Technology, Teacher Education, and Electronic Portfolios

Introduction
Technology alone does not improve teaching or learning. There are several fundamental principles, arguments, and research findings that support this statement. Technology does not replace instructors or teaching, nor does it supplant instructional practice or the effort students must put forth to learn. Even in the most independent learning environments (e.g., distance learning), instructors are essential. Teachers engage in high-level cognitive interactions with students to ensure critical thinking and in-depth understanding of theory, application, and connections among topics within and across disciplines. These interactions are far too complex to be reproduced by even the most sophisticated artificial intelligence.

Technology cannot replace instruction and curriculum. Even the best information management systems do not automate the process of designing instruction. However, technology has resulted in a cadre of powerful tools that can stimulate thinking, understanding, retention of information, and afford new types of human communication and interaction that improve learning.

The Role of Technology in Teacher Education
Computers, multimedia, and communication tools can facilitate and even accelerate learning; however, technology literacy, which includes awareness and competence for application, must be acquired and perfected. Such knowledge and skills are improved over time through daily practice. Consequently, training for effective use of technology may begin as early as possible during teacher education and in faculty development programs. Motivation to gain competency is as important as the training. Education students and practicing instructors must be given every opportunity to explore, practice, and gain self-confidence for using technology tools.

Their perception of relevance of technology skills to teaching is best established by direct demonstration. When followed by carefully guided practice, exciting demonstrations of technology tools can build interest and motivation for independent exploration and learning.

Reading the research on technology in education is not enough. Many issues surrounding the potential of technology to improve education have been confused by controversy. Technology has been touted as a silver bullet that will radically change and improve learning by some but pronounced as next to useless by others. Return on technology investment is realized only through the commitment to continuously develop technology competency and build on innovative practice. Competency building requires commitment to integrate technology training within teacher education curriculum and faculty professional development. Collaboration among instructors is essential and calls for learning communities or “communities of integrated practice” that generate excitement and build confidence among users. Such communities might be populated by the most motivated faculty, administrators, staff, and student representatives. Members should be self-motivated and desire to share experiences, insights, tools, and best practices. These groups have demonstrated success in educational reform and improvement by functioning as conduits for enthusiasm and adoption in and across colleges.

There are several broad-ranging areas of educational reform that technology has produced or facilitated. First, technologies that deliver curriculum and provide more opportunities for independent learning support the initiative for “learner-centered” instruction.
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In a learner-centered environment, teachers spend more time working with students face-to-face and in small groups, and learners spend more time monitoring and managing their own progress. Second, technology affords many tools that automate course and student information management (e.g., grade reporting, testing, and scheduling). This can increase teachers’ time available for working with students and provide student data that facilitates pedagogical decisions. Third, computers, Internet, and various software applications open new opportunities for teachers to collect subject matter and share instructional resources. Fourth, digital information can be combined with rich visual, aural, and dynamic elements that accelerate understanding, improve retention, and provide more opportunities for learners to interact with the information and with peers. Finally, to ensure that technology meets educational needs and is adopted and used, teachers need to be included in the process of technology acquisition.

The E-portfolio

The electronic portfolio or “e-portfolio” is a prime example of a powerful application that demonstrates the value of changes in today’s classrooms and advancements in today’s technology tools. The design and development of an e-portfolio can build beginning competencies for using common software applications, multimedia, and websites. The e-portfolio can be an end product of student projects or professional development workshops for faculty. There are myriad types of information and media that can be integrated within e-portfolios and a variety of technology tools that can be used to produce them. This makes the e-portfolio a good candidate for hands-on learning for instructors and students, particularly in teacher education.

Dr. Helen Barrett, an assistant professor and educational technology coordinator for the School of Education at the University of Alaska, Anchorage identifies five steps inherent in the development of effective e-portfolios:

1. Selection: the development of criteria for choosing items to include in the portfolio based on established learning objectives.
2. Collection: the gathering of items based on the portfolio’s purpose, audience, and future use.
3. Reflection: statements about the significance of each item and of the collection as a whole.
4. Direction: a review of the reflections that looks ahead and sets future goals.
5. Connection: the creation of hypertext links and publication, providing the opportunity for feedback.

She also describes the three most common types of portfolios:

1. Working portfolio: contains projects the student is currently working on or has recently completed.
2. Display portfolio: showcases samples of the student’s best work.
3. Assessment portfolio: presents work demonstrating that the student has met specific learning goals and requirements.

