

Electronic Portfolios in Engineering Technologies and Construction Management at the University of Cincinnati

Jo Ann Thompson, Ed.D. and George Suckarieh Ph.D., P.E. ,
University of Cincinnati
Cincinnati, Ohio

Electronic portfolios, or e-portfolios for short, are powerful tools that can be used to fulfill many objectives of higher education. The first and most important objective is student learning. When continuously compiling materials for e-portfolio, and reflecting on these materials, students learn to connect the dots between their classes and the skills they are developing while assessing their personal growth. Personal assessment is a skill that allows these future professionals to maximize their career potential. A second objective for e-portfolios is for faculty to readily access students' progress in programs to improve their learning. Depending on their contents, e-portfolios provide both dynamic and static views of student learning. They allow faculty to pinpoint deficiencies before they hamper student success. In essence, e-portfolios serve as a mechanism for a feedback loop to improve the education of the students. Finally, e-portfolios can be refined to serve as a rich website for students as they prepare to join the workforce. This paper presents the process for implementing e-portfolios in the College of Applied Science, University of Cincinnati. It describes the faculty's effort to learn about, devise a plan for, and implement e-portfolios in the College. This effort is in its second year.

Keywords: Electronic Portfolios, e-portfolios, Learning, Assessment, Lifelong Learning

Introduction

Seven faculties from the College of Applied Science (College), University of Cincinnati, formed a community to explore "Assessment of Learning with Electronic Portfolios" and participated in the university-sponsored September Institute. The Institute was part of a program initiated by the Center for Enhancement of Teaching and Learning (CETL) at the university. The community consisted of six faculty representing six different technology majors and one faculty member from the humanities department. Their main goal was to learn about and then implement the application of e-portfolios in various technology programs. The community met for one week in September, 2005, and explored launching a College-wide e-portfolio project. During that week, they reviewed the literature, discussed educational theories, and investigated different software packages that might be used to generate e-portfolios. They then developed a series of easily-usable templates, used them to develop their own portfolios, and devised an initial plan for implementation of the project at the College level. The plan was to begin immediately with a pilot course for students in the Honors Scholars program. By the end of the Fall Quarter of 2005, they broadened the e-portfolio development program to include most of the first-year students in the College. The latter cohort of students would then continue developing their e-portfolios by adding benchmark course materials and reflections throughout their first year. Plans were also made to include future benchmark courses which the students would include in their e-portfolios as they continued through their degree programs.

Seven specific objectives emerged for the project envisioned during the September Institute:

1. To understand basic elements of e-portfolio educational theory;
2. To explore software alternatives for e-portfolio development and choose an appropriate vehicle;
3. To construct a user-friendly template that would be appropriate for students in all majors;
4. To develop a pilot course that would employ the e-portfolio model and apply what was learned in the pilot to the general student population;
5. To educate other members of both the Applied Science faculty and the University faculty of the value and benefits of the e-portfolio;
6. To develop multi-level assessment strategies; and
7. To assess the outcomes of the initial project, in terms of student acceptance, ease of use, and transference and connectivity of knowledge/skills across courses, and in terms of faculty acceptance of the model.

The objective of this paper is to describe the process of the development of the e-portfolio project at the College, the implications of the use of e-portfolios on student learning, faculty assessment of that learning, and, in adapted forms, as enriched résumés.

Background and Context: Stakeholders and Scale

The College is a bachelor-degree-granting division of the University of Cincinnati. It offers nine technical majors which lead to bachelor's degrees: Architectural Engineering Technology; Construction Management; Chemical Technology; Computer Engineering Technology; Culinary Arts and Science; Electrical Engineering Technology; Facilities and Hospitality Management; Information Technology; and Mechanical Engineering Technology. Entering first-year classes number approximately 250 students. During their first year enrolled at the College, most students take a full load of courses (12 to 18 credit hours per quarter). These classes are a mixture of introductory classes in their major fields and general education courses such as mathematics, English composition, psychology, or speech communication. Students also take a professional development course to help prepare them for their co-op experiences. After their first year, students usually alternate between academic quarters, during which they attend classes, and co-op quarters, during which they work in their fields in university-sanctioned co-op positions. Students receive salaries for their co-op positions, and co-op employers frequently hire former students as they graduate. Students at the College of Applied Science are highly technical and career-oriented. However, despite these representative qualities, not all students enter the College with high degrees of competence, or confidence, in electronic learning practices or strategies.

