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Digital Portfolios in Teacher Education: Blending Professional Standards, Assessment, Technology, and Reflective Practice

SUMMARY. Digital portfolios can be powerful tools for facilitating reflective practice when based on sound developmental principles and adequately supported by mentoring, peer review, and other effective practices. This article explores the use of the digital portfolio to promote reflection by practitioners and suggests strategies that can be employed by teacher educators to maximize the benefits of these constructivist tools for learning, reflection, and assessment. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2003 by The Haworth Press, Inc. All rights reserved.]*

"If change is to occur, reflective thinking must become a taken-for-granted lens through which pre-service teachers conceptualize their practice" (Ross & Hannay, 1986, p. 14).

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When Cleborne D. Maddux (1984), Associate Editor for Research for *Computers in the Schools*, spoke of "breaking the Everest syndrome" in the journal's second issue almost two decades ago, he gave voice to a common concern held by many educators who found themselves at the threshold of a revolution in educational computing. Insistence on the part of computer advocates that computers should be used simply because they were there and the notion that computers would "deliver us from educational nirvana merely by existing" fueled fears that the fledgling educational computing movement, unless redirected, might turn out to be just another good idea that never arrived. (p. 38).

Writing in the first issue of the same journal, Maddux distinguished between Type I (using computers to make it quicker and easier to continue teaching the same topics in the same ways we have always taught them) and Type II uses (computer applications which support new and better ways of helping children learn). Applications which focus on drill and practice typify the first category while databases, spreadsheets, simulations programming applications, and problem-solving software are typical of Type II.

Maddux, Johnson, and Willis (2001) compared the characteristics of the two categories of applications and noted that most Type II applications were designed to "stimulate relatively active intellectual involvement on the part of the user" (p. 101). Jonassen (2000) coined the phrase "mind tools" to refer to Type II applications that promote problem-solving and other constructivist approaches to learning.

While the proliferation of Type II applications has been relatively slow, the ability of such applications to actively engage the learner's intellect in ways that lead to increased understanding suggests that Type II applications may have great potential when applied as tools for promoting reflective practice among pre-service educators.

Three powerful trends anchored in the educational reform movement are rapidly converging in ways that directly impact the evolution of the digital teaching portfolio and the preparation of teachers for the 21st century. The first of these trends, the movement of teacher preparation programs toward the adoption of professional teaching standards, drives the other two: the need for performance-based teacher assessment and an accompanying need for new technological tools to record and organize evidence of successful teaching.

Research on teacher effectiveness suggests that outstanding teachers learn from their experiences and constantly seek to refine their own professional practice. They remain current in the literature of their disciplines and continue to grow professionally. Master teachers continually try out new strategies and techniques in their classrooms, reflect on their successes and failures, and then adjust their professional practices accordingly. They often keep reflective journals and carry out formal action research projects to assist them in this process. Yet, most teachers would find it difficult to demonstrate how these varied experiences fit into the total framework of their professional development. Be-

cause the acquisition of complex knowledge, skills, and dispositions is a critical indicator of growing professional competency, it is important that teacher candidates who are preparing to enter the profession be able to articulate these competencies to themselves and others.

When employed as a tool for reflective practice, a digital teaching portfolio can enable both novice and accomplished teachers to make sense out of a myriad of professional experiences and bring into focus a clear picture of themselves as growing, changing professionals. Properly used, the digital portfolio can also be a meaningful and highly effective way to demonstrate to others the knowledge, skills, and dispositions teachers and teacher candidates have gained in the complex process of teaching.

PORTFOLIOS AND REFLECTIVE PRACTICE

While the use of teaching portfolios has moved from individual classrooms and teacher education programs to state departments of education and are the primary assessment used by the NBPTS, the electronic teaching portfolio is still very much in its infancy (Lyons, 1998a). There is not yet a systematic body of data documenting its uses and long-term consequences. While much research concerning the educational benefits of electronic portfolios remains to be undertaken, a survey of the literature linking reflective practice to the use of traditional portfolios provides promising glimpses of the powerful role these portfolios can play in producing a new generation of reflective practitioners (Moss, 1997).

