# Electronic Portfolios – A chapter in *Educational Technology; An Encyclopedia* to be published by ABC-CLIO, 2001.

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An innovation of the early 1990s, an electronic portfolio combines the use of electronic technologies to create and publish a portfolio that most likely will be read with a computer or viewed with a VCR. Let's define a few terms before describing what an electronic portfolio might contain, how it could be constructed, and published.

Artists have maintained portfolios for years, often using their collection for seeking further work, or for simply demonstrating their art; an artist's portfolio usually includes only their best work. Financial portfolios contain a comprehensive record of fiscal transactions and investment holdings that represent a person's monetary worth. By contrast, an educational portfolio contains work that a learner has selected and collected to show growth and change over time; a critical component of an educational portfolio is the learner's reflection on the individual pieces of work (often called "artifacts") as well as an overall reflection on the story that the portfolio should tell. All future references to "portfolios" in this article refer to portfolios used in education, although electronic portfolios may be developed in other fields for a variety of purposes.

## Definition of portfolio

Grant Wiggins' defines a portfolio as:
> "… a representative collection of one's work. As the word's roots suggest (and as is still the case in the arts), the sample of work is fashioned for a particular objective and carried from place to place for inspection or exhibition." (Wiggins, 2000)

Educators in the Pacific Northwest, through the Northwest Evaluation Association (1990), developed the following definition of a **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.

The traditional storage format for portfolios in education is paper-based, usually in manila folders, three-ring notebooks or larger containers. Most often, the artifacts are comprised of text and images on paper, although the use of video or audio tape has been emerging.

## Various Portfolio Purposes

There are three general purposes for developing portfolios: Learning (Formative) Portfolios, which usually occurs on an ongoing basis supporting professional development; Assessment (Summative) Portfolios, which usually occurs within the context of a formal evaluation process; and Employment (Marketing) Portfolios, which are used for seeking employment (Hartnell-Young & Morriss, 1999; Wolf, 1999). There are Working Portfolios, Showcase or Best Works Portfolios and Assessment Portfolios.

As noted above, portfolios can be a form of 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

"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 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.

**Electronic Portfolio defined**

An **electronic portfolio** uses electronic technologies, allowing the portfolio developer to collect and organize portfolio artifacts in many media types (audio, video, graphics, text). A standards-based portfolio uses a database or hypertext links to clearly show the relationship between the standards or goals, artifacts and reflections.  The learner's reflections are the rationale that specific artifacts are evidence of achieving the stated standards or goals.

Often, the terms Electronic Portfolio and Digital Portfolio are used interchangeably; however there is a distinction: an Electronic Portfolio contains artifacts that may be in analog form, such as a video tape, or may be in computer-readable form; in a Digital Portfolio, all artifacts have been transformed into computer-readable form. An electronic portfolio is not a haphazard collection of artifacts (i.e., a digital scrapbook or a multimedia presentation) but rather a reflective tool that demonstrates growth over time. (Barrett, 2000)

Most of these definitions include the word **collection**; collections of work can be folders, or scrapbooks or portfolios. What differentiates an electronic portfolio from a digital scrapbook or an online resume is the organization of the portfolio around a set of standards or learning goals, plus the learner's reflections, both on their achievement of the standards, and the rationale for selecting specific artifacts, as well as an overall reflection on the portfolio as a whole.

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)

**Electronic Portfolio Development Process**

Creating an electronic portfolio can seem daunting, but it becomes less arduous if viewed as a series of stages, each with its own goals and activities, and requiring different types of software. The author 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.

Creating an electronic portfolio can develop teachers' as well as students' multimedia technology skills. The **multimedia development process** usually covers the following stages (Ivers & Barron, 1998):

- *Assess/Decide.* The focus is on needs assessment of the audience, the presentation goals, and the appropriate tools for the final portfolio presentation.
- *Design/Plan.* In the second stage, focus on organizing or designing the presentation. Determine audience-appropriate content, software, storage medium, and presentation sequence. Construct flow charts and write storyboards.
- *Develop.* Gather materials to include in the presentation and organize them into a sequence (or use hyperlinks) for the best presentation of the material, using an appropriate multimedia authoring program.
- *Implement.* The developer presents the portfolio to the intended audience.