Stakeholders

Several distinct groups can be identified as stakeholders in this project: students, faculty, departments in the College, and employers. The primary stakeholders in this project are the students, who would benefit both educationally and professionally from creating their e-portfolios. Developing an e-portfolio such as the one envisioned in this project would help them make sense, or as John Dewey would say, "make meaning," of their college courses and the sequence of these courses (Rodgers, 2002). The e-portfolio would also help them realize their professional personas by helping them develop their résumés and analyze their professional and

academic experiences over time. In addition, they would be able to post complex projects for viewing by potential employers. Initiating e-portfolios would engage faculty as teachers, mentors, and assessors - both of student learning and of the quality and outcomes of their courses. Departments in the College would benefit from the e-portfolio process as described here in several different areas. Use of the proposed e-portfolio should improve students' understanding of departmental requirements. Faculty would be able to use e-portfolios to assess the progress of student learning at key points in the students' academic careers. In effect, faculty could use the e-portfolio as a gatekeeper. E-portfolios could be reviewed at regular intervals in students' academic careers. Students who had not achieved mastery of key concepts in a discipline could thus be identified, and appropriate steps taken before they had fallen too far behind in their programs. In addition, the inclusion of outcomes assessment would help departments identify student perceptions of course work in relationship to fulfillment of ABET criteria. Finally, co-op employers and post-graduation employers could use the students' e-portfolios as valuable tools that would provide much richer pictures of potential employees than a standard paper résumé.

Scale

During the early autumn, 2005, the e-portfolio project initially consisted of the seven original faculty members and a group of six Honors Scholars students. By late autumn, the project had expanded to include approximately 160 students enrolled in a first-year experience course and their instructors. Over the rest of the 2005-2006 winter and spring terms, approximately 175 students and an additional six faculty participated in the first stage of the project. In the autumn, 2006 quarter, the e-portfolio project included virtually all of the first-year students in the College (approximately 200), four of the original faculty members, and four additional English Composition faculty members.

Implementation

Software Issues and Decisions: the Nuts and Bolts of the Project

In addition to developing a theoretical schema on which to build the e-portfolio project, the faculty realized that the method of constructing the portfolios themselves had to be easily accessible and inexpensive for students and faculty at the college. The method also had to be simple. Students and faculty at the College of Applied Science represent a wide range of computer literacy. Some students enter the College with extensive software and Internet proficiency; others have little experience beyond word-processing. Faculty expertise also varies widely. The group needed to identify or create a systematic approach to e-portfolio development that would be adaptable, simple to use, and easily translate into more sophisticated software as the students themselves became more computer-literate.

The group initially investigated using the Blackboard Learning System™ (Blackboard) as the vehicle for students and faculty to create and maintain their e-portfolios. Since the University of Cincinnati supports the Blackboard system university-wide, and Blackboard offers an electronic portfolio function which would be available to all University students, this option seemed to be the most practical and the most obvious. A member of the Faculty Technology Resources Center

at the University of Cincinnati held a training session during the Institute during which she reviewed the capabilities of the Blackboard e-portfolio. Although the group had initially anticipated using Blackboard as the principal method for students to develop their e-portfolios, the limited disk space of the program (100 MB for students) and obvious problems that arose during the training session at the Institute led them to reject this option.

The second software option the faculty investigated during the Institute was the web development tool, Dreamweaver. As was the case with Blackboard, the group met for training sessions, this time with a member of the University Libraries instructional staff. Dreamweaver initially seemed to meet the group's needs. While sophisticated, this software was also user-friendly and promised to encourage and support creativity in student e-portfolio development. Faculty (and some student) training on the product would be available through the library's Instructional Services. In fact, the navigational template for the students' e-portfolios was developed using Dreamweaver. However, when the group considered potential student access to this product, it, too, had to be rejected. While Dreamweaver was available in some computer laboratories at the College of Applied Science, it was not universally available to all students. It is also relatively expensive program, a fact that would limit students from purchasing the program for themselves.

In the end, Microsoft Word emerged as the most easily adopted program for student use. One of the faculty members created an e-portfolio manual geared specifically for students in the pilot course to help them create their portfolios using Word. This software proved to be an easy entry point for all students, and was accessible throughout the College. The initial manual was then revised and adapted so that it could be used by any student in any course either to create the initial e-portfolio or as a reference tool for adding artifacts and reflections from subsequent courses.

