

Electronic Portfolios as Knowledge Builders

by Barbara L. Cambridge

Growth is the only evidence of life.

— John Henry Newman

Portfolios offer rich possibilities for learning and assessment. With increased pressure for better understanding of college and university students' learning and external pressure for better representation of it, portfolios enable learning for the creator and the user and demonstrate learning for multiple audiences. This book, with its focus on electronic portfolios, adds the extra value of technology to prompt learning and assessment.

Each section of this book contains a rationale for electronic portfolios for the creator (student, faculty member, or institution), possible features of an electronic portfolio, examples of current practice, cautions, and recommendations. Our examples are not exhaustive but offer instances of real people engaged in actual practice with the emerging medium of the electronic portfolio. This baseline book will undoubtedly be followed by others that scan the horizon for best practices, provide detailed analyses of a particular type of portfolio, or move toward integration of electronic portfolios by students, faculty members, and institutions. As editors of this volume, we hope that this foundational book paves the way for further inquiry into and practice with electronic portfolios for many audiences.

Features of Portfolios

Portfolios have features that can make them powerful tools of learning and assessment. Four characteristics adapted from Liz Hamp-Lyons and William Condon's *Assessing the*

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Portfolio: Principles for Practice, Theory and Research (1998) set the stage for features of electronic portfolios:

- *Portfolios can feature multiple examples of work.* Through multiple examples, portfolios authentically represent a range of work. For example, students can better demonstrate their progress toward increased critical reasoning during their undergraduate career if they include samples of early and late work, of reasoning in different disciplines, or of varied ways of showing critical thinking. Faculty members show their skill as teachers if they include students' work from the range of courses they teach, a comparative analysis of syllabi from the first and most recent time they have taught a course, or several peer observations of their classes in different semesters. Institutions include comparative data about retention across a number of years, examples of students' writing from across the curriculum, and studies of the impact of community involvement by the institution. In these ways, portfolios draw on basic premises about assessment and learning: A more accurate read is possible when varied measures are used, and through learning we change over time.
- *Portfolios can be context rich.* It is difficult to understand the grade on a student's essay if the reader has not seen the assignment, is not aware of the instruction before the assignment, and does not know the rubrics for grading. Fortunately, a portfolio can surround a student's essay with this context to make the learning and assessment more understandable. Faculty members who receive high student evaluations can surround those ratings with descriptions of pedagogies, classroom assessment techniques, and out-of-classroom interactions that help to explain those evaluations. High satisfaction on alumni surveys can be contextualized in a portfolio with employer survey results, information on an institution's career counseling, and statements from faculty mentors. In other words, the portfolio can provide the kind of thick description that helps a user understand an outcome and the reasons for the outcome.
- *Portfolios can offer opportunities for selection and self-assessment.* Because the reader of the portfolio sees evidence of the portfolio creator's ability to make choices based on criteria, the portfolio demonstrates decisions about quality. Although I will argue later that including only best work may foster a negative emphasis on success only, the selection process does demonstrate rhetorical savvy. Determining what products and processes will be warranted by which audiences is part of the selection process.
- *Portfolios can offer a look at development over time.* Because creators can add to and reflect on previous entries in a portfolio, they can demonstrate their learning over a period of time. For example, students who keep undergraduate portfolios will show progress at differing degrees in different areas of learning. After a shaky beginning with unsuccessful collaborative learning strategies, faculty members may have done professional development to learn and apply more fruitful prac-

tices. Based on input from students and new technologies, institutions may have added on-line mentoring to aid commuting students. This look across a sequence of activities enables readers to understand or assess decisions and achievement over a span of time.

The word *can* appears before each verb in the previous italicized statements because portfolios offer potential. In particular, portfolios can help turn information into knowledge, assessing into an integral part of learning, and failure into occasion for learning. Electronic portfolios can facilitate each of these outcomes if we consider technology as one of multiple essential features of decision making.