The 1998 winter issue of *Teacher Education Quarterly* featured a number of studies on the use of portfolios in teacher education programs. Jones (1998), in the editor's preface, asserted that "portfolios have assumed a significant role in teacher education." Writing in the same issue, guest editors Bartell, Kaye, and Morin (1998) noted that portfolios were valuable to students for promoting reflection and self-directed growth, building good teaching habits, encouraging collaborative dialogue and enriched discussions, documenting growth over time, and "integrating the diversity of their teacher preparation experiences" (p. 5).

Anderson and DeMeulle (1998) surveyed 127 teacher educators throughout the United States to examine the use of portfolios in teacher preparation programs. Teacher educators reported using portfolios for a variety of purposes, including promoting student development, encouraging student self-assessment and reflection, providing evidence for assessment and accountability, and documenting professional growth. Ninety-two percent of the teacher educators surveyed agreed that the use of portfolios had a positive impact on the professional development of pre-service teachers because the portfolios were student-centered, defined by professional standards, and reflective. Further,

the portfolios were viewed as "self-empowering tools that encourage pre-service teachers to assume more responsibility for their learning" (pp. 23-31).

Wolf (1996) described a teaching portfolio as a "collection of information about a teacher's practice" (p. 35). He emphasized that the portfolio should be more than a scrapbook of miscellaneous artifacts and lists of professional activities. According to Wolf, the introduction should include a statement of the student's teaching philosophy and goals but the heart of the portfolio should be a combination of teaching artifacts and written reflections. He emphasized that artifacts should be framed with clear identifications, contextual explanations, and reflective commentaries that examine the teaching documented in the portfolio. He also proposed that students include an informal self-assessment and that formal assessment be tied to standards such as those put forth by the NBPTS.

Grant and Huebner (1998) discussed the "powerful learning" that takes place when pre-service teachers incorporate personal beliefs into their professional practice. The authors defined "powerful learning" as a self-regulated learning process in which the teacher's mind is "proactive, problem-oriented, attentionally focused, selective, constructive and directed toward ends" (p. 34). They viewed constructivist patterns of thinking as particularly appropriate for teaching pre-service teachers and maintained that powerful learning took place when a meaningful question concerning professional practice was posed, data collected, and reflection on relationships between the data and the question undertaken.

Stone (1998) explored the importance of providing guidance and support when implementing teaching portfolios and the efficacy of introducing them early in the professional education program. He examined two groups of student teachers to determine an effective method for introducing pre-service teachers to the portfolio process. Each of the two groups was introduced to portfolios at different stages of their professional program and received varying levels of guidance and support. The majority (75%) of the group that received support near the beginning of their first student teaching experience believed that portfolios accurately communicated and documented learning and accomplishments. Only 48% of the second group, which began portfolio construction with their final student teaching assignment, agreed that portfolios were worthwhile in communicating and documenting learning. Stone concluded that the introduction of portfolios must be carefully planned and take place early in the teacher preparation program and that students must be taught how to select artifacts and reflect on their learning.

Lyons (1998b) analyzed the development of reflective practice in a longitudinal study of 10 graduates of Southern Maine's Extended Teacher Education Program. She conducted open-ended interviews with teaching interns during training and again two years later to determine how ideas concerning reflective practice changed over time. She concluded that there was a pattern of reflective processes developing and transforming over time though initial student reflection

may have been rudimentary. Lyons believed that the critical conversations concerning the significance of portfolio entries provided a "scaffold that fosters teacher awareness of their knowledge of practice." Additional findings indicated that a beginning teacher's philosophy of education becomes embedded in practice through the process of reflection and that this process occurs through collaborative inquiry related to personal values of teaching and learning.

Borko, Michalec, Timmons, and Siddle (1997) utilized an action research cycle to examine student teachers who completed teaching portfolios as part of a seminar program at the University of Colorado, Denver. Interviews of the 21 student teachers participating in the study explored the benefits of using the portfolio as a tool for reflection. Portfolios were viewed as beneficial in making connections between theory and practice by most participants. Fifteen of the student teachers surveyed reflected on the connection between their philosophy and their teaching practice. While many planned to use portfolios for employment interviews, the researchers concluded that the primary goal of providing a tool for reflecting on student teaching experiences had been met.

