

Transformative learning through “Teaching With Technology” electronic portfolios

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Electronic portfolios can foster transformation in teacher beliefs through critical reflection, ownership of learning, and personal agency.

For interested educators at any level, there is no shortage of information available on how to create and use electronic portfolios. As an assessment tool, they have been used to structure and align university programs and certification and licensure programs and have been used in every level of prekindergarten to 12th-grade education (P–12) for demonstration of learning and mastery. A significant appeal of electronic portfolios in education rests on the twofold strategy of reflection, both in the selection of artifacts and development of the portfolio, and in the statements of reflection imbedded with the artifacts and examples of learning. In the field of teacher education, portfolios are not novel approaches to assessment and measurement. For more than a decade, both paper-based portfolios and electronic portfolios have been used to allow undergraduate and graduate students to demonstrate best practices; showcase exemplary lessons and student products; show compliance with local, state, and national certification requirements and professional behaviors; and provide spaces for honest self-reflection and personal growth. Some

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authors noted the increased level of engagement for students as portfolios moved into the electronic realm (Piper & Eskridge, 1999), while others saw the change as beneficial to the content itself and its ability to be modified, updated, and revised over time (Yates, Newsome, & Creighton, 1999). Pecheone, Pigg, Chung, and Souviney (2005) lamented that although there is “much anecdotal evidence about the added value of engaging in a portfolio process, there is still a lack of systematic research on the effect of performance assessment on teacher learning” (p. 174). Most proponents of electronic portfolios laud the benefits of using them as assessment tools for teacher candidates (preservice teachers) and exalt portfolios as tools for student assessment. But we wonder if there is a relationship or correlation between those teachers who experience assessment through the portfolio and those who use portfolio-based assessment in their P–12 classrooms. In the current climate of standardized, high-stakes testing, how are the teachers’ beliefs about assessment and learning validated or challenged by their experiences with portfolio assessment? Our investigation has little to do with format or design but is concerned instead with the ability of the portfolio and the experience of its creation and maintenance to significantly and philosophically alter the teacher’s notion of assessment practices in the classroom.

Theoretical framework

If classroom teachers are able to reverse their role from student (at the university) to teacher (in the P-12 classroom) and recognize the benefits of portfolio assessment as authentic and individualized, they demonstrate characteristics of transformation through that reversal and reflection. Mezirow (1990, 2000) defined his theory of transformative learning as stages in cognitive restructuring and integration of experience, action, and reflection. Mezirow's theory of transformative learning focuses on the individual as a reflective learner. In addition, the principles of constructivist learning are important, because knowledge and meaning are built as a result of experience and are dependent upon sociocultural contexts. The theory of transformative learning applies to adults engaged in a variety of learning environments, and the transformation itself emerges at the end of a series of 10 stages the individual passes through. Transformative, or transformational, learning occurs when the individual is forced to encounter an event or situation that is inconsistent with his or her existing perspective. This shift in perspective can be gradual or sudden, and the individual moves through a series of stages in the cognitive restructuring and reconciliation of experience and action (Mezirow, 1990, 2000). We believe that courses in colleges of education, whether through preservice, graduate, or continuing education programs, must focus the portfolio experiences through a lens of transformational learning to alter the teacher's notions of schooling, learning, and assessment to make connections between theory and practice and to foster critical reflection in habits and practices of the P-12 classroom.

Review of related literature

In an early study, Athanases (1994) found that teachers who participated in portfolio assessment simulations reported changes in their pedagogical practice, especially with regard to their initial and ongoing assessment of student learning. Lyons (1998) found that preservice teachers who partici-

pated in portfolio development at the university level were able to develop "habits of mind" and reflective practices that have positive results later in the classroom. In a study by the University of California Santa Barbara, portfolio assessment for teacher education candidates was studied to compare the formative and summative nature of the portfolio (Pechione, Pigg, Chung, & Souviney, 2005). Although this study followed the teachers for a period of one year, no classroom activities were observed to determine the impact of the portfolio experience on teacher beliefs or practices.