Turning Information Into Knowledge

Predictable responses to the advent of print portfolios were “How can we read them all?” and “Where will we store them?” Faculty members already overwhelmed by reading individual papers or exams shuddered at the thought of more information to digest and process. Discouraged with a single letter grade on tests or papers, students were, nonetheless, aghast at the thought of revising papers or reflecting on tests, especially in quantity and during a semester. Faculty and students both were apprehensive about having just too much information.

The difference between information and knowledge becomes crucial here. John Seely Brown and Paul Duguid (2000) note three “generally accepted distinctions between knowledge and information. . . . First, knowledge usually entails a knower.” We may ask about the location of information (“Where can we find that information?”), but we expect an agent of knowledge (“Who knows that?”). Second, “knowledge appears harder to detach than information.” Verbs used with information but not easily with knowledge are “pick up, possess, pass around, put in a database, lose, find, [and] accumulate.” Third, “knowledge seems to require more by way of assimilation. It entails the knower’s understanding and some degree of commitment” (pp. 119-120). Information theory, in fact, holds information to be independent of meaning.

Two important practices supported by the use of electronic portfolios offer ways of making meaning of information: reflection and social construction.

Reflection is central to learning. For example, service-learning has been particularly helpful in emphasizing the difference between doing and learning. Students may volunteer in the community, doing good but learning little. Service-learning insists that students reflect on their activity, putting it in the context of what they are learning in their class and in the context of the service. It is by stepping back from the experience and contemplating and analyzing it that students become knowledgeable about it.

Throughout this book, reflection is identified as crucial to the practice of creating portfolios. A scrapbook of materials is only an accumulation of information. What turns the data into evidence is reflection about the meaning of selected materials. Moreover, continued reflection can evoke new meaning from those materials so that the electronic medium supports continued learning. Students and faculty members can use recent experience as fodder for new reflection, which can make new meaning. Learners can report new insights easily over time as they demonstrate the value of learning across a lifetime.

Social construction of knowledge is also an important tenet of portfolios. According to Chris Dede in “Rethinking How to Invest in Technology” (2000), much research documents that

helping students make sense of something they have assimilated but do not yet understand is crucial to inducing learning that is retained and generalized. Learners must engage in reflective discussion of shared experiences from multiple perspectives if they are to convert information into knowledge and master the collaborative creation of meaning and purposes. (p. 187)

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Dede goes on to say that “distributed learning involves orchestrating educational activities among classrooms, workplaces, homes, and community settings. This pedagogical strategy models for students that learning is a part of all aspects of life” (p. 187) and, I would add, all levels of activity in the university and beyond.

In addition to Brown and Duguid, Scardamalia and Bereiter (2000) have imagined

a network of networks — people from schools, universities, cultural institutions, service organizations, businesses — simultaneously building knowledge within their primary groups while advancing the knowledge of others. We might call such a community network a knowledge-building society. Electronically networked environments expand the possibilities for what such productive, mutually supportive communities can produce. (p. 312)

In fact, Scardamalia and Bereiter were part of a team of cognitive research and computer scientists who developed CSILE (computer-supported intentional learning environment) for use at all educational levels from first grade through the university. Analysis of CSILE shows that students who use the network system “are better able to comprehend difficult informative texts” than are their counterparts not using the system. They also demonstrate higher quality of portfolio commentaries, general depth of explanation, and facility with graphics. “They even demonstrate more mature beliefs about learning.” The diverse group of participants in the system includes “elementary and high school students and their parents, postsecondary teacher education and medical school students, museum staff, engineering firm staff, and staff from a science center and an art gallery” (p. 314).

Another project that demonstrates the possibilities of extended communities of learners is a partnership of Stetson University and Disney that uses a fiber-optic network linking houses, apartments, and businesses in a community with the local school. Students have personalized learning plans, manage their own electronic portfolios, and achieve graduation through an exhibition. Students choose a pivotal topic early in their senior year, approved by their graduation committee and assessed at various decision points throughout the year. Potential graduates demonstrate their knowledge and skills to that graduation committee and invited guests through multimedia that encompass the students' portfolios, including dance, song, oratory, video, and print. Criteria include evidence of communication, personal development, critical thinking, and social responsibility (Triedemann, 1996, p. 18).