Portfolios are increasingly becoming the means of demonstrating the skills, experiences, and accomplishments of teachers.

E-portfolio Design and Functionality

A teacher’s e-portfolio is surprisingly similar in purpose to student e-portfolios. Both function as a vehicle for recording, archiving, and presenting unique characteristics, academic and career achievement, and potential of the individual. Also, both can function as a comprehensive form of assessment and a means to reflect on past events and accomplishments that guide decisions for future direction and long-term goals. Administrators use teachers’ e-portfolios to evaluate teaching innovation, professional development, and worthiness for recognition and promotion. Instructors use student e-portfolios to guide progress and give advice on future academic choices and career development. The flexibility of digital content within the e-portfolio, capability to disseminate electronically and/or on post-on-line, and ease of editing, revising, and transportability make e-portfolios a highly versatile instrument that far exceeds the standard résumé or curriculum vitae. The digital nature of the e-portfolio affords impressive ways to integrate and display related achievements and even demonstrate important products of professional or academic work. Instructors can embed videos that show innovative teaching methods or their facilitation of student activities. Students can display plans for technical or creative works, chronological sequences of projects as they progress, and the culmination of their efforts, including evaluations by teachers and other subject matter experts. The value of an e-portfolio lies in its capability for continuous development, affordance for archiving diverse information modalities, and dynamic range for access and presentation to different audiences.
Definitions of e-portfolio vary greatly. While some describe the e-portfolio as a comprehensive archive of an individual’s achievements, records, associations, experiences, personal events, and affiliations that spans an entire lifetime, others restrict the definition to a concise collection of information normally presented by a résumé or curriculum vitae. Regardless of differing concepts, an individual’s purpose for developing an e-portfolio should guide its design, content, and accessibility by others. However, the versatility of digital information enables an e-portfolio owner to design different views, functions, and formats to suite multiple audiences. Instructors may wish to place teaching innovations in a specified area and their students’ test scores in another to help administrators assess different abilities and outcomes. Multimedia and hypermedia are key vehicles that make e-portfolios more dynamic, flexible, and superior to print-based records. E-portfolio builders might consider allowing the purpose, intended audience(s), and individual preferences govern design, access, and functionality.

“An educational portfolio contains work that a learner has collected, reflected, selected, and presented to show growth and change over time, representing an individual or organization’s human capital.” – Dr. Helen Barrett

E-portfolio Content and Platform
Choosing content for an e-portfolio can also be guided by the owner’s purpose and intended audience. In seeking promotion, a teacher’s e-portfolio may be more effective if institutionally accepted criteria for achievement are included (e.g., courses taught, publications, professional development) and are easily accessed and interpreted by deans and other evaluators. A student’s e-portfolio might be most successful for ensuring employment if contents include course completion and convincing demonstrations of knowledge and skills in areas identified as high priority to target organizations. A college student’s e-portfolio may represent the initial stages of launching a new career, but successful work in previous occupations is also important to employers and should be integrated with more recent, academic work. A chronological order of achievement can reveal steady purpose and growth toward specified goals. Access to such information can be restricted to the owner, reflect on errors as well as successes, and facilitate the fine-tuning decisions for further academic and professional growth. Once it is decided who will access the e-portfolio and how it will be shared, an appropriate platform to hold its contents can be chosen.

There are many software applications that can be used to construct e-portfolios. Yet, commercial software developers often claim to have superior tools for this purpose. The recent popularity of e-portfolios has initiated efforts to standardize interface design, functionality, and even content and data format. Companies refer to special tools and capabilities such as database compatibility, high-capacity networks, specialized search engines, automated data entry, and capability to merge data with other academic information systems. Some advocate standardization of e-portfolios to improve cross-platform compatibility, interoperability across college districts, and data warehousing for automated data entry.

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Like initiatives for standardized testing, these efforts seek uniformity in content, data format, and methods for e-portfolio development and use. Interoperability has its advantages such as better accommodation of e-portfolio access by different departments and institutions. Standardization is not without merit, but it also flies in the face of one of the primary purposes of the e-portfolio—to provide a unique and highly personal representation of the individual. One must also consider the possibility that commercial vendors are more interested in broadening a potential market across institutions than improving education. Educational organizations that lobby for adoption of their own standardized e-portfolio system may seek recognition for furthering this important innovation. Cross-platform compatibility is partially achieved simply by using standard website formats that are compatible with most Internet browsers. Instructors and teachers intending to develop e-portfolios and those representing institutions that are adopting e-portfolio practices should keep in mind that no one tool or system is superior to another. It is effective design of e-portfolios and clearly defined purposes that guide design which create the best return on investment.

