



# Examining Preservice Teacher Inquiry through Video-Based, Formative Assessment e-Portfolios

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## Abstract

*A capstone electronic portfolio, usually focused on summative assessment, was altered for preservice social studies teachers to include video-based formative e-portfolio assessment. Using a case-study design with three participants, we found that use of video artifacts facilitated reflection, supported inquiry into classroom success and failure, and influenced self-improvement plans. Additionally, the systematic examination of e-portfolio artifacts provided different points of view into classroom practices and influenced preservice teachers' perceptions of success. Yet, participants indicated that practicing teachers did not maintain portfolios, raising questions about the continued use of e-portfolios beyond graduation.*

Since the mid 1980s, teacher educators have used portfolios to document teacher practices, facilitate self-study, promote formative and summative assessment, develop pedagogical skills, and stimulate reflection (Bird, 1990; Linn, Baker, & Dunbar, 1991; Wolf, 1991). By collecting artifacts—often including written reflections aligned to professional standards—preservice teachers articulate their beliefs about teaching, current classroom practices, and teaching skills. Within the past decade, many programs transitioned from paper-based to self-contained, electronic portfolios for data storage and retrieval, program accreditation (Evans, Daniel, Mikovch, Metz, & Norman, 2006; Strudler & Wetzel, 2005).

While several portfolios have been described (e.g., Barton & Collins, 1993; Sherman, 2006; Zeichner & Wray, 2001), most focus on summative assessments (Conderman, 2001; Grossman, 2005) that document teacher practice and beliefs but do not promote professional development or foster sustained inquiry. Formative assessment portfolios, in contrast, are designed to facilitate professional growth (Land & Zembal-Saul, 2003; Theel & Talerico, 2004), enhance reflection (Avraamidou & Zembal-Saul, 2003) and improve practice over time. Some portfolios, for example, have helped preservice teachers to reflect on authentic experiences, identify strengths and weaknesses in their teaching, and implement changes in practice (Johnson, Mims-Cox, & Doyle-Nichols, 2006; Loughran & Corrigan, 1995).

Yet, few researchers have examined how formative portfolios influence preservice teachers' decisions (Orland-Barak, 2005; Zeichner & Wray, 2001) or are used beyond graduation. The purpose of this paper is to examine the influence of systematic analysis of formative e-portfolios on preservice teachers' perceptions and decisions regarding classroom practices and use following program completion.

## Summative Assessment Portfolios

Typically, portfolio development literature focuses on summative assessment (e.g., Burroughs, 2001; Dhonau and McAlpine, 2005; Gatlin

& Jacobs, 2002; Nazier, 1997; Reis & Villaume, 2002) that “stimulate preservice teachers’ reflections on their development, as well as to assess that development, often in a summative way” (Grossman (2005, p. 443). They often document mastery of specific skills, course objectives, or professional standards at a single moment in time. As part of an “exit portfolio,” for example, preservice teachers included resumes, classroom management plans, assessment instruments, self-evaluations, lesson plans, and reflections during a ten-week field experience (Reis & Villaume, 2002, p. 11). The portfolios were evaluated by faculty at the end of the semester to assess accomplishments. As part of a capstone project, Conderman (2001, 2003) documented similar procedures, where preservice teachers gathered artifacts related to their teaching and organized them around state-mandated standards. Findings indicated that portfolios helped preservice teachers reflect on their teaching using professional standards, plan and organize resources, and prepare for job interviews.

However, when mandated for summative assessment purposes, portfolios may paradoxically minimize preservice teachers’ engagement. In studies conducted by Wade and Yarbrough (1996) and Carroll, Potthoff, and Huber (1996), researchers found that preservice teachers became frustrated, claiming that the portfolios did not accurately represent themselves as teachers. Other researchers found that summative assessment portfolios were viewed as course projects or means for graduation rather than as tools to organize resources, promote reflection, and document mastery (Loughran & Corrigan, 1995).

## Formative Assessment Portfolios

Recently, portfolios have been advocated for professional growth purposes, documenting content and pedagogical skills acquisition, self-assessment, and reflection, suggesting that portfolios promote growth over time and facilitate inquiry into practice (Evans et al., 2006).