These examples are offered not to promote any one model for a knowledge-building society but to suggest that electronic portfolios can be part of a larger endeavor to link learners across our society. Instead of drowning in information, a network of people can turn that information into knowledge to benefit multiple constituencies. Although this book focuses on students, faculty members, and institutions of higher education, technology offers the potential for ever widening circles of linked learners.

Establishing how the network of linked learners works successfully, however, involves assessment. Although in the past some students and some faculty have seen assessment as a necessary evil imposed on them by some external force, it is clear that assessment can be a way of knowing how we are turning information into knowledge, moving beyond surface learning to deep learning.

Incorporating Assessment as an Integral Part of Learning

Students often dread quizzes, tests, and papers. The threat of a poor grade looms large, an incentive to study for the occasion but not a motivator for deep learning. Hansen and Stephens (2000) note that "many college students today (unrealistically) judge their own academic competence to be high, and tend to blame low performance on poor instruction" (p. 42). "Schools tend to condition students to focus on products and ignore the process that leads to those products" (p. 45).

Assessment systems for teachers also focus on product, not process. The most widely used tools for assessing teaching are ubiquitous end-of-semester student ratings. Their use for improvement almost obviated by placement at the end of the class, the rankings offer information at the conclusion of a unit of work — the class — rather than during the class when changes can be made. In addition, during high-stakes evaluations, teachers are often asked to supply only products such as unanalyzed syllabi and assignment sheets and

not analyses of the process such as responses to students' work with subsequent revisions by students or evidence of positive pedagogical changes based on faculty development.

Institutions have their own mordant products. Accreditation self-studies collect more dust than any other document generated in a college or university. When a regional accreditation visit looms, institutions gear up to collect information, write it up, present it to visitors, and, with a sigh of relief if the visit goes well, place it on the shelf until it is referred to just before the next visit. This heavy product has little influence on vital processes of change in the institution.

Electronic portfolios, however, incorporate assessment into the process and recording of learning for students, faculty, and institutions. The premise that assessment can be designed to improve learning during the process of learning is demonstrated in examples in this book. For example, Alverno College, long known for designing its curriculum to work toward competencies affirmed by assessments that signal students' levels of achievement and need for improvement, recently implemented the next stage of that commitment to assessment as a part of learning: the diagnostic digital portfolio. As students identify "key learning experiences," they include the events, criteria for assessment, and self-, internal, and external assessments. Students can thus both plan and plot their growth. Planning and plotting as process is a main point.

Faculty electronic portfolios that focus on process as well as product are being developed by a range of faculty members in multiple disciplines. For example, a group of members of the Mathematics Association of America determined that creating electronic course portfolios is important, but knowing how to read and interpret the portfolios is equally challenging. Two faculty members are generating portfolios, and other group members are responding, in the process raising a multitude of questions about the purposes of teaching mathematics to different groups of students, the most effective pedagogies, and appropriate ways of assessing students' work. All faculty involved are reassessing and altering their own practices as they engage in the social construction of knowledge about learning mathematics.

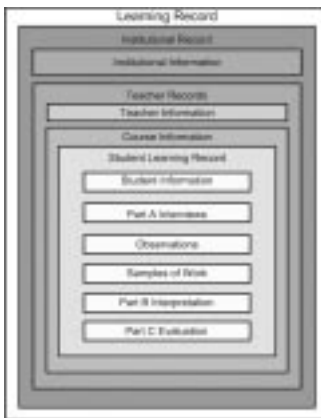
Changes made by the Western Association of Schools and Colleges in its accrediting process are described in this book in the institutional portfolios section. Particularly illuminating is the sense that accreditation can become consultative as well as evaluative, partly through the electronic institutional portfolio that enables institutions to communicate internally and externally on a continuous basis. The need for hurried assembly of information, collected by a few people and used by fewer, is overcome through institutional choices about focus and continuous generation of assessment information turned into knowledge through application, revision, and reapplication.