Developing the e-portfolio Model

As discussed earlier, the e-portfolio model visualized by the faculty in this project would serve several purposes. In her 2001 chapter in *The Electronic Portfolio Education Technology Encyclopedia*, Barrett describes three purposes for the electronic portfolio: "formative," "summative," and "marketing." The authors sought to unite these three purposes. The e-portfolio they suggest would be used to foster student learning in an on-going basis: it would be a "formative" portfolio. The authors also sought to develop an e-portfolio model that would serve as a "summative" portfolio: it would serve as a vehicle for assessment. The focus of this assessment, however, was both on individual student work, and on the achievement of program outcomes. The e-portfolio envisioned would facilitate assessment of each student's work, focusing on artifacts and reflections in benchmark courses. But it would also provide an integrated assessment of the courses and programs of study represented in the portfolios, guided by accreditation criteria. Use of the accreditation criteria would provide a strong mechanism for a feedback loop that could improve programs. Finally, the portfolios could be refined to serve as enriched résumés for students before starting a new cooperative education experience or before joining the workforce when they graduate. In this fashion, the College's e-portfolios could evolve to become "marketing" portfolios. These three different, sometimes competing, but always interconnected purposes had to be merged into a workable model for the students.

In addition to this conceptualization of an evolving e-portfolio model that could serve three purposes, the faculty also had to provide a model that could be easily utilized by beginning students. They developed a series of templates that contained all of the elements that students would need to begin to build their own e-portfolios. All of the templates were devised to encourage students to develop an e-portfolio which would, in the end, address the three purposes discussed above. This was accomplished by designing templates with the three outcomes (learning, assessment, and employment) in mind, then nesting the templates within the different navigational areas.

A first-page navigational template (see figure 1), and all of the other initial documents and additional support templates were packaged in a zip file. This file would be given to all students as they begin their e-portfolio development. The students would then save the file to their network space at the College, providing them continual access to the material. The first navigational page of the template supplies students with links to develop sections which roughly represent the three purposes of CAS e-portfolio. The lower left-hand corner of this page contains links to the academic, assessment and professional aspects of the portfolio: "My Résumé," "My Major Program," "My Course Portfolio," and "My Co-op Experience." The résumé and co-op links relate directly to the marketing and employment functions of the e-portfolio. "My Major Program" and "My Course Portfolio" can be considered as reinforcing the learning and assessment outcomes of the e-portfolio. The major program link (as in the student's major course of study) and the course portfolio link were designed to underscore both the learning and assessment purposes of the portfolio. Both of these links were designed with nested templates.