*Improving reflection.* Most research on formative portfolios focuses on strengthening reflective practice through question prompts and faculty feedback (Avraamidou & Zembal-Saul, 2003; Borko Michalec, Timmons, & Siddle, 1997; Fox, Kidd, White, & Painter, 2005). Although many definitions exist (e.g., Johnson et al., 2006; Van Wageningen & Hibbard, 1998; Whipp, 2003), for purposes of this paper, reflection involves identifying an interest or problem related to an individual practice, hypothesizing reasons for its occurrence, obtaining and analyzing information related to the practice, and implementing changes based on evidence (Dewey, 1933; Hatton & Smith, 1995). Richert (1991) suggested that reflective practices are facilitated by collecting artifacts that capture teaching details often overlooked “in action.” During a semester-long field experience, Borko et al. (1997) reported that preservice teachers who collected and reflected upon both course mandated and self-selected portfolio artifacts using question prompts reacted positively to the prompts, and stated that portfolios facilitated reflection and prepared them for future employment.

*Promoting content knowledge.* Avraamidou and Zembal-Saul (2003) found that e-portfolios helped participants' to examine their teaching, develop content knowledge, and improve pedagogical skills. Preservice science teachers developed teaching philosophies that included 3-4 claims about how students learn; evidence and reflection were used to warrant claims. Researchers reported that e-portfolios helped sensitize preservice teachers to student thought, recognize the need for physical and mental engagement to foster learning, and support claims with evidence.

Yet, literature has been inconclusive regarding the extent to which preservice teachers collect and reflect on artifacts to inquire into teaching practices. Delandshere and Arens (2003) questioned whether they selected artifacts to support existing ideas or to inform current practices. Additionally, they reported that faculty often failed to identify connections between portfolio artifacts and the standards they purported to represent. Land and Zembal-Saul (2003) noted that while working in small groups, preservice teachers examined properties of light using classroom experiments and e-portfolios. Although most formalized properties of light through experimentation and e-portfolio production, others relied on erroneous prior information included within e-portfolios even when evidence contradicted it.

When artifacts are selected to justify claims rather than to inquire, portfolio benefits may be minimized. In a review of three elementary education programs, Delandshere and Arens (2003) found that faculty used portfolios to document program effectiveness while preservice teachers used them for presentations and employment. Borko et al., (1997) reported similar conflicts: Although preservice teachers perceived portfolios as a tool to facilitate reflection, they concentrated on presenting themselves favorably to future employers.

This study examined how e-portfolios influenced preservice teacher inquiries into their classroom practices through the systematic analysis of artifacts. Particularly, we examined the extent that artifact analysis modified perceptions of classroom instruction, documented reasoning, and facilitated classroom practice.

## Methods

### Setting and Procedure

Since 2003, each preservice social studies teacher at a large southeastern U.S. university created an e-portfolio during a capstone seminar taken concurrently with a 12-week field experience; E-portfolios were housed in LiveText (a Web-based, commercial e-portfolio system). Historically, e-portfolios included a teaching philosophy, resume, artifacts (e.g., lesson or unit plans, student work samples, assessments, pictures), and reflections regarding mastery of state teaching standards. E-portfolios were also used to document teaching milestones for National Accreditation of Teacher Education (NCATE) and to stimulate reflection regarding the alignment and disparities between classroom teaching practices and rationales. Despite assignments involving development throughout the semester, instructors reported that e-portfolios were usually constructed during the final weeks of the semester rather than throughout field experiences. Instructors also expressed doubt that students continued e-portfolio development beyond graduation.

To address these concerns, e-portfolio requirements were modified during one semester. In addition to previous requirements, preservice teachers conducted three e-portfolio development cycles (see Figure 1) where they iteratively identified problems, hypothesized and implemented solutions, examined the outcomes of their implementations, and modified future implementations as needed (Corey, 1953; Johnson et al., 2006; Shepherd & Hannafin, in press). For each cycle, preservice teachers reviewed suggestions to promote active student engagement, increasing mindful activity