The feedback loop has been a fundamental premise of assessment. Information gathered through assessment must be fed back into practice to alter that practice; a subsequent round of assessment determines whether the altered practice gets the practitioner closer to achieving goals. Visuals of the feedback loop feature arrows pointing to next steps, emphasizing the connections among assessing, applying, and learning. Electronic portfolios enable movement around the loop through hyperlinks, among other methods, so that a person can move through the loop or back into the loop to understand the process. The electronic portfolio embodies the principle that assessment is part of the learning process.

Sheingold and Frederiksa (2000) point to the importance of transparency in assessment:

The positive systemic effects of performance assessments depend critically on the openness or transparency of the values and criteria used in those assessments. . . . The goal of transparency is important precisely because it requires reflective practice. . . . For students, understanding and participating in the performance assessment process should encourage reflection on their own work — the personal styles, strengths, and weaknesses it may reveal and the ways it can be improved. For teachers, understanding the performance assessment process should encourage reflection on their own and others' classroom practices and on ways to support students' development in a manner consistent with what is valued in the assessment system. . . . This activity of social construction should be an ongoing one, allowing for the constant renewal of the assessment system through the invention of new activities, the improvement of scoring frameworks, and the incorporation of new ideas about the goals of teaching and learning. . . . Ideally, the resulting socially distributed assessment system will be a self-improving process for enriching the view of competence incorporated within the educational system. (pp. 326, 327, 332)

Syverson's model of an integrated portfolio system



www.cwrl.utexas.edu/~syverson/otr/

An exciting thought for the future is the integration of student, faculty, and electronic portfolios as a “socially distributed assessment system” that becomes “a self-improving process for enriching” educational systems. Margaret Syverson, at the University of Texas at Austin, has designed an integrated system that offers this interactivity among portfolios (see figure opposite). Although not yet in use, this model promises connectivity that supports the kind of social fabric central to the vision of Brown and Duguid and of Scardamalia and Bereiter.

But that social fabric will be rent if we continue to regard disappointing assessment results as fatal. In education, and elsewhere, we must learn how to turn failure into occasion for learning. As Salvatori (2000) demonstrates in theory and practice, “moments of difficulty” are prime opportunities for growth, which, as John Henry Newman tells us, is the only sign of life.

Turning Failure Into Occasion for Learning

We all fail sometimes. Even with carefully established goals and conscientiously executed work, we do not meet the goals because of any number of circumstances. Yet we set up systems that condemn students, faculty members, and institutions for not meeting goals. Portfolios can be part of such systems if we choose to include in them only those pieces of evidence that bear good news: the exemplary essay in a student portfolio, the well balanced syllabus in a faculty portfolio, or selected statistics about minority participation in the institutional portfolio.

Some systems punish for not meeting goals, no matter the reason. Students receive a failing grade when they do not meet expectations — no matter the cause of the failure; faculty who risk trying new pedagogies that take time to learn and implement well lose points toward merit raises because of initial low student ratings; and institutions that include in accreditation self-studies unfavorable retention rates risk requirements for extra reports or visits. Although we know that learning can and often does occur at times of dissonance or moments of difficulty, we look there not for the learning but for the problems.

Two practices are particularly problematic. First, our reporting mechanisms disallow explanations. Tests rarely encourage explanation of reasons for answers. Student course ratings provide few or no contextual explanations. Accrediting self-studies telescope so much material that explanations appear defensive. Second, we use snapshots for important evaluations. A single test speaks to a moment in time. A single student rating occurs at only one point in a semester of work. And a self-study every 10 years freezes at only one point what is fluid and changing in the many years before and after the study.

