

ICT Support for Electronic Portfolios and Alternative Assessment

The State of the Art

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Abstract: This paper covers the use of technology to support three aspects of Alternative Assessment: Observations of Student Learning, Performance Assessments, and Electronic Portfolios. Discussion includes the differences between Performance Assessments and Portfolios, definition of electronic portfolios, the benefits of electronic portfolios, along with the author's five-stage and five-level electronic portfolio development process. Technology tools to support electronic or digital portfolios are outlined, including proprietary software and the use off-the-shelf multimedia development software. Significant research in electronic portfolio development will be discussed along with examples from the USA and international examples with corresponding web sites.

Key words: Self-Assessment, Empowering, Catalyst for Adaptation/Changes, Learner-Centered Learning, Multimedia

1. OVERVIEW

This paper covers the use of ICT to support three different aspects of Alternative Assessment: Observations of Student Learning in the Classroom, Performance Assessments, and Electronic Portfolios. A discussion of these strategies will be included, with a perspective on the present international state of the art.

2. ALTERNATIVE ASSESSMENT

The terms alternative assessment, authentic assessment, or performance-based assessment are often used synonymously "to mean variants of performance assessments that require students to generate rather than choose a response" (Herman, Aschbacher, and Winters, 1992, p. 2). The characteristics of this type of assessment are: the student is involved in meaningful performance tasks; there are clear standards and criteria for excellence; there is an emphasis on metacognition and self-evaluation; the student produces quality products and performances; there is a positive interaction between assessor and assessee (Burke, 1999). There are two central features to alternative assessments: "First, all are viewed as *alternatives* to traditional multiple-choice, standardized achievement tests; second, all refer to direct examination of student performance on significant tasks that are relevant to life outside of school" (Worthen, 1993, p. 445).

Kay Burke (1999) and Robin Fogarty (1998) advocate a balanced approach to assessment, with a focus on three components:

- Traditional Assessment, with a focus on grades and rankings, knowledge, curriculum, and skills, implemented through classroom assessments (tests, quizzes, homework assignments), and standardized tests (either norm-referenced or criterion-referenced)
- Performance Assessment, with a focus on observable results and standards, application and transfer, implemented through standards, tasks, criteria and scoring rubrics.
- Portfolio Assessment, with a focus on growth and development over time, implemented through selection, reflection and inspection of classwork, along with goal-setting and self-evaluation

2.1 Performance Assessment

"Performance assessment focuses on the direct observation of a student's performance" (Fogarty, 1998, p.10). Students create projects or perform tasks based on predetermined standards, criteria, and indicators, which are evaluated by scoring rubrics. Teachers have always observed student learning in the classroom. However, until recently documenting these observations has been difficult and time-consuming. In the early 1990s, several tools were developed to collect and organize these observational data; the Greater Victoria (B. C., Canada) School District developed a system using bar codes to record student classroom activities. Subsequently, the software was published by Sunburst as *Learner Profile*, and moved from using bar code readers, to using Apple's Newton and now Palm hand-held

devices to collect data in the classroom. The most promising application of the Palm involves linking data collection to generic database applications, such as *FileMaker Pro*, to allow more flexible use of observational data.

There is a new program developed that supports the performance assessment process. Educational Testing Service and Grant Wiggins' re:Learning have developed *Assessment Wizard*, a professional development tool for designing and sharing student assessments (<http://www.teachingandlearning.org>). The program includes a master file of sample assessments and associated rubrics or scoring guides indexed by subject, topic, and grade level, and linked to both generic and state-specific standards.

There are significant differences between Performance Assessments and Portfolios. A portfolio is a container that holds examples of student or teacher work (the "artifacts") and reflections on that work that transforms the artifacts into "evidence" of achievement. Many of those artifacts could be the results of performance assessments with associated evaluations and reflections. A standards-based portfolio creates linkages between student tasks and performance assessments, with their associated scoring guides, and the standards that they are designed to demonstrate. The reflections of the portfolio developer create the rationale or argument for converting these artifacts into evidence.

2.2 Portfolio Assessment

Portfolios have been used for years by professionals in the graphic arts field to demonstrate the quality of their work, often for marketing purposes. A financial portfolio documents the accumulation of fiscal capital or monetary assets; an educational portfolio documents the development of human capital or intellectual assets. Educators began adopting the portfolio in the early 1990s as a means for determining grades and reporting student progress to parents (Linn & Gronlund, 2000). More recently, portfolios have become powerful tools for teacher professional development (Wolf, 1999; Burke, 1997) and documenting pre-service teacher education (Campbell, Melenyzer, Nettles & Wyman, 2000). Wilcox & Tomei (1999) propose to extend the possibilities for the portfolio in education "by going beyond assessment, learning and professional development to the use of the portfolio as a living history of a teaching-learning life" (p.5).