Pechione, Pigg, Chung, and Souviney (2005) claimed that a methodological weakness of preservice teachers' self-reports is that there is an "inherent subjectivity of teachers' judgments about what they have learned" (p. 169) and that other methodological issues cloud our research because we are unable to disentangle the multitude of influences on teacher candidates. These authors also state,

Furthermore, we need hard evidence that teachers actually improve their teacher practices as a consequence of participating in a performance assessment and corroborating data such as more observations and information on student learning. Stronger evidence on the effect of portfolio assessments on teacher learning also is sorely needed. In short, we need to understand the aspects of assessment that promote teacher learning and the kinds of changes in teacher knowledge and practice that result from completing the assessment. (p. 174)

Matese, Griesdorn, and Edelson (2002) pointed to educational reforms that tie formative assessment to learning objectives and content mastery in P-12 classrooms. In their study, teacher interviews were categorized to determine beliefs regarding the nature of assessment, including the purpose, audience, and nature of assessments, as well as beliefs regarding the role of students in the process and teachers' levels of comfort with and value placed on existing assessment measures. The researchers determined that "new" forms of assessment may be inconsistent with existing teacher beliefs and practices. It is therefore necessary to

determine how to encourage a shift in both theoretical orientations and professional habits.

Each of these studies help to illuminate the need for the classroom and field experiences embedded in colleges of education that connect "learning as student" to "practice as teacher." Are electronic portfolios an effective means of accomplishing this goal?

Description of the study

The Literacy and Technology Across the Curriculum course at Oklahoma State University is designed for students enrolled in the Teaching, Learning and Leadership master's degree program. Primarily, these students are inservice teachers in P-12 schools and are seeking an advanced degree for certification as a reading specialist or a school library media specialist. The purpose of the course is to examine the characteristics of computer facilitated learning as they relate to computer fluency, classroom experiences, and broad definitions of literacy. The main goal is for students to become proficient in using the World Wide Web and a variety of computer application tools and in integrating these tools across the curriculum. There are nine instructional modules (Introduction to Instructional Technology, File Management, WWW Search Strategies, Multimedia, Online Communication, Teacher Tools, Internet Tools, Copyright, and Web Development) whose projects culminate in a comprehensive Teaching With Technology "e-portfolio." (See <http://tech4u.org> for more on the modules and e-portfolios in general.) The Cognition and Technology Group at Vanderbilt (an interdisciplinary research team based out of the Peabody College for Education at Vanderbilt University) has designed a framework for technology learning and designed a cycle through which module learning such as this can be successful. It begins with a challenge, allows users to make initial thoughts and predictions, introduces perspectives and resources, allows for self-assessment, and then provides opportunity to publicize information and knowledge gained

(Bransford, Vye, Bateman, Brophy, & Roselli, 2004). Marra, Howland, Wedman, and Diggs's (2003) similar conceptualization of the Technology Learning Cycle (TLC) allows for the integration of technology regardless of the complexity of the technologies or the level of expertise of the professional. By thinking of technology learning as a process, the model is flexible enough to be used by those with high levels of technology expertise or those with very little technology experience. Instead of classifying and categorizing learners as innovators or novices, the TLC process recognizes the value of starting at the point of need and focuses on the teacher as a lifelong learner. The TLC recognizes the constant change inherent in educational technology, and, rather than providing specific guidelines for technology implementation, it offers a framework for the process of acquiring, using, and sharing new technologies and their impact on teaching and learning. It is around this framework that the curriculum for the Literacy and Technology Across the Curriculum course is designed.

Students are guided through each stage of the TLC—Awareness, Exploration and Filtration, Learning, Personal or Professional Application, and Sharing and Reflection—within each of the nine modules in this course. For example, in the Multimedia Module, the students are exposed to many different types of multimedia productions that actual teachers have used in classrooms, and then they begin exploring the types of production and filtering out those that aren't a good fit for their skills or the resources they have to work with. Next, they learn both pedagogical and technical skills related to that type of production and apply what they learn by creating an artifact that will be placed in their Teaching With Technology e-portfolio, which is created for a Web browser. Finally, they share their production with others in the class and thoroughly reflect on the TLC they have undertaken. These habits of creation, collaboration, and reflection are firmly embedded throughout the process of developing the final e-portfolio. While each student creates a Teaching With Technology e-portfolio containing artifacts from all nine modules in the course, each

e-portfolio reflects the individual creativity, knowledge, and growth that student has gone through. It seems that the experience of developing a Teaching With Technology e-portfolio has the potential to transform the manner in which the students teach with technology in their own classrooms. To determine this, the authors have explored the following research questions:

1. Are teachers more likely to create/maintain and have students create/maintain Web-based portfolios once they have created their Teaching With Technology e-portfolio?
2. Do the teachers who have completed a Teaching With Technology e-portfolio evidence transformational learning?