Portfolios can be structured to include lack of success as the inevitable and potentially educational experience that it can be. Because portfolios are albums rather than single snapshots, they can illustrate process. For example, a student who writes a paper whose sections reveal no organization can, with feedback from peers and the instructor, revise the piece. In her portfolio she can explain the reasoning behind her changes and situate the piece among other examples of well organized work or a series of increasingly well organized pieces. A faculty member whose classroom assessment techniques reveal students' discomfort with initial applications of problem-based learning can trace how he modifies instructions and practices for better results. When an institution finds that its new summer orientation does not supply all the information students need to begin the fall semester, it can describe changes in length, activities, and follow-up that lead to more satisfaction and a pattern of self-assessment portending more changes.

Electronic portfolios especially can provide contextual responses to failure so that readers can see continuously how individuals or institutions use lack of success as impetus to change. A student who stumbles in an oral presentation can include videos of both the original unsuccessful and subsequent more successful speeches, with analysis of changes made in preparation and execution of the speeches. A faculty member's analysis of efficacy of assignments given and revised in subsequent semesters can be buttressed with students' work and students' responses. When institutions gradually reallocate funds to improve library services described as insufficient, the emergent pattern of support speaks to realization of and response to need.

Any information can be misinterpreted or misused. The section on student portfolios cautions about the need to consider carefully who has access to student portfolios on the Web. The section on faculty portfolios includes worries about the possible repercussions of going public with lack of success, i.e., what will happen to faculty who admit to failure? The section on institutional portfolios also deals with the risks of misuse of information to denounce the quality of an institution.

Electronic portfolios open possibilities for putting failure in context.

In an important meeting of a project described in the section on institutional portfolios, members of multiple publics — media, state governments, accrediting bodies, and public policy centers — said loudly and clearly to project leaders that institutional portfolios will be useless if they present only a rosy picture. Everyone knows that institutions, however successful in multiple aspects, have areas that need improvement. Not representing those areas only makes the portfolio suspect. When change is warranted, however, an institution should feature its strategies for change, with results posted as soon as possible. Repeated failure is cause for alarm; failure that is addressed with concrete steps is more readily understood.

This book does not claim that electronic portfolios will solve the problems related to misuse of failure. It does claim, however, that electronic portfolios open possibilities for putting failure in context, demonstrating how it can spur learning and acknowledging that everyone has areas in which they can improve. Before we move to electronic portfolios, however, we must confront issues about usability and availability of technology that changes rapidly.

Choosing Electronic Portfolios

In *Dancing With the Devil: Information Technology and the New Competition in Higher Education*, Katz and his colleagues contend that higher education can be successful in dealing with the challenges of technologies that change quickly. For example, Lehigh University president Gregory Farrington writes that “a good assumption is that within ten years inexpensive technology will allow each of us to send and receive video, audio,

graphics, and text, synchronously or asynchronously, wherever we are in the world” (1999, p. 76). Katz, vice president of EDUCAUSE, identifies two of the central assumptions of the next decade: “Ubiquitous, high-speed, economically accessible network capacity will exist nationally, and, to a great extent, globally [and] affordable, multimedia-capable computers will be commonplace, and most leading universities will assume student ownership of such devices” (p. 28).

Yet other people worry about the inequality of access to computers and the resulting “digital divide.” Seven percent of lower income households have a computer, compared with 32 percent in the \$30,000-50,000 income bracket, 53 percent in households making more than \$50,000 annually, and more than 70 percent in those with incomes higher than \$75,000 annually (Tapscott, 2000, p. 131). The “leading universities” mentioned by Katz may indeed expect students to own a computer, but how about the majority of students attending community colleges and comprehensive universities? Even if computers are supplied by institutions, what is needed to prepare students and faculty for their use on behalf of learning? Will there be technical support, appropriate training, and maintenance of equipment and systems over time? An essay in the section on student portfolios worries about these issues as campuses consider requiring or even making optional the use of electronic portfolios.

The researchers identified five key factors to address in making a digital portfolio system work: vision, assessment, technology, logistics, and culture.

