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Citation: MARTIN, M., 2007. Evaluating an approach for eportfolio development. IN: Norman, E.W.L. and Spendlove, D. (eds.). The Design and Technology Association International Research Conference 2007, University of Wolverhampton, Telford Campus, 4,5,6 July. Wellesbourne : The Design and Technology Association, pp. 57-60

Additional Information:

- This is a conference paper

Metadata Record: https://dspace.lboro.ac.uk/2134/3349

Publisher: © DATA

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Evaluating an Approach for Eportfolio Development
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Introduction
This paper reports on the evaluation of three years of eportfolio development work at Liverpool John Moores University with undergraduate students undertaking a final year design and technology module of key significance in determining their overall degree classification.

Set up in 2002 the module is assessed solely through an electronic portfolio. Whilst, on first impression, appearing not to value students’ making skills, the module encourages risk taking and often results in high quality finished products. Common to the module from 2003 to 2006 was the use of grade-related assessment criteria. These were modified versions of criteria from similar modules where students would develop paper-based portfolios and three-dimensional outcomes.

The aim of the research was to explore similarities and differences in the pedagogical approaches that have been undertaken over the years and identify future trends and ways of further developing the students’ experience. In doing so it was necessary to use a mixture of quantitative and qualitative methods that included: comparing assessment procedures by analysing documentation; comparing outcomes across the cohorts and interviewing tutors and students to provide insights into the processes of development.

Significance of portfolios
Portfolios have long been established in design and technology education with their own distinct purpose for the development of capability (Welch and Barlex 2004). The development of a design portfolio is useful for both learner and teacher. For the learner, it is useful as a means of recording their thinking and developing ideas by the interaction of mind and hand (APU 1981). For the teacher it is useful as a record of their work and as a means of assessing capability over a prolonged period of time.

Central to portfolios is the development of process skills and particularly decision making about how to proceed to the next stage of design and making. Annotation is crucial in providing a window on learners thinking and demonstrating their knowledge of materials, manufacturing processes and aesthetics. Hand drawn sketches and annotation provide authenticity to the work and can be highly personal.

Dialogue with learners about their portfolios are an important part of the process of developing practical skills, providing opportunities to refine, extend and sometimes totally change the direction of project work. This exchange of views is essential when high-risk activities are being undertaken as the tutor is able to advise on possible ways forward. In addition, the dialogue provides an opportunity for teachers to assess pupils cognitive modelling and decision making skills.

The iterative nature of portfolios as they develop, with opportunities for formative feedback, is also important as credit for aspects of designing and making can be acquired at different stages before a final product is realised. Should there be problems in the manufacturing of a product, credit can still be given for the work undertaken up to that point. The use of review points, involving the sharing of assessment criteria with learners, can help them understand the level of their performance and provide targets for development.

Assessing portfolios can be problematic and subjective. Grade-related criteria can help with this and provide learners with a mechanism for judging their progress and likely level of attainment.

Eportfolios
The term eportfolio has many different meaning depending on the purpose for which they are seen to be used. Research in the United States has been considerable and there is much that practitioners in the UK can learn from those who have undertaken work with pupils and students in the USA.

The use of eportfolios in the UK has been less prolific. Mitchell et al (2003) suggest a number of factors why and suggest that the barriers are being removed over time.

The idea of electronic portfolios as examples of story telling in digital form (Barrett 1994) is of particular interest to those involved in design and technology education.

Nature of the module
The undergraduate module being evaluated is an important one for students in their final year of study and is worth 24 credits at Level 3 (worth 20% of the final year marks). Set up in 2002 the module, involving designing and making a
product, is assessed solely through a portfolio. There is an emphasis on process and risk taking is encouraged.

Examples of work undertaken in previous years are used to reassure students that the quality of the process and not the eventual outcome is of significance. This is further reinforced by the assessment criteria where only one of the eight criteria is related to making. As they are equally weighted this clearly indicates that other aspects of their designing are highly valued.

A number of review points occur during the three months that the module runs and students are expected to outline their progress and plans for future development of their work.

**Pedagogy**
The differing views of tutors was reflected in the pedagogical and assessment strategies used.

In 2003 and 2004 students the Module Leader provided a fixed structure for the portfolio with no more than 10 PowerPoint slides. The discipline of keeping to a limited number of screens was felt to be important with students having to make decisions about the content and refine the way they presented the information. During this time students were assessed against criteria but no grade-related statements were provided and the marks for each criteria were indicated on a sliding scale.

In 2005 and 2006 the strategy adopted by the module leader changed and students were not restricted in any sense – either software used or size of portfolio. This was felt to better reflect the way in which students worked through their project work with the portfolio illustrating the journey they had undertaken. In this sense storytelling through portfolios was encouraged (Barrett 2004).

For assessment purposes grade-related assessment criteria was used. For the 2005 cohort the grade-related statements were introduced after a number of weeks of progress. With the 2006 cohort, however, students were aware of the criteria from the very beginning which, as will be seen later, affected the approach they took to structuring their portfolios.