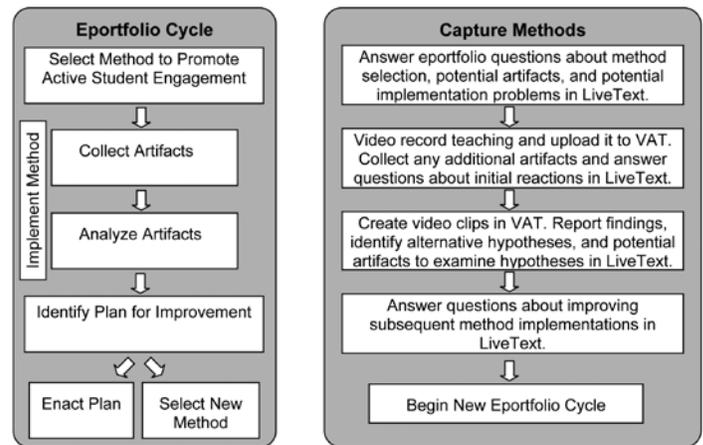


Figure 1: Formative eportfolio cycles and capture methods.

by which learners receive, process, manipulate, judge, and/or interpret knowledge to enhance student understanding (Black, Sileo, & Prater, 2000; Dewey, 1933). They either selected and implemented a suggested technique or chose their own technique based on personal needs, prior e-portfolio results, and course feedback. Once selected, question prompts within the e-portfolio directed them to identify how they would implement the technique in their classroom, collect evidence to gauge success, hypothesize problems they might encounter, and potential solutions.

While implementing the technique, preservice teachers video recorded and analyzed a minimum of one classroom implementation using the Web-based Video Analysis Tool (VAT). As shown in Figure 2, VAT enabled them to examine their own video recordings, locate and tag practices relevant to active student engagement, write reflective comments explaining their decisions, and create hyperlinks within their e-portfolio. Additional question prompts directed them to select and interpret additional artifacts as well as capture reasoning during stages of e-portfolio production (see Figure 3). These questions probed the extent to which selected techniques differed from traditional practices, alternative hypotheses accounted for findings, and additional artifacts could confirm or refute their claims. At the conclusion of each cycle, preservice teachers proposed future instructional improvements and decided whether to continue focusing on the selected technique during subsequent e-portfolio cycles or choose a new one.

### Participants

Seventeen social studies education preservice teachers enrolled in the modified e-portfolio course. Although all preservice teachers developed the modified e-portfolio throughout the semester, 11 agreed to participate in the research study; five subsequently became ineligible to participate because their schools did not agree to participate in the study. Of the six remaining preservice teachers, three were purposefully selected (Patton, 2002). Two were selected because they exhibited e-portfolio interests representative of most students in the course, as indicated through researcher observation and instructor recommendation, and the other based on reluctance to complete the modified e-portfolio. Mitch<sup>1</sup> was a male Caucasian in his early 20s and taught in a large urban high school within 40 miles of the university. Wendy was a female African American in her early 20s and Meg was female Caucasian in her 40s, each of whom taught in different rural high schools within 25 miles of the university.

### Data Sources and Analysis

At the end of each cycle, we collected e-portfolios and interviewed participants using a semi-structured protocol to identify perceptions

<sup>1</sup> All names have been changed to protect the confidentiality of participants.

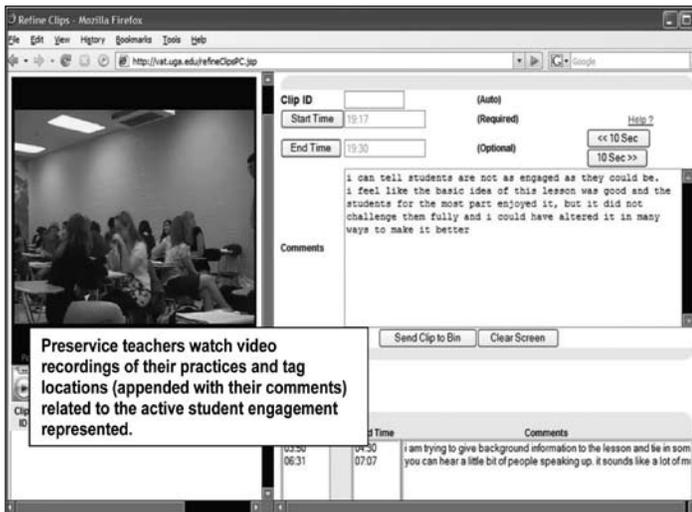


Figure 2: Creating and tagging video segments in VAT.

towards e-portfolio development, rationales for artifact inclusion and analyses, received support, and steps taken for cycle completion. We also interviewed the course instructor at the conclusion of the semester to document perceptions towards e-portfolio construction. All interviews were audio taped and transcribed verbatim.