- *Evaluate*. In this final stage of multimedia development, the focus is on evaluating the presentation's effectiveness in light of its purpose and the assessment context.

Each stage of the **portfolio development process** contributes to teachers' professional development and students' lifelong learning. Danielson and Abrutyn (1997) lay out a process for developing a portfolio:

- Collection - teachers and students learn to save artifacts that represent the successes (and "growth opportunities") in their day-to-day teaching and learning
- Selection - teachers and students review and evaluate the artifacts they have saved, and identify those that demonstrate achievement of specific standards
- Reflection - teachers and students become reflective practitioners, evaluating their own growth over time and their achievement of the standards, as well as the gaps in their development
- Projection (or Direction) - teachers and students compare their reflections to the standards and performance indicators, and set learning goals for the future. This is the stage that turns portfolio development into professional development and supports lifelong learning.
- Presentation - teachers and students share their portfolios with their peers. This is the stage where appropriate "public" commitments can be made to encourage collaboration and commitment to professional development and lifelong learning.

Combining both the Multimedia Development Process and the Portfolio Development Process, five stages of Electronic Portfolio Development emerge:

1. **Defining the Portfolio Context & Goals:**

   In this first stage, the primary tasks are: Identify the assessment context, including the **purpose** of the portfolio. Identify the goals to be addressed in the portfolio. This important step sets the assessment context and helps frame the rest of the portfolio development process.

   Knowing the primary **audience** for the portfolio will help decide the format and storage of the formal or presentation portfolio. Before making any decisions about the development software, identify the **resources** available for electronic portfolio development.

2. **The Working Portfolio**:

   This stage of the electronic portfolio development process occupies the longest span of time and is the stage often called, "Becoming a Digital Packrat!" Knowing which goals or standards you are trying to demonstrate should help determine the types of portfolio artifacts to be collected and then selected. Select the software development tools most appropriate for the portfolio context and the resources available. Just as McLuhan said, "The medium is the message", the software used to create the electronic portfolio will control, restrict, or enhance the portfolio development process. Form should follow function as well, and the electronic portfolio software should match the vision and style of the portfolio developer.

Use whatever software tools are currently being used to collect artifacts, storing them on a hard drive, a server, or videotape. Set up electronic folders for each standard to organize the artifacts (any type of electronic document) and use a word processor, database, hypermedia software or slide show to articulate the goals/standards to be demonstrated in the portfolio and to organize the artifacts. Identify the storage and presentation medium most appropriate for the situation (i.e., computer hard disk, videotape, local-area network, a WWW server, CD-ROM, etc.). There are also multiple options, depending on the software chosen.

Gather the multimedia materials that represent your achievement. You will want to collect artifacts from different points of time to demonstrate growth and learning that has taken place. Write short reflective statements with each artifact stored, to capture its significance at the time it is created.

**3. The Reflective Portfolio**:

This stage of the electronic portfolio development process usually precedes evaluation reviews (for summative portfolios) or employment applications (for marketing portfolios). In the formative portfolio reflections typically occur at significant points in the learning process, and are added contemporaneously as noted in the previous stage. Reflection on one's work is requisite if the portfolio owner is to learn from the process.

Here are three simple questions to ask which clarify this reflective process (Campbell, Melenyzer, Nettles, & Wyman, (2000) based on Van Wagenen and Hibbard (1998):
1. "What?"
2. "So what?"
3. "Now what?"

To use these questions, the student would first summarize the artifact that documents the experience, in order to answer the question "What?" Second, the student would reflect on what he or she learned and how this leads to meeting the standard, which answers the question "So what?" And third, the student would address implications for future learning needed and set forth refinements or adaptations, in order to answer "Now what?" (p.22).