A total of 78 students over four semesters have created Teaching With Technology e-portfolios through their participation in this course. (See <http://susanstansberry.net/cied5483> for examples of the students' e-portfolios.) At the beginning of each course, students were asked to complete a presurvey adapted from the Technology in Education Competency assessment instrument. The 20 questions were designed to determine students' likeliness to use certain instructional technology tools as a teacher as well as their likeliness to have students in their classrooms use the same tools. For each item, the participants could choose (1) very unlikely, (2) somewhat unlikely, (3) unlikely, (4) somewhat likely, or (5) very likely. The postsurvey included the same Likert-type survey with additional open-ended essay-type questions. For this study, we focus on four of the survey questions: How likely are you to create websites for classroom or school use? How likely are you to have students create websites to complete or enhance assignments? How likely are you to maintain a professional portfolio of teacher products, skills, and knowledge? How likely are you to assess your students' learning using portfolios? The matched pairs from the 60 students who completed both the pre- and postsurvey instruments were ana-

lyzed statistically using SPSS, a quantitative statistical software package.

Additional data were collected through a final reflection paper that 78 students completed as part of the course. This data was analyzed using NVivo, a qualitative software package. While reflective writing was embedded in each of the modules, this final reflection paper focused on the entire process of creating the Teaching With Technology e-portfolio.

Findings

The findings in Table 1 present a picture of the gains the students in this class made in their likeliness to continue the use of Web-based portfolios and begins to answer our question, Are teachers more likely to create/maintain and have students create/maintain Web-based portfolios once they have created their Teaching With Technology e-portfolio?

While it is statistically significant that these teachers are likely to employ Web-development tools in instruction, there is less of a probability that they will use these tools particularly for the creation and maintenance of Web-based portfolios.

The statistics in Table 1 also indicate evidence of transformational learning to some degree. However, the second research question is answered more fully with data analyzed qualitatively. Do the teachers who have completed a Teaching With Technology e-portfolio evidence transformational learning? Transformational learning experiences typically begin with some disorienting experience that causes the learners to become critically aware of their assumptions and how these assumptions constrain the way they perceive, understand, and feel about the world. Next, the learners begin a process of changing their expectations to a more inclusive, discriminating, and integrating perspective. Finally, learners making choices or acting upon new understandings will evidence that transformative learning has occurred (Mezirow, 1991). The data

Table 1
Statistics from the pre- and postsurveys

Survey question	Mean presurvey	Mean postsurvey	Mean difference	<i>t</i>	Statistically significant at:
How likely are you to create websites for classroom or school use?	3	3	-1.27	-6.67	
How likely are you to have students create websites to complete or enhance assignments?	2.37	3.33	-0.97	-5.59	<.0001
How likely are you to maintain a professional portfolio of teacher products, skills, and knowledge?	3.65	3.87	-0.22	-1.48	0.15
How likely are you to assess student learning using portfolios?	3.65	3.87	-0.2167	-4.03	0.0002

from students' final reflection papers were coded in NVivo, and then the coded data were grouped appropriately according to stages of transformative learning.

Disorienting dilemma

Creating an electronic portfolio based on teaching with technology is a disorienting dilemma for most students in this class. Students described themselves as "inept," "confused," and "out of [their] comfort zone" as they were introduced to the e-portfolio assignment. One student described the project as "the sum of all fears," and another student admitted he had "extremely limited awareness of the task involved" and "hoped it would stay that way."

Self-examination

Upon experiencing the disorienting dilemma, students began to examine their own assumptions. One student "suddenly realized how much time

[she] had wasted by not allowing technology to help [her] teach [her] students." Another student noted that she "wasn't aware that technology could make a classroom such a dynamic place. As [she] began to experience technology, [she] became aware of the conveniences and positives that technology could bring." The process of shared, reflective discourse is an important aspect of the transformational learning experience. As students examined their own assumptions, others benefited, as evidenced by the following student statement:

As someone wrote to me in the listserv, change is inevitable...growth is optional. I thought this was very profound. As teachers we all want to grow and above all want our students and the teachers in our building to do the same.

Critical assessment and a sense of alienation

As students progressed through self-examination, they began critically assessing their assumptions about teaching with technology: "I had a bank of

five computers and did not use them wisely at all. Now looking back I am embarrassed by how little I used what I had." Others were quite surprised to learn how much they did not know about teaching with technology. One student expressed a sense of alienation and connected it to how his students may often feel:

I really felt that I gained so much because it was a trial and error. I had to sit and try things and figure them out. It really allowed me to see what it is like for them having me try to teach them something and if they do not understand, what do you do. I can see the glass through their eyes a little bit more and remember what it was like to learn something new for the first time. I would be doing them an injustice by not introducing them to technology from the beginning. I am their foundation for the rest of their life; I need to make sure I am giving them all they need to build their knowledge.