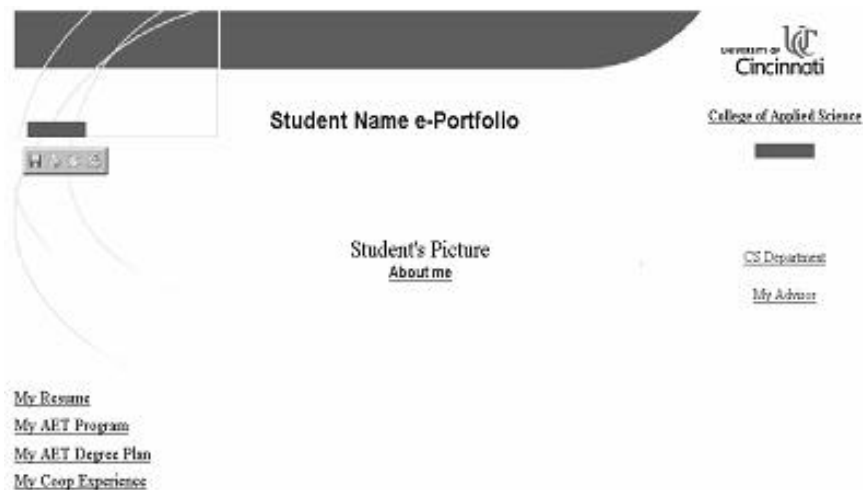


Figure 1: The original first page template



Figure 2: A first-year student's adaptation of the first-page template

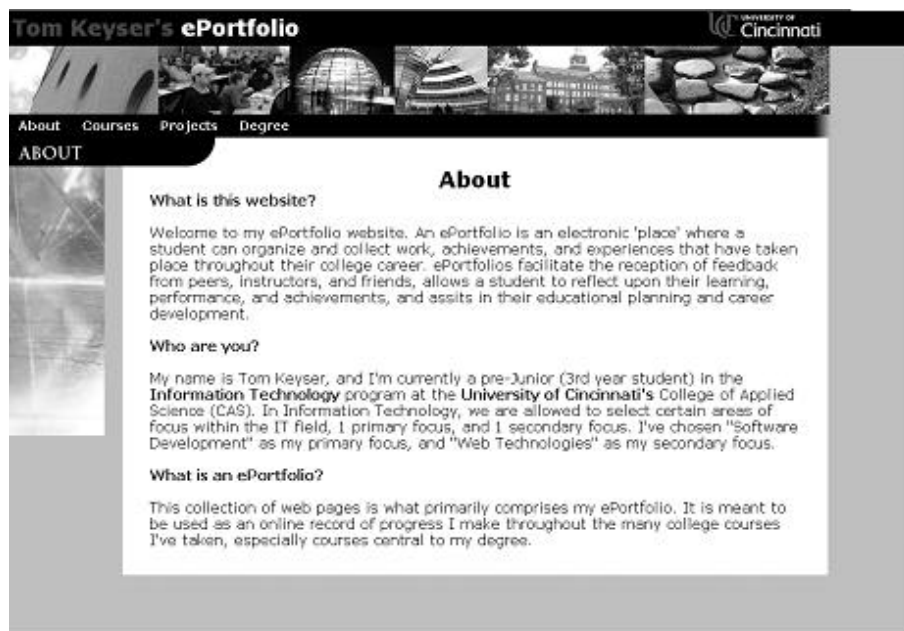


Figure 3: A third-year student's adaptation of the first-page template

The focus of the navigational page template is the student's photo, and a link, "About Me," which encourages students to provide their own histories and images. It also allows them to customize the portfolio over time. The faculty envisions that, as the students mature and gain experience, these sections of the students' e-portfolios will reflect that evolution and enhance student learning in the affective as well as cognitive arenas. In fact, any number of students, from first-year up, immediately changed this first page to make it their own (see figures 2 and 3). They adopted and adapted much more quickly than the authors could have imagined.