Using case-based methods (Yin, 2002), open-coding, and constant comparison (Glaser & Strauss, 1967; Pigeon & Henwood, 2004; Strauss & Corbin, 1998), analysis began immediately following e-portfolio training and continued throughout the study. Several concepts and categories were subsequently identified, defined, and refined. Initially, we documented open codes using a Microsoft Excel spreadsheet to examine interviews, and e-portfolios. Throughout the analysis, we employed constant comparison techniques to refine codes, develop formative concepts, and identify their properties. Data obtained through e-portfolio entries were triangulated with participant and instructor interviews (Patton, 2002).

## Findings

Preservice teachers stated that video captured and examined during e-portfolio development helped them to examine current practices from diverse perspectives, draw inferences regarding those practices, and consider additional evidence to strengthen claims. All participants stated that their initial perceptions of classroom implementations changed one or more times through artifact analysis and e-portfolio construction. However, participants identified mismatches between e-portfolio development and observed teaching practices and expressed limited interest in using e-portfolios beyond graduation. These findings are detailed below.

### Evidence Examination

Although approached differently, preservice teachers stated that video artifacts helped them to examine classroom practices from different vantage-points, focus on aspects previously overlooked, and refine initial beliefs. For example, during her first interview, Wendy compared video analysis to comments from her cooperating teacher.

When you get field instructor time, that's going through someone else's eyes. The video tape is just raw data. You know, it's not someone else's opinion. It is just the camera focused on picture [the classroom]... And so you can actually see what you did: how many "ums" you said, or how many times you walked around the room; how many times you did whatever. You can also see what the students are doing as well.

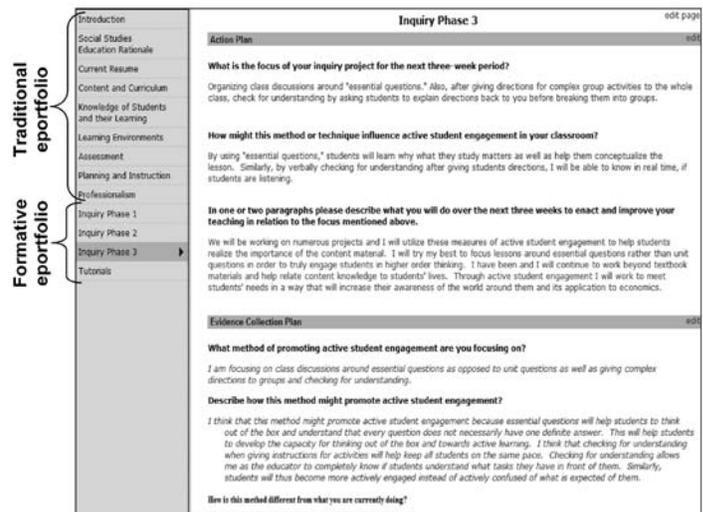


Figure 3: Reflection questions and responses regarding method selection in live text.

By replaying video to observe specific students, identifying attentive and inattentive students, and reviewing her own and others' comments, Wendy re-assessed both her mannerisms (which she had previously overlooked) as well as student reactions to her instruction. During her second interview, Meg observed, "sometimes I distracted myself...I would be watching [the video for attributes of active student engagement] but then I would watch myself and go like 'oh my God, what was I doing there?'" Because the camera showed the classroom from a student perspective, enabling participants to view their own behaviors, each identified particular mannerisms.

Participants then transitioned to focus on student performance (both verbal and non-verbal) to draw conclusions. During his first e-portfolio cycle, for example, Mitch wrote:

I don't know if I always allowed enough wait-time for my students to think about the questions, but I do know that...the majority of the class was attentive and seemed to be thinking about the answers... many students would raise their hands to answer the questions or they would tell me the answer once I asked the question...Some of the students were [also] writing questions and answers down on their own paper.

Although Mitch questioned if he allocated enough time for students to formulate responses, he examined student behaviors using video evidence to draw conclusions. Video review also helped participants to consider the needs of students overlooked during teaching. In both interview and e-portfolio statements, Meg indicated that video "helped me [to pay] more attention to the people who weren't speaking." While facilitating a discussion, she reported "concentrating on who had the dialogue...When I was watching this [video], I concentrated on who didn't have the dialogue." Meg indicated that she could better identify students who did not participate verbally while reviewing video of the discussion.