More than 95% of community colleges are Internet connected.
Source: American Association of Community Colleges Fact Facts

Faculty E-portfolios
Faculty e-portfolios will share similarities even across disciplines, because a common function of the e-portfolio is to demonstrate teaching achievement and merit for purposes of promotion or new employment. In addition to standard demographic and contact information and perhaps a short biography, an instructor’s e-portfolio content may include: occupational history, degrees held, courses taught, training and professional development, curriculum developed, awards received, professional references and their contact information, statement of teaching philosophy, syllabi, and special contributions (e.g., voluntary membership on college committees). The e-portfolio may also include instructional innovations, statements of recognition from colleagues or deans or alumni, aggregated student evaluation data, publications and formal presentations, professional memberships, workshops or symposia conducted, aggregated student test scores, student achievements such as employment or admission to universities, community volunteer work, mentorship, special areas of interest, grant proposals, and digital photos or videos that demonstrate teaching effectiveness.

Student E-portfolios
Faculty e-portfolios will share similarities for student e-portfolios, content will differ from one individual to another according to major area of academic study, occupational interest, background, and current goals. Students’ e-portfolios may include more academic achievements, but these can be combined with content that illustrates previous occupational experiences and skills. The content, its sequence, and its format can clearly demonstrate an academic and planned career path being pursued and an overall goal. Level of academic and professional performance is critical. Items may include, but should not be limited to overall GPA and GPA in major, awards, letters of recognition or recommendation by employers and faculty, term papers, peer and teacher reviews, in-progress or completed course projects and internships, and expected graduation or certification completion dates. Potential employers may also be interested in personal characteristics such as results of the Myers-Briggs Personality Inventory.

Entries in an e-portfolio can be dated or organized in a chronological order to show progressive growth and improvement. The following questions may be useful when choosing content to populate an e-portfolio: What represents your best work? How did you solve a key problem or barrier to achievement? What comparisons between items in the e-portfolio can be made to show progress and growth? What is most important and needs to be given the most emphasis? What are you most confident and passionate about? What provides evidence of successful collaboration and teamwork with others? What best demonstrates your self-confidence and devotion to achieve? What would depict the environment and type of work you enjoy most? E-portfolio developers who already have a résumé or curriculum vitae can use these as a starting point when deciding what to include.

Having students design and build their own e-portfolios will quickly provide valuable experience for using a number of application tools. A consumer-level webpage software application is a good choice for new users. Instructors might consider encouraging students to create a simple but flexible format for their first e-portfolio. Provide design examples as guides to show how the finished product may look and function. Demonstrate new procedures to students before assigning the work. Then provide assistance as students work in small groups. Show video clips, digital photos, and hyperlink functions within an example e-portfolio to stimulate ideas and get students excited about the potential of their own e-portfolio. Encourage collaboration and sharing of ideas, but promote the understanding that each student’s design and content should be unique to their purpose, achievement, experience, and individual creativity. Remind students to choose only the most important items for content and reflect on their reasons for choices. Provide tips that encourage strategic thinking such as limiting video content to small viewing windows and short vignettes (10-20 seconds) that express a powerful message and purpose quickly while minimizing file size computer requirements. Remind students to consider privacy issues when choosing content and a means to restrict access to their intended audience (e.g., password protection). A good textbook or other instructional material on designing websites may be helpful in assembling curriculum for an e-portfolio course.
Differentiating Assessment Systems 
& E-portfolios

E-portfolios are multi-purpose – they can be used as assessment tools, for learning purposes and for marketing purposes. Unfortunately, utilizing the e-portfolio as an assessment/accountability tool can often lead to conflict. “When portfolios are used for accountability purposes, to document pre-service teachers’ achievement of standards-based competencies, teacher candidates viewed their portfolios as a hoop they needed to jump through to graduate, and not the lifelong reflective tool that had been envisioned” (Barrett & Carney, 2005). Instead, Barrett & Carney contend for a balanced system that respects the value of the portfolio for self-assessment and life-long learning.

Barrett (2003) claims that both purposes, the need to assess learning outcomes through aggregated data and the individual construction of an educational journey of growth over time, need to be addressed in programs. In fact, Barrett makes a distinction between an e-portfolio and an assessment management system as a means to bridge these two (learning and assessment) approaches. “The assessment management system is basically a reporting system used to aggregate and analyze assessment data. It is an institution-centered database used to collect faculty-generated assessment data based on tasks and rubrics. The e-portfolio becomes a personal creation whereby students tell their own story and express their own unique voice about what they have learned and value during a specific period of time. The learners then take ownership over their own ability to plan and assess and reflect upon their learning.