MERGING STANDARDS, TECHNOLOGY, ASSESSMENT, AND REFLECTIVITY THROUGH PORTFOLIO DEVELOPMENT

"An electronic portfolio uses electronic technologies, allowing the portfolio developer to collect and organize portfolio artifacts in many media types (text, video, audio, and graphics). A standards-based portfolio uses a database or hypertext links to clearly show the relationship between the standards or goals, artifacts, and reflections. The learner's reflections are the rationale that specific artifacts are evidence of achieving the stated standards or goals" (Barrett, 2000a, p. 14).

While the notion of using portfolios as tools for assessment and reflective practice is not new, teacher educators are just beginning to explore the advantages of storing those portfolios in a digital format. As schools and colleges of teacher education have expanded their access to technology, an increasing number of options have become available for developing electronic teaching portfolios. Technological innovations, including Hypermedia programs, Webpage editors, PDF distillers, and commercial proprietary software such as Chalk and Wire's e-Portfolio have made the process of creating and storing electronic portfolios relatively easy, enabling teacher educators to take advantage of a number of advantages the digital format provides over traditional, paper-based portfolios (Montgomery, 2002).

A development of the 1990s, digital portfolios combine the use of electronic technologies to create and publish a portfolio that can be displayed on a computer monitor. As early as 1992, Shiengold recognized that using electron-

ically stored portfolios can make student work accessible, portable, and more easily distributed. Niguidula (1993), working with the Exhibitions Project at the Coalition of Essential Schools to develop a digital portfolio methodology, recognized the value of paper-based portfolios but posed the question, "What are we going to do with all this stuff?" He described the "logistical nightmare of thousands of papers turning brittle and collecting dust" and proposed that educators create a tool using computer technology that allows "for a richer picture of what a student can know and do" (p. 1).

The International Society for Technology in Education (ISTE), in a report prepared for the National Foundation for the Improvement of Education (1997), described technology as providing new assessment tools that would enable students to engage in "authentic projects" that are more "real world in nature." ISTE asserted that information technologies "added new dimensions to portfolio assessment" and suggested that computer editing could facilitate the arrangement of portfolio artifacts, allowing one presentation to be used for a variety of purposes. ISTE further recommended the use of interactive multimedia stacks and Web pages to develop and store portfolio products.

Sheingold and Frederiksen (1994) argued that technology could provide students and teachers with a medium for conversations about the values and standards for student performance. They suggested that technology could help link assessment with reform through providing: (a) support for student work in extended, authentic learning activities; (b) portable, accessible, and replayable copies of performances in multiple media; (c) libraries of examples and interpretative tools; (d) greater participation in the assessment process; and (e) publication of works demonstrating student accomplishments. Further, technology could provide assessment evidence beyond the capability of text-based products that require the physical presence of an evaluator. Using electronic technologies, student work could be captured and preserved for review anywhere or at any time, eliminating the need for transporting and storing bulky paper portfolios.

Jackson (1998) studied the effects of the use of electronic portfolios at St. Mary's University of Minnesota. Teacher education students determined the characteristics they thought would make them effective teachers and reflected on their progress toward the acquisition of these characteristics using multimedia-based electronic portfolios. In addition to benefits derived from reflecting on their accomplishments, students reported the value of publicly sharing the contents of their portfolios with potential employers and expressed confidence in the possibility of infusing technology in their own classrooms.

Barrett (2000) supported the use of portfolios for authentic assessment of prospective teachers and proposed that professional standards provide the basis for portfolio organization. She maintained, "An electronic portfolio without clear links to standards is just a multimedia presentation or a fancy electronic resume or digital scrapbook. Without standards as the organizing basis for a portfolio, the collection becomes just that . . . a collection, haphazard and without

structure; the purpose is lost in the noise, glitz and hype. High technology disconnected from a focus on curriculum standards will only exacerbate the lack of meaningful integration of technology to improve teaching and learning."