Wendy also described how e-portfolio evidence helped her to reflect on classroom practices and focus on student behaviors and performance. She described herself as a reflective practitioner who frequently used student work to explain classroom phenomena prior to e-portfolio production, yet indicated that e-portfolio production helped her

to reflect in a different way... [and to] think more about what the students are getting out of what I'm doing because I could actually see them in real time, after the fact, after I've thought about how the lesson

went. I could see how they reacted to it [the lesson] from a different perspective.

*Student focus alters initial perceptions.* All participants stated that e-portfolio development also helped them to examine and to reformulate initial ideas. Immediately following her first lesson implementation, Meg wrote, “My initial response to the activity, while it was happening, was that it was not at all successful...I didn’t think that everybody was involved. She later wrote, “After watching the video, it seemed that the students, even if they were not talking, were interested and paying attention.” She concluded that her method was more successful than initially judged based on evidence of student participation identified during video analysis. In contrast, in his first e-portfolio entry Mitch initially concluded that his “method was fairly successful in promoting active student engagement.” Yet, he later wrote

Once I viewed my video recording, I realized that I did not really extend wait-time very much for my discussion...I don’t know if I really reached as many students as I had wanted. I am glad that I was able to watch myself because I did realize that I did not really allow much more time than normal to answer the questions.”

By gathering and analyzing evidence related to student behaviors, all participants modified initial thoughts regarding lesson implementation during one or more e-portfolio cycles.

Participant statements also described increased perceptions of success during the semester. During the first e-portfolio cycle, all participants reported mixed success in promoting active engagement. At the conclusion of her e-portfolio entry, for example, Wendy wrote “I am satisfied with my...method; however, everything needs improvement.” Mitch wrote, “I think that I had the right idea...but I need to work on [it] in order to promote more active student engagement.” Although they all identified student participation, they questioned if they had adequately implemented their technique, provided ample directions, or reached specific individuals. Meg and Wendy reported similar concerns during their second e-portfolio cycle. Meg stated “watching the tape, I realized that I just gave up on it [calling on particular students to participate].” Wendy wrote “Essential questions in the way that I framed my class did not go over so well. [My] essential questions seemed more in the vein of unit questions...An essential question should foster discussion.” In both cases, reviewing video artifacts helped participants to indicate that they had not implemented their technique as planned. However, within their third e-portfolio cycles they indicated success. For example, Wendy wrote “My evidence suggests that...essential questions provided a foundation and a sort of rationale for the importance of [my] topic...More students asked questions...and students had a reason to want to know more.” In contrast to her previous e-portfolio cycle, Wendy indicated that improved essential question quality increased student discussion.

In contrast, Mitch described success in both his second and third e-portfolio cycles. After implementing essential questions during his second cycle, Mitch wrote “My evidence suggests that asking ‘essential’ questions seemed to get [students] actively engaged...I am satisfied with this method.” Similarly, at the conclusion of his third cycle he wrote “I think my evidence shows that my method of promoting active student engagement [making class content relevant to students’ lives] was pretty successful due to the increased responses I got.” In all cases, participants initially felt uncertain about the effects of their implementations on active engagement. However, as they refined practices through e-portfolio cycles and artifact analysis, their perceptions of success increased.

*Limitations of evidence.* Although video evidence influenced preservice teachers’ assessments of specific classroom practices, reflective portfolio questions helped all participants to identify both limitations in existing

evidence and additional evidence needed to bolster or refute claims. E-portfolio development helped Wendy examine classroom practices using video evidence and correlate her findings with student performance data. During her first e-portfolio cycle, Wendy stated, “it is hard to judge whether or not active student engagement really occurs for each individual even with video evidence.” Therefore, she decided to use student performance data: “the next day [we] were having a test on the material that...we did this inquiry project on...I hoped that the students would perform well on the test because I utilized smaller groups and extended wait time...[and] a lot of them did better.” During her second e-portfolio cycle, she compared student participation with assignment quality.