Exploring options for new ways of acting

The previous quote gives evidence of a student moving from critical assessment to exploration of new ways of acting as a teacher. A student who previously believed that she would appear "weak" if she allowed students to show her how to use technology reported that as she "is re-creating [her] view, [and she] cannot help but think that [her] students may view teaching of technology and accepting their help as strength instead."

Building confidence in new ways of behaving

The students who created Teaching With Technology e-portfolios overwhelmingly expressed pride in their accomplishments. This expression of confidence was echoed in the reflection papers as well: "I feel like I can step into a classroom and not be afraid of using technology as my instructional partner. That is a good feeling to have!" Some students reported "showing off" their e-portfolio to family, friends, coworkers, and even strangers. Others described an appreciation

for the lessons they'd learned through hard work and the feeling of confidence the completed e-portfolio gave them. One student in particular expressed herself in an original poem entitled, "Technology Blues:"

My neck hurts and my eyes are a painful shade of red,
My back aches up and down my spine; my brain is filled with dread,
I feel odd and time is eerily suspended,
The house is a wreck and the kids are neglected,
I forgot to feed the dog,
Did I write on the latest blog?
I battle my computer, I've battled it for days,
I must create a website that will win me great praise.
Why does my computer freeze?
Why do the files fracture instead of uploading with ease?
Did I save that file or did it disappear into Internet space?
If I don't get this done I will soon be a mental case.
Wait...I think I did it, my website's complete.
Isn't technology wonderful? It makes my life so sweet!

Another student's feeling of pride caused her to reevaluate her own students' learning experiences:

It made me see how important it is for students to take ownership over their learning. Sure, children can complete a project and get a grade if they have to, but when they can be their own teachers and feel proud of themselves, that is better than any grade.

Planning a course of action

In the process of transformative learning, once the learners begin building confidence, they next may move into the stages of planning and implementation. Upon completion of their Teaching With Technology e-portfolios, these students immediately expressed plans for continuing to improve the project, using the knowledge and skills gained to replicate the process for another purpose, or having their own students create websites or portfolios. As evidenced by these students'

plans, they were able to transfer what they'd learned into a specific course of action:

- It is a great way to compile and display student work. I think I may use it with some of my students next year.... We could place the student's websites on our school's website.
- I don't want to stop learning now, so I will be reading up on html code this summer. I will also be incorporating Web development in my advanced placement English class next year.
- Creating the [e-portfolio] artifacts for this class has helped me gain a better idea of how I will approach my classes next year. I will also be able to help my fellow teachers set up webpages as was recently requested by our superintendent. I am looking forward to sharing my newfound knowledge and learning with my colleagues.
- I plan on having an electronic scrapbook for each of my students, on which we will build throughout the year. I hope to move onto electronic portfolios of some type as well. I will continue to update the newsletter I created, and I will link it to the class website I will be designing during the summer.

Acquiring knowledge in order to implement plans

While the students articulated plans for employing what they learned, some also expressed recognition that they "have learned so much but still have more to do." One student specifically noted that she

will need to practice some more on creating electronic files because it would be very useful to use the electronic files not only in the same circumstances as we did for the course but also for creating maps for instructional use.

Experimenting with new roles

Because P-12 teachers tend to be isolated in their own classrooms, the process of collaboration throughout the creation of their e-portfolio required somewhat of a new role. One student noted that "through participating in meaning negotiations, discussing problems, and learning how to solve them, [he] felt that [he is] a part of a community of learners who are working on the same problems and speak a common language." Another student expressed what a "major difference" the experience made in her professional life, as evidenced by her "increased communication with colleagues regarding technology issues, and [her] increased awareness of how technology impacts the lives of educators."

Reintegration into society

If the new perspective has become a part of the learner, evidence of the transformation will be seen in the reintegration of what has been learned into the learner's life. One student recognized that her learning will "not end with the semester, but will continue throughout [her] life." Others described specific results as evidence of their transformations:

- I have approached my administration about an inservice encouraging other teachers to expand their horizons and build their own sites. Administrators are open to the idea and have encouraged me to proceed.
- I am no longer just a "surfer" or a person seeking journal articles for reference. My students are no longer just researchers of the Internet. We are becoming beings literate in technology.
- I created my own online group to help colleagues stay in contact.

Finally, one student, a school principal who was a self-avowed "nonuser of technology" at the beginning of the course, shared her ideas for creating

templates for teaching with technology activities specifically for the teachers in her building.