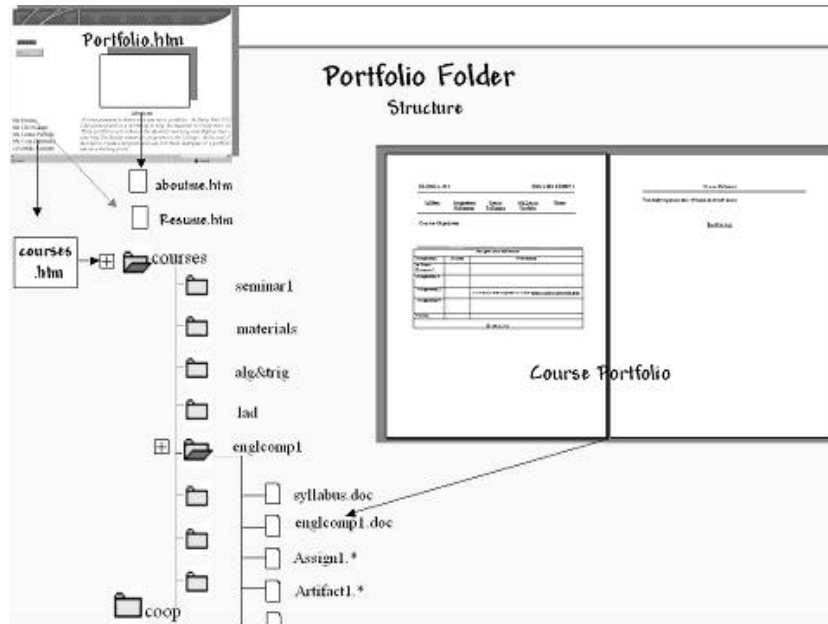


Figure 5: The structure of the e-portfolio

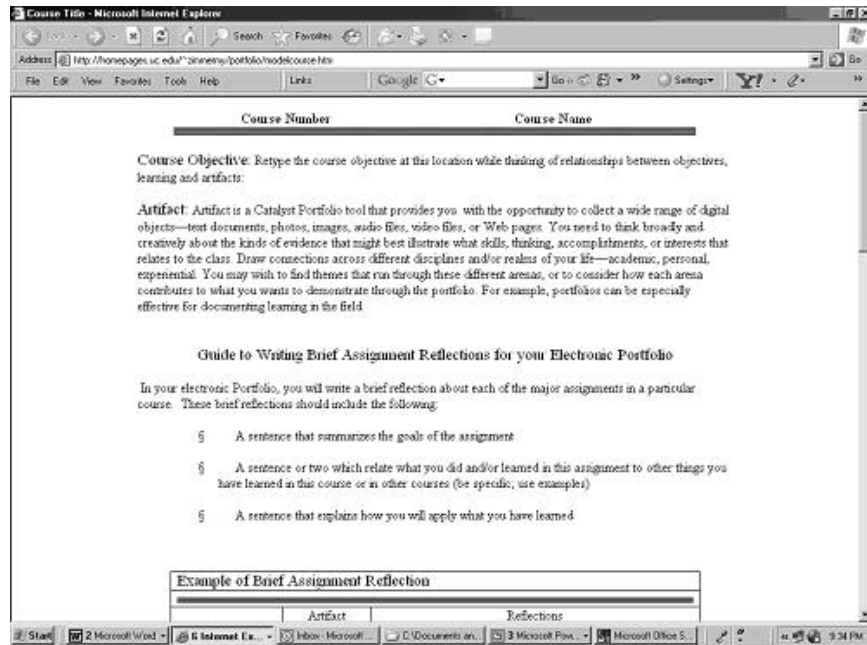


Figure 6: Artifact table and reflection prompts

A longer, more directed, prompt was developed for the full course reflection that follows the artifact table. It is with this prompt that the authors hoped students would provide information for program assessment. The "Guidelines for Writing a Course Reflection" ask the students to

develop a multi-paragraph essay within a standard essay format. But the guidelines also include a series of questions derived from the accrediting body's (ABET's) outcome criteria for engineering education (see figure 7). The authors feel that close readings of these reflections will help faculty assess course and program effectiveness in terms of whether students perceive their courses fulfill the stated criteria.