“By differentiating between assessment management systems and e-portfolios, institutions allow students to use technology tools for building individual e-portfolios which will help develop critical thinking, information literacy skills, and build upon students’ own unique diversity and background. Keeping assessment management systems and e-portfolios separate allows an institution to develop a philosophical framework to support the development of e-portfolios that is consistent with the mission and philosophy of the program” (Cohen, 2005).

In 2004, Barrett and Wilkerson devised a new arrangement that balances an institutions need for an assessment management system while meeting the needs of learners. The new e-portfolio system is composed of three different systems: “digital archive of learners’ work, a learner-centered e-portfolio using the learner’s authentic voice and an institution-centered database to collect faculty-generated assessment data based on tasks and rubrics. Software enables these three different parts to talk to each other electronically.”

Barrett (2003) defined the differences between e-portfolios and online assessment systems in the following chart:

<table>
<thead>
<tr>
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<th>E-Portfolio</th>
<th>Assessment Management System</th>
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</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Multiple purposes: learning, assessment, employment</td>
<td>Single purpose: formative and summative assessment</td>
</tr>
<tr>
<td>Data Structure</td>
<td>Data structure varies with the tools used to create the portfolio; most often common data formats (documents often converted to HTML, PDF)</td>
<td>Data structure most often uses a relational database to record, report data</td>
</tr>
<tr>
<td>Type of Data</td>
<td>Primary type of data: qualitative</td>
<td>Primary type of data: qualitative and quantitative</td>
</tr>
<tr>
<td>Data Storage</td>
<td>Data storage in multiple options: CD-ROM, videotape, DVD, WWW server, LAN</td>
<td>Data storage primarily on LAN or on secure WWW server</td>
</tr>
<tr>
<td>Control of Design &amp; Links</td>
<td>Visual design and hyperlinks most often under control of portfolio developer</td>
<td>Visual design and hyperlinks most often controlled by database structure</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>Student-centered</td>
<td>Institution-centered</td>
</tr>
<tr>
<td>Selection of Contents</td>
<td>Artifacts selected by portfolio developer</td>
<td>Artifacts prescribed by institution</td>
</tr>
<tr>
<td>Technology Skills Required</td>
<td>More advanced skills required, including information design through hyperlinking, digital publishing strategies, file management</td>
<td>Minimal skills required, equivalent to using a web browser and adding attachments to an e-mail message</td>
</tr>
<tr>
<td>Technology Competency Demonstrated</td>
<td>Medium to high, depending on tools used to create portfolio</td>
<td>Low to medium, depending on the sophistication of the artifacts added to the portfolio</td>
</tr>
</tbody>
</table>
Summary of Technology Competencies for Instructors and Students

Many important technology competencies are applicable to both teachers and students as shown in the table below. For example, ability to efficiently use search engines and other Internet resources helps both teachers and students collect and share information that may not be included in standard textbooks. The list is not intended to be complete or to be used for assessment or certification purposes, but it does serve as a starting point for developing more detailed and measurable knowledge and skill objectives for technology competency.