Educators in the Pacific Northwest (Northwest Evaluation Association, 1990), developed the following definition of portfolio:

A portfolio is a purposeful collection of student work that exhibits the student's efforts, progress, and achievements in one or more areas. The collection must include student participation in selecting contents, the

criteria for selection; the criteria for judging merit, and evidence of student self-reflection.

Portfolios give a richer picture of student work than can be gained from more traditional, objective forms of assessment. Traditionally, portfolios have been stored in three-ring binders or folders with physical dividers between sections. Students place work on paper media presenting text and images and sometimes include an analog videotape. In a standard paper-based portfolio, matching specific artefacts or evidence to desired learning standards or outcomes is dependent on the organizational structure imposed by the linear medium of paper, and very problematic when attempting to find specific clips on a video tape.

2.3 Types of Evidence in Portfolios

Barton & Collins (1997) have identified four types of evidence that can be placed in a portfolio:

- Artifacts: documents produced during normal academic work
- Reproductions: documents of student work outside the classroom
- Attestations: documentation generated about student's academic progress
- Productions: documents prepared just for the portfolios. These productions include:
 - Goal Statements: Student's personal interpretations of each specific purpose for the portfolios
 - Reflective Statements: Students write as they review and organize the evidence in their portfolios
 - Captions: Statement attached to each piece of portfolio evidence, articulating what it is, why it is evidence, and of what it is evidence.

2.4 Electronic Portfolios

An electronic portfolio includes technologies that allow the portfolio developer to collect and organize artifacts in many media types (audio, video, graphics, and text). A standards-based electronic portfolio uses hypertext links to organize the material, connecting artifacts to appropriate goals or standards. Often, the terms "electronic portfolio" and "digital portfolio" are used interchangeably. However, this author makes a distinction: an electronic portfolio contains artifacts that may be in analog (e.g., videotape) or computer-readable form. In a digital portfolio, all artifacts have been transformed into computer-readable form. (Barrett, 2000)

The benefits of developing electronic portfolios for either students or teachers includes:

- minimal storage space

- easy to create back-up files
- portability
- long shelf life
- learner-centered
- increases technology skills
- through hypertext links it is easier to make argument that certain standards are met
- accessibility (especially web portfolios) (Kankaanranta, Barrett & Hartnell-Young, 2000)

3. ELECTRONIC PORTFOLIO DEVELOPMENT PROCESS

Creating an electronic portfolio should be viewed as a series of stages, each with its own goals and activities, and requiring different types of software. The author has derived a framework for electronic portfolio development from two bodies of literature: portfolio development in K-12 education and the multimedia or instructional design process. These complimentary processes are both essential for effective electronic portfolio development. Understanding how these processes fit together and how standards or goals contribute to electronic portfolio development, teachers gain a powerful tool for demonstrating growth over time.

From a discussion of both the Multimedia Development Process and the Portfolio Development Process, five stages of Electronic Portfolio Development emerge:

1. Defining the Portfolio Context & Goals (Purpose and Audience)
2. The Working Portfolio (Archive Creation/Digital Conversion)
3. The Reflective Portfolio (asking questions: What? So what? Now what?)
4. The Connected Portfolio (using the capability of the computer to create hypertext links between reflections and portfolio artefacts)
5. The Presentation Portfolio (publishing on WWW, CD-ROM, videotape)

In addition to the stages of portfolio development, there appear to be at least five levels of electronic portfolio development, each with its own levels of expectation and suggested software strategies at each stage depending on technology skills of the student or teacher portfolio developer (Barrett, 2000). These levels are roughly related to “ease of use:”

1. Word processing documents
2. PowerPoint or database files or hypermedia “stacks”
3. Adobe Acrobat (plus digital audio and/or video files)
4. HTML - Web pages
5. Multimedia authoring (i.e., Macromedia Director)

3.1 Reasons for Developing Electronic Portfolios

There are many reasons to move from paper-based to digital portfolios. According to Sheingold (1992), by using technology to store student portfolios, we can make work portable, accessible, and more easily and widely distributed. We can also replay performance works anytime. The author's assumptions (Barrett, 1998) include:

- Today, many documents placed in a traditional portfolio are initially created with a computer, and then printed to paper.
- The use of hypertext links allows clear connections between standards and portfolio artifacts.
- There is emerging evidence that creating an electronic portfolio can develop skills in using multimedia technology.
- A teacher who models the development of an electronic portfolio may be more likely to have students who value the use of this tool to support and document their own learning.
- It may also be more motivating and easier to manage the portfolio development process!

3.2 Electronic Portfolio Development Strategies

There are many strategies for developing electronic portfolios, and they appear to fall under two general approaches: the generic tools approach or using off-the-shelf software, and the customized systems approach which involves designing a networked system or buying a proprietary software package.