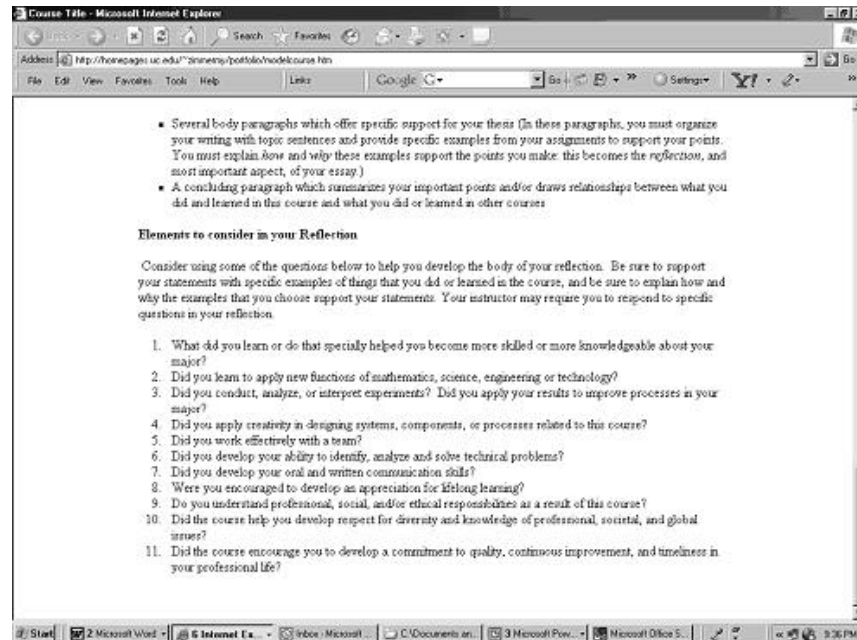


Figure 7: Course reflection guidelines developed from ABET criteria

Speculations on Success

Over a year has passed since the launch of the e-portfolio project at the College. In that time, both the faculty and the students at the College have become more proficient at portfolio development. Faculties who facilitate students' initial e-portfolio development find an easier task: many of the problems encountered in the first iterations of the project have been either eliminated or can be forestalled with more specific instruction. In addition, the University is seriously investigating the purchase of software and services that would simplify the development of e-portfolios for students and make both student and program assessment relatively seamless. The College has become one of only two within the University with hands-on experience with the development of e-portfolios. Anecdotal evidence seems to point to the fact that students, too, are beginning to recognize the value of the e-portfolio process. A student from the initial pilot course has, unsolicited, included every one of his first year courses, with artifacts and reflections, in his e-portfolio. Other students from the first cohort have developed elaborate "About Me" sections of their e-portfolios, mimicking, in a more professional format, a "My Space" site.

The objectives specifically discussed in this paper include enhancement of student learning, ready access for faculty to assess that learning, and the potential modification of students' e-portfolios so as to be used as enriched résumés when they enter the job market. It is too early in

the project to speculate on all of the possible results. Students are only beginning the e-portfolio process, and time will tell whether they will reap the benefits with long-term exposure to the concepts and their own intellectual and academic maturation. However, it is not too early to reflect on the e-portfolio process and its impact on teaching and learning within the group engaged in its development. Each of the original members of the project has come away from the first year with different opinions regarding its implementation and the nature and functions of the e-portfolio for student learning and assessment.

All, however, recognize its potential as a means to foster learning and promote transference of that learning both within and among courses. The key to these aspects of the e-portfolio process is the reflective component itself. Barrett (2004) notes that, without substantive reflection, an e-portfolio is only a “container” serving no purpose other than acting as an apparatus for collecting materials. It is the act of thinking and writing about *how* and *why* from which students construct meaning in their courses, internalize that meaning, and begin to see the relationships in the learning between one course and another. Understanding and building upon these relationships are crucial in all courses, but have special meaning and importance in the applied sciences. If faculty can readily access both examples of student work (“artifacts”) and the students’ reflections on that work in e-portfolios, they can use that information to assess students’ progress. They can pinpoint and address problems in student learning much earlier in a student’s academic career. In fact, several faculty from the Construction Science Department of the College are focusing on this approach within their department.

The possibility of students’ converting their e-portfolios from learning and assessment vehicles to enriched résumés offers both promise and challenges. The possibility of electronically presenting large scale projects for review by potential employers will give students enormous flexibility in their application process. Potential employers would also benefit. They would have the opportunity to form a much more complete picture of prospective employees’ capabilities. On the practical side, however, employers might not feel comfortable accessing or manipulating e-portfolios, and therefore might not realize their value.

The plan for assessing the outcomes of this project includes conducting telephone exit interviews with a sample of the students and faculty involved during the 2005-2006 academic year. These interviews have yet to be conducted, but are crucial to the credibility of the project and to identifying its strengths and weaknesses. Other aspects of the project had to be revisited and restructured for the 2006-2007 academic year. The course which was identified as the initial portfolio development course no longer serves a majority of the first-year students. The first-year English Composition courses will now function as the entry point for e-portfolio development. Benchmark courses in the students’ major areas also must be identified and their instructors enlisted to participate in the project. To this end, several members of the Construction Science Department began to incorporate e-portfolios into their courses in the autumn, 2006 quarter. However, without more complete participation of more faculty in other major areas of study, the full value of the portfolio process will never be realized. The introduction of e-portfolios as learning, assessment and employment tools at the College promises success. Whether the promise can be sustained over the years required to fulfill the long term mission of e-portfolio learning has yet to be realized.

References

Barrett, H. (2001). Electronic Portfolios. *Educational technology: An encyclopedia* [WWW document]. URL <http://electronicportfolios.org/>

Barrett, H. (2004). *Electronic portfolios as digital stories of deep learning* [WWW document]. URL <http://electronicportfolios.org/digistory/epstory.html>

Barrett, H. and Wilkerson, J. (2004). *Conflicting paradigms in electronic portfolio approaches* [WWW document] URL <http://electronicportfolios.org/systems/paradigms.html>

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *Teachers' College Record*, 4, 242-266.

Rubens, W. and Heinze, O. (2005). *Portfolio as tool for academic education and professional development*. Eifel Conference Paper. Eportfolio 2005, Cambridge, UK