Barrett (2000) suggested that a portfolio should include student self-reflections on professional standards and argued that an electronic format was appropriate because:

1. Documents included in portfolios are generally created with a computer to begin with.
2. Hypertext links allow clear connections between standards and portfolio artifacts.
3. Creating an electronic portfolio can help students develop skills in using multimedia technologies.
4. If teachers develop electronic portfolios, their students may be more likely to do so.
5. Electronic portfolios are fun and technology makes it easier to manage the process, especially where storage, presentation, and duplication are are concerned.
6. Electronic portfolios make student work replayable, portable, examinable, reviewable, and widely distributable.

In the year 2000, the National Council for the Accreditation of Teacher Education (NCATE) introduced new standards that make effective use of technology a central requirement for teacher preparation programs. NCATE has called for a reappraisal of teaching practices and recommended a paradigm shift for teacher educators, with an emphasis upon the use of technology to support constructivist teaching and active learning. NCATE suggested that teachers incorporate a wide range of technological tools into their "instructional repertoire" and explore new roles that will help their students explore, discover, and interpret information that "inspires them to become lifelong learners." Powers (1998) recommended that NCATE technology standards developed by the International Society for Technology in Education (ISTE) be adopted as the foundation standards for all teacher candidates. In addition to mastering basic computer applications and operations, ISTE standards require candidates to demonstrate competence in using technology for professional growth and planning and delivering instruction. Powers also recommended that candidates demonstrate proficiency through the use of performance assessments and artifacts included in their professional teaching portfolios.

RESEARCH ON TEACHER REFLECTION

The notion of reflective practice as a goal of teacher education is not new. The seminal work of Donald Schon (1983) built on a foundation laid by Pro-

gressive educator John Dewey (1933), and teacher educators across the nation rallied to Schon's (1987) challenge to make reflective practice a central goal of teacher education programs. By the 1990s, the ability to engage in reflective practice was recognized as an important skill for both beginning and experienced teachers. With this renewed emphasis on reflective practice came new modes of teacher assessment, including the use of professional portfolios and other performance assessments suggested by the work of Lee Shulman (1992) and the NBPTS.

A review of the literature on reflection reveals that reflective practice is defined and implemented in teacher education programs in a myriad of ways (Clarke, 1995; Grimmett, Erickson, MacKinnon, & Riecken, 1990), but most of the definitions of "reflective practice" reveal a strong influence by Dewey and Schon. Dewey (1933) believed that reflective thinking involved: (1) a state of doubt or mental difficulty, in which thinking originates, and (2) an act of searching or inquiring, to find material that will resolve the doubt. For Dewey, reflective thinking was "deliberation," a type of thinking that closely resembled scientific thinking. Schon (1983, 1987) viewed reflective thought as being embodied in action. Reflective practice involved calling up previous knowledge and translating it into action to address a particular aspect of practice. Dewey defined reflective thinking from a perspective of problem solving, and both he and Schon viewed the world of professional practice as complex, unstable, and often conflicting.

Dewey's idea of "deliberation" and Schon's concept of "reflection embodied in action" have become a point of departure for many teacher educators who think about the nature of reflective practice and attempt to employ it in teacher education programs. Yinger (1981) viewed reflection as "contemplation" while Fenstermacher (1988) saw it as "practical arguments." Zeichner and Liston (1987) added a moral or ethical dimension to the definition, while Clarke (1995) disputed Schon's assertion that reflection occurs within the context of a single incident or conversation. Clarke viewed reflection as evolving from a series of thematic incidents occurring over relatively long periods of time.

One way of describing the characteristics of reflective thinking is through analyzing modes of delivery. While researchers differ on the hierarchical nature of reflection, they generally agree on three modes or levels of reflective thinking: (a) technical, (b) contextual, and (c) dialectical (Taggart & Wilson, 1998, p. 2).