3.2.1 Generic tools approach

Portfolios are developed with reflections and artifacts that more closely emulate the traditional 3-ring binder. The portfolio's structure is imposed by the learner or the software for maximum flexibility and creativity. There is a relatively low cost for equipment or software, but there may be a higher cost for training. Students can continue developing their portfolios once out of the educational system.

There are some very good commercial electronic portfolio programs on the market, although they often reflect the developer's style or are constrained by the limits of the software structure. Many educators who want to develop electronic portfolios in the classroom or for themselves tend to design their own, using off-the-shelf software, or generic strategies. The most common tools are: relational databases, hypermedia "card" software, multimedia authoring software, World Wide Web (HTML) pages, Adobe

Acrobat (PDF files), Office Suite software, multimedia slide shows, and digital or analog video.

There is a variety of off-the-shelf multimedia development software that have been adapted for the purpose of electronic portfolios:

- Relational databases

FileMaker Pro - <http://www.filemaker.com>

Microsoft *Access* - <http://www.microsoft.com>

- Hypermedia card formats

HyperStudio - <http://www.hyperstudio.com/>

HyperCard - <http://www.apple.com/hypercard/>

Digital Chisel - <http://www.pierian.com/>

Asymetrix Toolbook - <http://www.asymetrix.com/>

SuperLink - <http://www.alchemediainc.com/>

Some commercially available electronic portfolio templates use some of these programs - the best is a *HyperStudio* template designed at Peakview Elementary School in Colorado and now published by Forest Technologies as *Designer Software Electronic Portfolio Toolkit* - <http://www.foresttech.com/>

- Network-compatible hypermedia - web pages built in HTML using any of the web page development software available
- Adobe *Acrobat* - <http://www.adobe.com/> - an ideal container for publishing digital portfolios that most closely emulates the 3-ring binder of traditional, paper-based portfolios (in fact, Adobe calls Acrobat's Portable Document Format *ePaper*)
- Office software - <http://www.microsoft.com/>
Microsoft *Word* and Microsoft *Powerpoint*
- Multimedia authoring software
Macromedia Authorware
(<http://www.macromedia.com/software/authorware/>)
Macromedia Director (<http://www.macromedia.com/software/director/>)

3.2.2 Customized systems approach

Portfolios are also developed as online record-keeping systems that can be used to collect reflections and artifacts. They are usually highly structured using an online database, leaving the learner with limited flexibility and creativity. There is a high cost for equipment, network server and software development. There may be a lower cost for training, depending on system design. One concern is whether the students can continue developing the portfolio once they are out of the educational system.

Software packages to support these types of electronic or digital portfolios are varied and the titles are growing yearly, although a few

products are no longer available. Some publishers of proprietary software include:

- Aurbach & Associates (*Grady Profile*, initially developed using *Hypercard*, currently under development using other tools, this was the first commercial electronic portfolio program) <http://www.aurbach.com/>
- Scholastic, Inc. (*Electronic Portfolio* based on the metaphor of a timeline using their *Point of View* software -- this is a program that may no longer be available) <http://www.scholastic.com/home.htm>
- SuperSchool Software (*Electronic Portfolio* plus a family portfolio program) <http://www.superschoolsoftware.com/>
- LearningQuest - <http://www.learning-quest.com/ephome.html>
- PersonaPlus - <http://www.personaplus.com/>
- *Portfolio Builder for Powerpoint* by Visions Technology in Education - a series of a templates for PowerPoint - <http://www.toolsforteachers.com/>

The current trend in electronic portfolio development is to make them web-accessible (often using the customized systems approach). The most common choice is developing portfolios as static web pages. However, an emerging trend is to develop dynamic web pages supported by a server-based relational database. One example of this strategy is published by Edmin.com (<http://www.edmin.com/assessment/index.cfm>) and their *Student Portfolio and Assessment System (SPAS)*.

4. EXAMPLES AND WEB RESOURCES

Some significant research in electronic portfolios in K-12 schools has been published by David Niguidula and the Coalition of Essential Schools (http://www.essentialschools.org/pubs/exhib_schdes/dp/dpframe.htm). Kalamazoo College has developed a comprehensive college-wide application of portfolios, emphasizing reflections, connections, and life (<http://www.kzoo.edu/pfolio/>). Alverno College, an early pioneer in the use of portfolios in Teacher Education, developed a *Diagnostic Digital Portfolio* which maintains key performances (<http://ddp.alverno.edu/>)

4.1 Examples from U.S.A.

Some other examples from around the USA that can be found on the World Wide Web include:

- Alaska, USA: Mt. Edgecumb's electronic student portfolios digital learning portfolio research. Many examples of student portfolios from Alaska's boarding school for rural high school students - <http://www.mehs.educ.state.ak.us/portfolios/portfolio.html>

- Colorado: Teachers at Peakview Elementary School have developed a strategy for developing electronic portfolios using *HyperStudio* which, once organized on the computer, are recorded to video tape for sharing with parents. Their program is being marketed through Forest Technologies as the as *Designer Software Electronic Portfolio Toolkit*.
- California: An early project at Bell High School created video portfolios, digitized and written to CD-ROM. Initially a project of the Advanced Technology Group of Apple Computer, this project is one of the earliest illustrations of the use of digital video in portfolios:
http://www.atg.apple.com/personal/Brian_Reilly/video_portfolios.html
- Susan Silverman's web site is one of the few sites on the Internet with electronic portfolios for early elementary students - <http://kids-learn.org>

4.2 Examples from around the world

There are several significant projects conducted internationally that illustrate the worldwide interest in this topic.

Women @ the cutting edge is a small team based at RMIT University in Australia. It originated from a group of women teachers, determined to show that women can lead the development and implementation of technology (<http://www.results-aust.com>) This project began as a response to the growing need to record learning and achievements, and to reflect on them for performance review, recruitment and certification. Two of the team members, Elizabeth Hartnell-Young and Maureen Morriss, recently published a book through Skylight Professional Development, which outlines the results of their work. Currently in the state of Victoria, over 12,000 school teachers now have laptop computers leased from the government, and as a condition of the lease they are required to complete professional development activities. Web-based multimedia portfolios are being developed which reflect the linkage of two trends, ICT and professional portfolios. These authors believed that teachers who engage in developing multimedia portfolios will increase skills in technology, enhance self-knowledge, gain in self-esteem and present a forward-thinking image to their employers. (Kankaanranta, Barrett & Hartnell-Young, 2000)

The CATO project conducted by the Institute for Educational Research at the University of Jyväskylä, Finland, presents an action research study, in which digital school portfolios are used interactively as a means for teachers to collaboratively display and assess the pedagogical practices of kindergartens and primary schools (<http://www.pedanet.jyu.fi/cato/> or <http://www.pedanet.jyu.fi/portfolio/>). This research project was designed to enhance mutual collaboration and understanding between kindergartens and schools. The development work is made visible, followed and assessed

through the research network by means of digital portfolios. In this study there is an emphasis on teacher support in the form of teacher training in educational technology.

A very innovative web site is the Portfolio Info Site at the Amsterdam Faculty of Education: <http://portfolioinfo.efa.nl/uk/index.html>. This web site was developed by the Educative Faculty of the Netherlands as an experimental project in portfolio development. The site was custom-designed to their specifications, and has both public and restricted access.

The Ministry of Education in Singapore has begun a research project on implementing electronic portfolios with teachers and students. In October, 2000, the author trained over 40 Senior IT Trainers on developing professional portfolios. In the next year, electronic portfolios will be implemented in two elementary schools and a high school, to assess the impact of this strategy on student learning.

All of these examples, and many more, can be found on the author's internationally-known web site on this topic: <http://www.electronicportfolios.com/portfolios.html>. The web site is always under development, new additions are welcome, and educators from around the world are encouraged to share their experiences with electronic portfolios and other forms of ICT support for alternative, authentic or performance-based assessment. The author maintains a listserv on electronic portfolios that has members throughout the world, to continue the dialogue on this emerging method of documenting, assessing, and storing the results of student learning and teacher profession development.

5. CONCLUSIONS

With the widespread dissemination of ICT in homes and schools, and the many software tools available to support development, the electronic portfolio is becoming a viable option for dynamically documenting learning and reflection across the lifespan. Young children, with the assistance of older students or parents, can learn to digitise samples of their work and reflect either in writing, or using the power of the technology, to record reflections on their learning in audio or video clips. Older students and adult learners can prepare digital portfolios for employment to further their professional advancement. Teachers can develop electronic portfolios to document their own professional development or achieve advanced certificates. It is the author's wish that electronic portfolios become dynamic celebrations of learning across the lifespan.

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BIOGRAPHY

Helen Barrett is on the faculty of the School of Education at the University of Alaska Anchorage. She has been researching electronic portfolios since 1991, publishing a website on Technology and Alternative Assessment since 1995 (<http://electronicportfolios.com>) and is the Assessment Coordinator for the International Society for Technology in Education's (ISTE) National Educational Technology Standards for Teachers (NETS•T). She has written three successful Preparing Tomorrow's Teachers to use Technology (PT3) federal grants, the most recent being a Catalyst Grant that will provide materials development and dissemination to support technology use in assessment and electronic portfolio development in teacher education programs throughout the United States in 2001-2002.