Analysis of findings

The quantitative data from the pre- and postsurveys provided assurance that students' likeliness to create and maintain websites and portfolios both for themselves and with their students had increased. The qualitative data from their final reflection papers gave voice and emotion to the transformation that did occur.

According to Mezirow's theory (1990, 2000), transformative learning takes place through experiences, critical reflection, and reflective discourse. The Teaching With Technology e-portfolio experience within this course was designed with expectations that students would experience transformation in their perspectives and understandings of teaching with technology. While there is evidence in the findings that transformation did occur, the researchers were somewhat disappointed that the transformation specifically in the use of e-portfolios as assessment tools was rather weak.

Final thoughts

In the current climate of standardized testing and compliance with No Child Left Behind (2002), there may be little room for authentic assessment through portfolios. Because classroom-based assessment may be less important to local, state, and federal governments than test scores and the Academic Performance Index, classroom teachers may find themselves overburdened and feel that they do not have the extra time and energy required to teach students the skills needed for portfolio creation and reflection. However, for teachers whose own work and development has been chronicled through professional portfolios, the time and effort will be seen as a valuable way to assess student learning and academic growth.

Electronic portfolios can foster transformation in teacher beliefs through critical reflection, ownership of learning, and personal agency. Perhaps this student said it best:

To summarize my learning this semester...I would have to use the word *empowerment*. I believe that we have to be empowered to learn and explore. Taking this class has done this for me. How refreshing and exciting to be challenged [and] supported as I attempted new learning....

This investigation has diverged from the traditional discussion of format or design of portfolios and brought to the discussion the larger question of what happens to teachers when they create a professional portfolio? Are they able to transform the experience into more authentic assessment with their own students? Beyond proficiency in using portfolio development tools, have their core beliefs and philosophies related to these tools been altered? While not all of the students in this study seem ready to replicate the process of developing electronic portfolios with their students, it is clear that they were transformed by the process of creating their own. In particular, the content addressed through this particular e-portfolio (Teaching With Technology) and the specific format of the course (collaboration, critical reflection, supportive discussion, and individual construction of learning experiences) did facilitate transformative learning.

REFERENCES

- Athanases, S.Z. (1994). Teachers' reports of the effects of preparing portfolios of literacy instruction. *The Elementary School Journal*, 94, 421-439.
- Bransford, J., Vye, N., Bateman, H., Brophy, S., & Roselli, B.J. (2004). Vanderbilt's AMIGO3 project: Knowledge of how people learn enters cyberspace. In T.M. Duffy & J.R. Kirkley (Eds.), *Learner-centered theory and practice in distance education: Cases from higher education* (pp. 209-234). Mahwah, NJ: Erlbaum.
- Lyons, N. (Ed.). (1998). *With portfolio in hand: Validating the new teacher professionalism*. New York: Teachers College Press.

- Marra, R.M., Howland, J., Wedman, J., & Diggs, L. (2003). A little TLC (technology learning cycle) as a means to technology integration. *Tech Trends*, 47(2), 15–20.
- Matese, G., Griesdorn, J., & Edelson, D.C. (2002, April). *Teacher beliefs about assessment in inquiry-based science: Research to inform professional development*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
- Mezirow, J. (1990). *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning*. San Francisco: Jossey-Bass.
- Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco: Jossey-Bass.
- Mezirow, J. (2000). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco: Jossey-Bass.
- No Child Left Behind Act of 2001, Pub. L. No. 107-110, 115 Stat. 1425 (2002).
- Pechione, R.L., Pigg, M.J., Chung, R.R., & Souviney, R.J. (2005). Performance assessment and electronic portfolios: Their effect on teacher learning and education. *The Clearing House*, 78, 164–176.
- Piper, C., & Eskridge, S. (1999). Infusing technology into the preservice teacher education program through electronic portfolios. In J.D. Price, J. Willis, D.A. Willis, M. Jost, & S. Boget-Mehall (Eds.), *Proceedings of the Society for Information Technology & Teacher Education 1999, 10th International Conference* (pp. 1191–1195). Charlottesville, VA: Association for the Advancement of Computing in Education.
- Yates, B., Newsome, J., & Creighton, T. (1999). Standards based technology competencies: Electronic portfolios in pre-service education. In J.D. Price, J. Willis, D.A. Willis, M. Jost, & S. Boget-Mehall (Eds.), *Proceedings of the Society for Information Technology & Teacher Education 1999, 10th International Conference* (pp. 1232–1235). Charlottesville, VA: Association for the Advancement of Computing in Education.

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