Van Manen (1977) referred to the initial level of reflective thinking as "technical rationality" and served as a model for Lasley (1992), and Grimmett, Erickson, McKinnon, and Riecken (1990). He suggested that the first level of reflection dealt with methodological problems and theory development to achieve objectives. Valli (1990) also referred to the first level as technical rationality but insisted that it was actually a nonreflective level. His second level,

"practical decision making," added reflection to the technical aspects of teaching.

According to Taggert and Wilson (1998), "practitioners reflecting at the technical level function with minimal schema upon which to draw when dealing with instructional problems" (p. 2). At this level, practitioners reflect on short-term measures such as getting through lessons and using instructional management approaches only in terms of meeting outcomes. Individual, often isolated, episodes are building blocks for developing the professional repertoire needed to reflectively handle non-routine problems. A lack of schema in dealing with educational problems forces many novice teachers to function at a technical level.

The contextual level, a second level of reflective practice (Grimmett et al., 1990; Lasley, 1992; Van Manen, 1977), involves classifying and reflecting upon the assumptions underlying classroom practice as well as upon the consequences of various strategies employed by the teacher. Contextual practitioners critically examine pedagogical matters relative to the relationship between theory and practice. The non-problematic nature of technical rationality gives way to problems which often stem from the practitioner's personal dispositions, biases, and beliefs. At this level, practitioners examine situations in context and question practice from a perspective of increased pedagogical knowledge and skills.

Critical reflectivity, Van Manen's (1977) third and highest level of reflectivity, involves questioning moral and ethical issues related to a teacher's professional practice. At this level, such principles as equality, caring, and justice are taken into consideration, and practitioners contemplate ethical and political contexts when planning and implementing instruction. Critically reflective practitioners recognize and attempt to compensate for personal biases and are concerned with the value of knowledge and social circumstances useful to students. The ability to make defensible choices and open-mindedly review a teaching event are characteristics of practitioners functioning at a level of critical reflectivity.

USING DIGITAL PORTFOLIOS TO PROMOTE AND DOCUMENT REFLECTIVE PRACTICE

The reflective thinking level at which a practitioner functions impacts both the meaning of experiences documented in the digital portfolio and what is learned from reflecting on those experiences. The work of Taggert and Wilson (1998) suggests a number of strategies useful in promoting reflection appropriate for the various levels.

Appropriate portfolio goals for teachers reflecting at a technical level might focus upon selecting and implementing a preset lesson to achieve an established, non-problematic objective. Since the practitioner at this level does not

deliberate on the context of the situation, the acquisition of skills, methodological awareness, and technical knowledge are important. Identification of the relevancy of activities and objectives becomes increasingly important as technical practitioners transition into linking theory development to practice. Practitioners at this level benefit from making observations and processing information to validate pedagogical decisions.

Practitioners functioning at a technical level need genuine, continuous experiences and thoughtful discussion of problems and possible solutions that emerge from those experiences. Experimentation and application of solutions with clear explanations and meaningful activities are also important. Reflections should focus on pedagogy, content, and theory, and provide for use, examination, and analysis of varying instructional and management approaches. Knowledge of student characteristics will also assist the technical practitioner in reflecting on problems experienced in actual classroom settings.

Understanding concepts, contexts, and theoretical bases for classroom practices and defending those practices in light of their relevance to student growth are appropriate goals for practitioners functioning at the contextual level. Reflecting on assumptions and biases that impact practice helps contextual practitioners recognize the implications and consequences of their professional actions and beliefs. Understanding how their own personal characteristics interact with environmental and contextual factors of teaching and learning is especially important at this level. Through increased practice and the acquisition of theoretical knowledge, practitioners at this level begin to examine conflicting views of actions and consequences and develop defensible routines and "rules of thumb."

Teacher educators working with practitioners at this level should attempt to facilitate reflection upon situational constraints and external factors that impact effective teaching practices. Time for collegial support, input, and discussion to provide bridges between concepts, theories, and practices is especially appropriate. Timely feedback and guiding questions directed at promoting reflection on portfolio entries should be provided.