<table>
<thead>
<tr>
<th>Category</th>
<th>Teacher Competency</th>
<th>Student Competency</th>
</tr>
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<tbody>
<tr>
<td>Communication</td>
<td>Communicate efficiently with students, colleagues, staff, and administrators via synchronous (e.g., cell phone, instant messaging) and asynchronous (e.g., email, voice mail) tools.</td>
<td>Communicate efficiently with teachers, peers, and outside organizations using synchronous (e.g., cell phone, instant messaging) and asynchronous (e.g., email, voice mail) tools.</td>
</tr>
<tr>
<td>Information Management</td>
<td>Organize, manage, and archive course and student data, records, and reports using computer files and folders.</td>
<td>Organize, manage, and archive course materials, collaborative projects, and products of course assignments using computer files and folders.</td>
</tr>
<tr>
<td>Constructive Development</td>
<td>Create, revise, and supplement instructional materials using word processors, spreadsheets, websites, and distance learning systems.</td>
<td>Complete course assignments and projects using word processors, spreadsheets, websites, and distance learning systems.</td>
</tr>
<tr>
<td>Multimedia Application</td>
<td>Use multimedia tools (e.g., presentation software) to develop and deliver instruction, enhance existing instruction, and increase learning through application of learning principles.</td>
<td>Use multimedia tools (e.g., presentation software) to study and improve understanding, research topics, present research findings, essays/papers, projects to peers and other audiences.</td>
</tr>
<tr>
<td>Promote Technology Competency</td>
<td>Teach students how to explore available technology tools to increase their learning and academic achievement.</td>
<td>Collaborate with peers to share ideas, knowledge, and skills for exploring available tools that support learning and academic achievement.</td>
</tr>
<tr>
<td>Facilitate Technology Acquisition</td>
<td>Collaborate with and assist administrators and technical staff in determining the technology tools that will result in the greatest return on investment for pedagogical improvement and student success.</td>
<td>Collaborate with and assist peers in determining the technology tools that will result in the greatest return on investment for achieving academic success.</td>
</tr>
<tr>
<td>Collection, Use of Electronic Material</td>
<td>Comply with intellectual property laws/policies when collecting and using materials and resources obtained electronically (e.g., Internet).</td>
<td>Same as teacher competency</td>
</tr>
<tr>
<td>Dissemination &amp; Collaboration</td>
<td>Prepare and transport digital instructional material and methods to other teachers for collaborative review, feedback, and revision via college-resident vehicles such as websites, distance learning systems, and networks.</td>
<td>Prepare and transport digital information resulting from individual study/research for collaborative review, feedback, and revision via college-resident vehicles such as websites, distance learning systems, and networks.</td>
</tr>
<tr>
<td>Monitor &amp; Manage Progress</td>
<td>Use word processors, spreadsheets, and scheduling applications to record and monitor personal (self) and student progress toward performance goals.</td>
<td>Use word processors, spreadsheets, and scheduling applications to record and monitor progress toward personal and professional goals.</td>
</tr>
</tbody>
</table>
NCATE and Electronic Portfolios
The National Council for Accreditation ofTeacher Education (NCATE) standards do not require the use of digital portfolios; however, they do make effective use of technology in instruction a central requirement for teacher preparation programs for both faculty and teacher candidates. NCATE Standard 6 requires that the teacher preparation unit provides adequate campus and school facilities to support candidates in meeting standards. NCATE Standard 1 requires teacher candidates to demonstrate that they are able to “facilitate student learning of the subject matter... through the integration of technology. NCATE Standard 5 requires faculty to demonstrate that they are able to integrate diversity and technology throughout their teaching. Regarding the school of education's facilitation of professional development, Standard 5 also mandates that “the unit provides opportunities for faculty to develop new knowledge and skills” in areas including technology.

Also, according to NCATE Standard 2, institutions are expected to use technology to assess their assessment systems, though how complex an undertaking this is varies with how many programs are in the unit. Some institutions are moving toward electronic portfolios in which candidates can demonstrate their mastery of proficiencies.

Source: NCATE (www.ncate.org), Frequently Asked Questions

Technology & Teacher Education Links
PEERS (Pre-College Engineer/Educator Resource Site)
This website is designed to encourage communication and collaboration between practicing engineers and K-12 teachers. It provides resources targeted to support educators and engineers and is part of a larger site on pre-college education developed by the Institute of Electrical and Electronics Engineers. www.ieee.org/organizations/eab/precollege/peers/

ITEA: List of Tech Ed Teacher Education Programs
The International Technology Education Association hosts this site with links to various institutional members that offer degree programs in technology education. www.iteawww.org/j4.html

E-portfolio Links
Electronic Portfolios
A website developed by Dr. Helen Barrett, Assistant Professor at University of Alaska Anchorage School of Education. The site has links regarding e-portfolio development and digital storytelling. http://electronicportfolios.com/

Electronic Portfolio Consortium
The Electronic Portfolio Consortium, or ePortConsortium, is an association of individuals -- from 56 countries and more than 600 higher education and IT commercial institutions -- who are interested in the development of academic e-portfolio software systems and the establishment of standards for such systems. www.eportconsortium.org

EDUCAUSE
A webpage from EDUCAUSE with information regarding e-portfolios including an overview, examples, presentations, e-portfolio tools, websites, and publications. www.educause.edu/E-Portfolios/5524

The Reflect Initiative
A research project with Dr. Helen Barrett and TaskStream to assess the impact of e-portfolios on student learning, motivation and engagement in high schools. http://electronicportfolios.com/reflect/

Sources

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