This process of setting future learning goals turns electronic portfolio development into a powerful tool for professional development. That's why the "Now What?" question becomes important. Semi-public commitments to professional development goals can become motivation to work on those areas. As Kay Burke (1996) insists, quoting Kenneth Wolf (1996), a professional portfolio system invites "teachers to become the architects of their own professional development." (p.37)

**4. The Connected Portfolio**:

To some degree, this stage is unique to the electronic portfolio, because of the capability of the software to create hypertext links between documents, either locally or on the Internet. At this stage, create hypertext links between goals, work samples, rubrics, and reflections. Insert appropriate multimedia artifacts. Create a table of contents to structure

the portfolio; use the outlining capabilities of either Word or PowerPoint, or the graphical organizing AND outlining capabilities of Inspiration.

The choice of software can either restrict or enhance the development process and the quality of the final product. Different software packages each have unique characteristics, which can limit or expand the electronic portfolio options. It is important to select software that allows easy creation of hypertext links, to be able to link evidence of achievement to the goals and reflections and identify patterns through this "linking" process.

The process of creating a portfolio with hypertext links contributes to the summative assessment process. When using the portfolio for assessment, the transformation from "artifacts" to "evidence" is not always clear. Linking reflections to artifacts makes this thinking process more explicit. The ability to create links from multiple perspectives (and multiple goals) also overcomes the linearity of two-dimensional paper portfolios, permitting a single artifact to demonstrate multiple standards (i.e., national technology standards, our state's teaching standards).

Use the portfolio evidence to make instruction/learning or professional development decisions. This process effectively brings together instruction and assessment, portfolio development and professional development.

**5. The Presentation Portfolio**:

At this stage, record the portfolio to an appropriate presentation and storage medium. This will be different for a working portfolio and a formal or presentation portfolio. The best medium for a working portfolio is video tape, computer hard disk, Zip disk, or network server. The best medium for a formal or presentation portfolio is CD-Recordable disc, WWW server, or video tape.

Present the portfolio before an audience (real or virtual) and celebrate the accomplishments represented. This will be a very individual strategy, depending on the context, and an opportunity for professionals to share their teaching portfolios with colleagues for meaningful feedback and collaboration in self-assessment. This "public commitment" provides motivation to carry out the professional development plan of a formative portfolio.

Evaluate the portfolio's effectiveness in light of its purpose and the assessment context. In an environment of continuous improvement, a portfolio should be viewed as an ongoing learning tool, and its effectiveness should be reviewed on a regular basis to be sure that it is meeting the goals set.

Post the portfolio to WWW server, or write the portfolio to CD-ROM, or record the portfolio to videotape.

**Electronic Portfolio Development Tools:**

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).

1. No digital artifacts. Some video tape artifacts.
2. Word processing or other commonly-used files stored in electronic folders on a hard drive, floppy diskette or LAN server.
3. Databases, hypermedia or slide shows (e.g., PowerPoint), stored on a hard drive, Zip, floppy diskette or LAN server.
4. Portable Document Format (Adobe Acrobat PDF files), stored on a hard drive, Zip, Jaz, CD-R/W, or LAN server.
5. HTML-based web pages, created with a web authoring program and posted to a WWW server.
6. Multimedia authoring program, such as Macromedia Authorware or Director, pressed to CD-R/W or posted to WWW in streaming format.

As shown above, here are many strategies for developing electronic portfolios, and they appear to fall under two general approaches: the **common 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 or online service.

**Common 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. Student can continue developing their portfolio 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.

**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.

**Summary:**

There are many tools that can be used to develop electronic portfolios over the stages that have been outlined in this article. The value added of creating an electronic portfolio should exceed the efforts expended, and teachers should approach their use of technology conservatively. Keep the process simple by using familiar software as you get started. Above all else, the electronic portfolio should showcase learner achievements, and growing capabilities in using technology to support lifelong learning.

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