Meg and Mitch also identified limitations in video evidence. When prompted if analysis altered initial perceptions, Mitch wrote: “the video did not do much to support my stance because I was not able to really see my students’ faces due to some technical difficulties with the tripod and camera placement.” He hypothesized that examining “test scores from their benchmark” might support his claims of engagement because “students knew that this information would be on the benchmark and that the benchmark was an important grade.” Meg made similar claims during her second interview. When asked how she examined her video to identify student engagement she stated “it’s hard to tell because you can’t see that many students on the video.” She then hypothesized that “you might tell how effective it was by test scores.” However, neither Mitch nor Meg attempted to collect additional evidence for their e-portfolio analyses.

### **e-portfolio Mismatch**

While preservice teachers claimed that e-portfolios helped them to examine classroom practices through evidence collection and analysis, all participants described inconsistencies between preservice and professional portfolio practices. Meg initially questioned whether e-portfolios were useful for potential employers, as some faculty members had suggested: “when we go out and apply for jobs, I haven’t seen anyone ask ‘let me see your portfolio.’” During her second and third interviews, Meg stated that teachers and administrators at her student teaching placement as well as schools where she applied for employment indicated no use of portfolios in everyday schools. Wendy responded similarly when asked about future uses of her e-portfolio. Although mentioning that her e-portfolio would help her to obtain employment during her first two interviews, during her third interview Wendy indicated that the teachers she encountered stated “no one looks at your portfolio when you’re trying to get a job.” Participants also questioned the importance of e-portfolios during inservice teaching. Meg indicated that e-portfolios facilitated development, but doubted she would continue beyond graduation:

If I was actually going to use it to get jobs, if people were actually going to look at it when they considered hiring me then it would be useful...You know, you want to continue thinking about it. You don’t want to stagnate at some point...I don’t see where I will continue to write a portfolio...It’s not me and it’s not going to happen.

Because they were not considered important within the schools she applied to, Meg stated that she would retain lesson materials and use notes to indicate lesson success and future implementation ideas. Similarly, Wendy questioned the value of continuing e-portfolio practices when not supported within her school. During her final interview she stated:

To apply the portfolio into real life would be hard because you don’t have a reason to do it. I mean it would be great, but who has the time to like work on that kind of stuff...but if you’re out in the real world and you’re spending all your time planning lessons

and stuff like that, remembering to reflect and to document things is going to be a little secondary.

## General Discussion and Implications

This study examined the formative use of e-portfolios to capture evidence of preservice teacher practice, guide personal inquiry, and inform teaching decisions regarding active student engagement. We found that e-portfolios helped preservice teachers to reflect and inquire into perceived classroom successes and failures, examine active student engagement through video evidence, and generate self-improvement plans. However, participants perceived a mismatch between e-portfolio experiences and the reflective practices of inservice teachers, thereby questioning their continued use beyond graduation.

Consistent with studies by Avraamidou and Zembal-Saul (2003) and Carroll et al., (1996), e-portfolios helped preservice teachers to reflect on current practices. Preservice teachers collected and organized video artifacts related to specific methods which helped them to focus on elements of their classroom, identify phenomena previously overlooked, and identify individual strengths and needs. The systematic examination of video evidence through e-portfolio development also helped preservice teachers to assess and modify perceptions of success, examine student behavior in greater depth, and guide decision-making. Thus, e-portfolios became useful for professional development when they promoted the purposeful and systematic collection and examination of classroom artifacts.

Furthermore, the Video Analysis Tool and question prompts within e-portfolios were instrumental to success because they helped participants to identify and focus on multiple perspectives when observing classroom practice. These outcomes are consistent with those of Sherin and Van-Es (2007) who found that capturing and reviewing short video segments helped teachers to inquire into classroom experiences and obtain feedback for professional development. Yet, our study also indicates that video evidence may provide a limited field of vision—often missing unrecorded facial expressions, deskwork, and student comments. Thus, video-based e-portfolios should include multiple sources and types of evidence to extend and triangulate classroom depictions. For example, while video captures students' behavior and verbal remarks, teachers might include work samples to examine the thoughts of non-vocal students or lesson plans to examine teacher intentions with implementations. Including supporting artifacts would provide richer depictions of classroom events and strengthen claims made from artifact analyses. Including multiple sources of evidence may further extend already considerable e-portfolio demands on time and resources (e.g., Borko et al., 1997; Delandshere & Petrosky, 2004; Fallon & Watts, 2001). To address these concerns, research is needed to identify the types and quantities of artifacts needed to inform classroom practices as well as scaffolds to facilitate and focus their examination.