The Annenberg Institute for School Reform and the Coalition of Essential Schools Exhibition Project had some of the same questions as they considered the use of electronic portfolios in grades K-12. “When it became clear that ordinary mortals, not just computer techie types, could put together multimedia collections of student work, we began to study how such technology could supplement a school’s reform process” (Niguidula, 1999, p. 26). Over 1993-1996 they studied six Coalition schools — rural, suburban, and urban; traditional and alternative; technology rich and technology strapped — assuming that ordinary people are capable of creating such portfolios, that portfolios are part of a process of change, and that portfolios can be used in multiple contexts.

The researchers identified five key factors to address in making a digital portfolio system work: vision, assessment, technology, logistics, and culture. The central question under vision is “What should a student know and be able to do?” Vision thus becomes the main menu of the portfolio. Four questions apply to assessment: “How can students demonstrate the school vision? Why do we collect student work? What audiences are most important to us? How do we know what’s good?” Questions about technology underlie these factors: “What hardware, software, and networking will we need? Who are the primary users of the equipment? Who will support the system?” With regard to logistics: “Where will information be digitalized? Who will do it? Who will select the work? Who will reflect on the work?” The fifth feature, culture, is the most crucial: “Is the school used to discussing student work? Is the school open to sharing standards? With whom?” The researchers con-

clude that “school culture is perhaps the most critical component in making digital portfolios a tool for reform rather than a technological version of a set of file folders” (p. 28). Key elements are relationships with the school, regular discussions of students’ work, and openness to examining the school’s vision with others outside the school.

Technology is only one component of decision making about the use of electronic portfolios and, in this analysis, not the most crucial one. The availability of resources to provide the necessary technology must be part of the consideration, but as is established elsewhere in this book, the range of possibilities for electronic portfolios includes low-cost and high-cost varieties. A careful decision-making process will examine more than technological constraints and possibilities. The major challenges for institutions in the Urban Universities Portfolio Project described in the institutional portfolios section of this book and those of the Coalition schools centered on the culture of the institution. As more technology becomes more and more universally available, institutions that have developed a culture of practice around student learning and a culture of assessment around improvement will be ready for the rich possibilities of electronic portfolios.

References

- Brown, J.S., & Duguid, P. (2000). *The Social Life of Information*. Boston: Harvard Business School Press.
- Dede, C. (2000). Rethinking how to invest in technology. In *The Jossey-Bass Reader on Technology and Learning* (pp. 184-191). San Francisco: Jossey-Bass.
- Hamp-Lyons, L., & Condon, W. (1998). *Assessing the Portfolio: Principles for Practice, Theory and Research*. Cresskill, NJ: Hampton Press.
- Hansen, E.J., & Stephens, J.A. (2000, September/October). The ethics of learner-centered education: Dynamics that impede the process. *Change* 32 (5), 40-47.
- Katz, R.N., & Associates. (1998). *Dancing With the Devil: Information Technology and the New Competition in Higher Education*. San Francisco: Jossey-Bass.
- Niguidula, D. (1997, November). Picturing performance with digital portfolios. *Educational Leadership*, 26-29.
- Salvatori, M.R. (2000). Difficulty: The great educational divide. In P. Hutchings (Ed.), *Opening Lines: Approaches to the Scholarship of Teaching and Learning* (pp. 81-93). Palo Alto, CA: Carnegie Foundation for the Advancement of Teaching.
- Scardamalia, M., & Bereiter, C. (2000). Engaging students in a knowledge society. In *The Jossey-Bass Reader on Technology and Learning* (pp. 312-319). San Francisco: Jossey-Bass.
- Sheingold, K., & Frederiksa, J. (2000). Using technology to support innovative assessment. In *The Jossey-Bass Reader on Technology and Learning* (pp. 320-337). San Francisco: Jossey-Bass.
- Tapscott, D. The digital divide. In *The Jossey-Bass Reader on Technology and Learning* (pp. 127-154). San Francisco: Jossey-Bass.
- Triedemann, D. (1996, October). New Florida school celebrates education and technology. *Techtrends*, 14-18.