Portfolio goals for practitioners functioning at the dialectical or critical reflectivity level should focus upon identifying and analyzing knowledge systems and theories in context, discovering relationships between them and relating them to their own daily professional practice. Critical examination of underlying assumptions, norms and rules and practicing introspection, open-mindedness, and intellectual responsibility (Dewey, 1933), are appropriate topics for reflection at this level. Equally important is reflecting on the moral and ethical issues involved in day-to-day planning, teaching, and assessing.

Teacher educators can assist practitioners functioning at this level by assisting them to examine the appropriateness of their actions. The analysis of case studies, curricular approaches, conventional wisdom, and best practices enables dialectical practitioners to examine professional practice through the lens of optimum benefit for students. Portfolio activities grounded in action re-

search should also be a natural product of reflective thinking at the dialectical level. Other activities might include analyzing stereotypes and biases through journaling, self-talk, and storytelling; practicing affective elements of caring and concern; and reflecting on the educational roles of school climate and social values.

THE PORTFOLIO AS A TOOL FOR SCAFFOLDING PROFESSIONAL AND ETHICAL DEVELOPMENT

A feature of the professional teaching portfolio that begins to come into focus when various reflective levels are considered is the opportunity the portfolio can provide for practitioners to author their own learning and professional development. Regardless of their level of functionality, the insights of self-reflection enable practitioners to examine ways that their own beliefs and actions impact students. Through a process of reflecting upon professional teaching standards and experiences encapsulated in portfolio artifacts, practitioners can scaffold their own ethical and professional development.

The work of Richard Stiggins (1987) provides a strong theoretical base for the value of this process. Stiggins advocates a three-prong process that involves engaging prospective teachers in assessment, recording their own progress, and communicating their own success. He maintains that involving candidates in these activities opens the assessment/development process and brings candidates in as full partners. In addition, a high level of involvement provides candidates a clear vision of the meaning of academic success and reveals to them where they stand relative to that vision. The result, according to Stiggins, is a clear sense on the part of the candidate of the path he or she must follow to improve his or her own practice. Another result is a classroom environment in which there are "no surprises" for candidates or professors.

Also consistent with the model advocated by Stiggins is the process of practitioner-involved record keeping, which is facilitated through portfolio development. Teachers can learn to be reflective practitioners by monitoring their own performance through repeated self-assessment utilizing professional standards and a uniform and constant set of performance criteria. Professional portfolios provide opportunities for practitioners to chart evidence of their success over time. Self-reflections about best practice and the changes they see in their own performance permit emerging educators to literally watch themselves grow. As candidates chart their progress, they assume control of and responsibility for their own professional growth and success. According to Stiggins, when candidates know from the onset of the learning process that they will be expected to tell the story of their own success, "they experience a fundamental deep-seated internal shift in their sense of responsibility for their own learning" (Stiggins, 1987).

Barton and Collins (1993) also emphasized the importance of the portfolio in establishing a context for candidate learning and setting goals for personal growth:

> The development of a portfolio begins with the act of establishing purposes. Students, with the help of an advisor, develop purposes for their studies by establishing what they need and want to learn in order to become master teachers. Once they establish these purposes, students seek to find and create practices that meet the need. Because the portfolio emphasizes purpose, students share real and authentic reasons to look for connections between theory and practice. (pp. 210-211)

DIGITAL PORTFOLIOS AND CONVERSATIONS WITH COLLEAGUES

The use of focused interviews and practitioner-directed portfolio conferences at strategic points throughout the portfolio development process constitutes another crucial component anchored in the work of Stiggins. Portfolio conversations refer to structured discussions about professional teaching practice between the portfolio author and other group members, including peers and teacher educators. These conferences focus on standards and the documented evidence of teaching collected and included in the portfolio as artifacts. A strength of the digital portfolio is the ease with which evidence can be presented to others in the group. Since the documents included in the portfolio are digital, they can easily be distributed and displayed for discussion.

Public discussion and debate about what constitutes good teaching brings candidates into the process of presenting the evidence of their own success relative to mastery of professional standards. As productive as teaching portfolios are for facilitating individual reflection and improving professional practice, their value increases dramatically when they serve as a focal point for conversations with colleagues about teaching (Wolf, Whinery, & Hagerty, 1995).