Although e-portfolios improved reflection, preservice teachers expressed little interest in systematic artifact examination following graduation. This raises additional concerns about the viability of e-portfolios for sustained professional development purposes. Although both the Interstate New Teacher Assessment and Support Consortium (INTASC) and the National Board for Professional Teaching Standards (NBPTS) require portfolios for certification purposes, both practicing and preservice teachers did not associate e-portfolios or evidence-based reflections as being valued in local schools. These findings are consistent with studies by Grant and Huebner (1998) and Rolheiser and Schwartz (2001) who found that reflective skills gained through portfolio development were rarely continued during induction experiences because school systems did not support them. Together these findings suggest that reflective practices gained through preservice portfolio development may not transfer if not valued or supported during induction and inservice experiences.

Compounding this concern, many teacher education programs use e-portfolios primarily for purposes of accreditation (e.g., Gatlin & Jacobs, 2002; Reis & Villaume, 2002). Although these practices require preservice teachers to gather artifacts documenting growth, such practices focus on program evaluations rather than individual development (Delandshere & Arens, 2003). It is unclear how this shift in portfolio purposes influences preservice teacher perceptions towards e-portfolio practices and their willingness to enact similar practices during inservice teaching. If e-portfolios are to become tools for formative assessment and professional development, stronger connections are needed between and among teacher educators, local school systems, and induction programs as to their use and value. Research is also needed that examines the longitudinal use and impact of e-portfolios as teachers transition from preservice to induction programs, particularly regarding the support needed to transfer reflective practices and skills to inservice environments. To facilitate e-portfolio development beyond graduation and encourage collaboration with local schools, teacher educators and school personnel need to better communicate shared e-portfolio goals and methods while addressing the priorities and goals of each. Formative e-portfolios might facilitate mentoring by enabling the capture and examination of teaching practices, documenting decision-making processes for professional development purposes, sharing best practices, and building sustainable learning communities.

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President's Message continued from p. 3

- SIGTE sponsored workshop: Learn to Design, Develop, and Syndicate Effective Podcasts and Vodcasts led by Joan Hughes and a number of graduate students from the University of Texas—sold out and well received.
- SIGTE Forum: described above in 21<sup>st</sup> Century Skills Assessment, attended by more than 100 members; SIGTE business meeting: attended by about 100 members.
- “SIGTE picks” concurrent and poster sessions: Seven concurrent sessions and two poster sessions attended by more than 400 participants with an average of more than 50 participants at each session. These included the SIGTE sponsored sessions, all of which were either panels or shared sessions, maximizing the number of SIGTE members presenting.

## Recognition

At the SIGTE business meeting we recognized the contribution of many SIGTE members to this year's SIGTE activities. Arlene Borthwick just completed her two years of service as SIGTE president, and now serves as past-president of SIGTE for the next year. As Surowiecki points out, if crowds are to be wise, collective decisions must be made within a decentralized structure. Arlene contributed greatly to SIGTE by enabling the work of many other SIGTE members in leadership roles, and her approach was the key to expanding our work as a SIG. For this and her many contributions to SIGTE and ISTE, Arlene was awarded a “pink jacket” by ISTE at this year's NECC for her ability to Make IT Happen. Thank you Arlene for your continuing service to SIGTE.

## Resources

Surowiecki, James (2004). *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York: Doubleday.

The Wisdom of Crowds Wikipedia Web site. [http://en.wikipedia.org/wiki/The\\_Wisdom\\_of\\_Crowds](http://en.wikipedia.org/wiki/The_Wisdom_of_Crowds)

NECC 2008 link to presenter handouts for the SIGTE Forum and other sessions. [http://center.uoregon.edu/ISTE/NECC2008/program/presenter\\_handouts.php](http://center.uoregon.edu/ISTE/NECC2008/program/presenter_handouts.php)

The home for the 21<sup>st</sup> Century Skills project [http://web.mac.com/kylepeck/ISTE\\_21/Home.html](http://web.mac.com/kylepeck/ISTE_21/Home.html)

The wiki home for collaboration on the 21<sup>st</sup> Century Skills project. <http://21-skills.iste.wikispaces.net/>

ISTE Web site advocacy page <http://www.iste.org/Advocacy/Feb08-support>

National Technology Leadership Summit Web site. <http://www.ntls.info/>

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