will be able to highlight their achievements in a more consistent, thorough, yet creative way.

Future improvements include adding an additional seminar to help students place their multimedia portfolio on the Internet. Since the preservice multimedia portfolio was originally designed to accomplish this, our students are beginning to move in this direction as they use technology to search for employment. To further describe the process of creating the multimedia portfolio, the next section describes the computer hardware used in the creation of the portfolios.

**Hardware and Software**

Two identical workstations, dubbed the *Creation Stations*, were purchased for use in this project. The first component in each system was a sufficiently powerful multimedia personal computer. Two identical Pentium 133’s equipped with stereo sound, a CD-ROM player, and digital video capture cards were purchased. The video capture card is needed to convert analog video from either a video camera, television, or VCR to compressed video for storage on the computer. A microphone was also purchased to allow the preservice teachers to record their own voices for inclusion in the portfolio.

Because of the large size of multimedia computer files, Iomega 100 Zip Drives® were purchased. Each participant is expected to purchase their own Zip disk to hold his or her files. This disk is used as working storage as the project develops and as a final testing and storage area for the final version to be transferred to the CD-ROM. Two read/write CD-ROM players were purchased to create the final product.

Other equipment included digital still cameras for photographs, digital video cameras for live video, videocassette recorders to digitize videos taken with regular video cameras, and color scanners for documents. Most of the software used in this project came with the various media devices purchased. The digital still camera, scanner, and video capture cards all came...
supplied with appropriate software. The student HTML documents were created with Microsoft Word with Internet Assistant (Microsoft, 1996). Internet assistant is available for free from Microsoft. Participants created their pages in Word and saved them in HTML format. Most modern word processors including WordPerfect and ClarisWorks allows this.

As the project progressed, it became obvious that software was needed to manipulate the graphic images and convert them to formats recognized by Web software. This was accomplished with the computer shareware program LView Pro (MMedia, 1996). This program was used to rotate, size, and convert file formats. Also, since many different preservice teachers would be using the Creation Stations, McAfee Virus Scan (McAfee, 1996) was installed on both computers.

CONCLUSION

The research on preservice teacher portfolios suggests that they can encourage students to engage in self-evaluation and become more responsible for their learning. For the most part, faculty, staff, and administrators seem to support this new method of authentic performance, assessment and evaluation. It appears that the greatest problem facing universities is how to manage portfolios college-wide. Developing and implementing multimedia preservice teacher portfolios is an enormous responsibility and task. It requires the cooperation of students, faculty, staff and administrators. Financial support for equipment and technical support to maintain equipment is essential if the project is to succeed. The team in charge of the project must continually revise procedures, be aware of problems, seek solutions to problems, and keep students, staff, and faculty motivated as they move into the future. As preservice teachers pass through their courses, they must be continually reminded by faculty to seek artifacts that are meaningful representations of their capabilities as growing adults and future teachers.

Preservice teacher multimedia portfolios represent a breakthrough in education and technology. We have an obligation as professional educators to help our preservice students learn how to utilize technology by forming accurate, meaningful, holistic, yet creative portraits of themselves reflected in the portfolios they develop. As a result, preservice teachers will possess the knowledge they need to empower future students they will teach as they embark on a lifelong journey into the 21st century.
References


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