Shulman (1992) pointed out that teaching portfolios do not achieve their full value if they sit in a box (or an unopened computer file). They become valuable only when they become a point of departure for "substantive conversations" about the quality of a teacher's work.

Wolf, Whinery, and Hagerty (1995) suggested that the goal of a portfolio conversation should be to help the portfolio author and other members of the group improve their professional practice. To accomplish this goal, several conditions must be met: (a) the conversation must focus on standards and their relation to the teaching artifacts being presented, (b) clear guidelines for the session must be established to ensure effective interpersonal communication, (c) the discussion group must be carefully organized to maximize both the

quality and quantity of input and feedback, and (d) the presentation of portfolio artifacts must relate to a specific set of standards and reflect an authentic teaching enterprise.

It is critical to focus on specific artifacts of teaching rather than upon teaching or education in general. Richert (1990) found that when discussions focused on artifacts, practitioners talked with colleagues about their teaching, and their conversations were more focused and reflective.

A common problem in portfolio conversations occurs when the discussion group loses sight of the primary purpose of the conversation: to guide the portfolio author in improving his or her teaching practice. This situation can often be averted by asking the portfolio author to present a particular artifact and request specific types of feedback from other group members. In this way, the author assumes the responsibility for directing the conversation about his or her work. Once the author's initial set of questions has been addressed, the group should raise additional questions about the artifact that the author may not have considered. The session should close with the portfolio author summarizing what was learned and what action he or she will take as a result (Richert, 1990).

SUPPORTING THE PORTFOLIO DEVELOPMENT PROCESS

Campbell, Melenyzer, Nettles, and Wyman (2000) emphasized the importance of a support system for electronic portfolio development that involves all the stakeholders, including teacher educators, public school mentors, and peers. Two essential types of collaboration and support are mentoring and peer support. The first method, collaboration, is a program-wide effort while the second, peer support, can be done in individual teacher education classrooms.

Mentoring is an effective way to initiate and facilitate academic growth for students just entering professional education programs. Mentors can provide valuable assistance through sharing their own professional portfolios with newcomers and discussing the standards that provide a framework for the collection of artifacts the portfolios contain. Mentors, who include teacher educators, public school practitioners, and advanced teacher education candidates, can serve as "critical friends" to students entering the professional education program. The role of the mentor includes emphasizing the importance of professional standards and encouraging initiates to collect important documentation that can be used as evidence of growth toward meeting those standards. Campbell suggested that participation in a mentoring program can be a highly motivating experience for both mentor and the initiate.

Peer support may take place in the context of the individual classroom. Students who need support can be referred to advanced students who have their portfolios well underway and who have demonstrated their proficiency through

portfolio conferences or other assessment activities. According to Campbell, this type of support is especially useful for students who are struggling with articulating their self-reflections.

Peer editing is yet another way that peer support can be provided in the college classroom. This strategy is particularly helpful because it requires students to articulate their work for an audience other than the course instructor, adding a level of authenticity. Peer editing not only helps students improve their work but also models the collaborative nature of the work of real-life professionals.

CONCLUSION

As the demand for authentic, standards-based assessment of teacher performance continues to grow, teacher educators will need to develop new strategies for recording and presenting evidence of successful teaching. While the notion of using portfolios as an assessment tool in professional education programs is not new, teacher educators are just beginning to explore the advantages of digital formats for these assessment tools.

Appropriately used, a digital portfolio is far more than an electronic collection of course projects, assignments, and teaching memorabilia. A thoughtfully developed portfolio provides organized, standards-driven documentation of professional development and competency in teaching. When anchored in professional teaching standards, the digital teaching portfolio becomes a highly meaningful and effective way to demonstrate to others the knowledge, skills, and dispositions gained in mastering the complex art and science of teaching.

A critical goal of the professional teaching portfolio, whether presented in digital or traditional form, should be to facilitate the development of reflective practice. When this goal is addressed, a digital teaching portfolio can enable professional education candidates to assume responsibility for their own learning, make sense out of a myriad of teacher preparation experiences, and bring into focus a clear picture of themselves as growing, changing professionals.

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