**Research**
Whilst the module itself has remained unchanged during the last four years, staff and students and resources have changed. In particular there has been a change from a PowerPoint presentation with a fixed number of slides to the current year with no limitations in terms of software or size of electronic portfolio. Currently the entire course is under review and this, along with a general interest in digital portfolios across the D&T community, provide good reason to review the development of portfolios and speculate on future needs and training. In addition, the use of electronic portfolios for recording subject knowledge and the professional development has been discussed and research into the module was likely to be of use in framing future developments within the Department.

**Methodology**
Available for evaluation were 38 electronic portfolios on CD and USB memory stick from four cohorts of students from 2003 to 2006. In looking at the portfolios it was necessary to develop a strategy to categorise the structure and content of portfolios. It was decided to look at a number of attributes including portfolio size, degree of annotation, use of images/audio/video, quantity of additional information, use of indexing, hyperlinks and ease of navigation. Results were recorded on a spreadsheet so that comparisons could be made.

In addition to an exploration of the portfolios themselves, five of the current cohort of students were questioned in order to identify what they felt were important issues. Five simple, generally open, questions were asked.

The number of portfolios were relatively small and whilst the quantitative data proved interesting, the approach taken was essentially qualitative. Overall the research aimed to identify possible issues with the development of electronic portfolios for high-stakes assessment in design and technology and a small amount of rich data was felt to be enough to provide guidance for future developments.

**Results**

**Eportfolio comparison**
The key similarities across cohorts are the use of software, inclusion of images on virtually every slide, annotation only on scanned sketches and little use of audio.

The differences between the cohorts reflected different pedagogical and organisational approaches. Those in 2003 and 2004 had a limited number of slides (average 11), no audio or video and a linear structure with no navigational aids. In 2005 the number of slides increased (average 24 slides), most had some form of navigation and there was only one example of the use of audio and video.

In contrast, those in 2006 used even more slides (average 43), all used a menu structure and links back to a homepage, half used video and one used audio.
Student views
Issues emerging from their responses are outlined below.

Q1. What do you see as the benefits of using electronic portfolios?
The two main benefits identified were the manageability of the portfolio and the ability to edit and refine the content. Additionally students felt that they saved time and gave a professional finish. One of the more interesting comments referred to the non-linearity of their portfolio:

... you can make links between specific parts of the design process which makes it more like the true design process (i.e. not a linear process) ...

(Student A)

Other comments related to the ability to add multimedia content and the fact that they were more affordable.

Q2. What do you see as the drawbacks of using electronic portfolios?
The main drawback was linked to sketches. Students felt that scanned sketches were not as effective as paper copies, the annotation was easier, paper facilitated more creativity and that inputting data took time.

Other drawbacks related to the need for access to a PC and the level of ICT skills. Those students with good ICT skills were seen to benefit and gain more credit.

Q3. In what ways did working electronically change the final product?
It was clear from the response of the students that they felt the production of an electronic portfolio had had little effect on the nature of the final product.

The most significant change was felt to be the reduction in time ‘making it pretty’ and the consequent additional time that could be devoted to the making of the product itself. One student, however, felt that it took more time due to the level of ICT skills. The only other identified change was of a higher overall quality of product.

Q4. Describe how you feel about the end result
All but one of the students felt happy with the end result, being proud about the end result and preferring electronic portfolios. One student felt they had climbed a steep learning curve and were not pleased with the end result.

Q5. In what ways could the support for developing electronic portfolios be improved?
The most important way in which it could be improved was felt to be having experiences earlier in the course when the stakes were less and they could understand the process of development. Additionally students would have liked additional training on software and handling of digital artefacts. Other comments related to the availability of hardware.

Emerging issues
Training
As the students identified, the development of appropriate ICT skills and experience in developing electronic portfolios prior to this module will be important in the future. It is anticipated that a degree of training in the use of multimedia tools will result in their being used more readily for the production of portfolios.

Resources
Further development of a learning environment that facilitates the easy creation of digital resources is required to keep the focus on the development of the product and not the technology. Institutional support, such as this, is seen as crucial in the development of reflective portfolios (Siemens 2004). In addition to the development of the learning environment at University, there needs to be consideration of the use of mobile resources such as digital voice recorders, digital cameras, video cameras, PDAs etc. It is the nature of this kind of work that ideas may emerge at any point and the ability to record those is an important part of the process.

Authenticity
In design and technology there continues to be two central purposes to the development of (electronic) portfolios: the development of designing and making by the student; assessment of capability by the teacher. Within this context it is important that students feel they own the portfolio (McMillan 2004) and develop it in their way otherwise it will become an artefact in itself.

Looking at the portfolios produced for the module, a key missing element is the use of annotation. Whilst it is clear in most cases how the work proceeded, what is lacking is the voice of the student (Barrett 2004). The few examples of the use of audio highlight the importance of multimedia in expressing personal views. Importantly the audio clips provide a window into design thinking and the decisions that they have made in developing their work.

Sketching
The use of a sketchbook, packed full of individual thoughts and notes is important in the development of design ideas and product outcomes (Welch and Barlex 2004). The students clearly felt that their sketches were of real importance and that
it was hard to produce the same effect digitally. For the experienced, sketching on paper is faster than anything that can be done digitally with annotations easily added. Further refinements can be made instantly, other media added etc.

If the shift to digital working is to be achieved, what is required is either a better way of reproducing the same effects (using digital tools such as digital pens and tablets) or a different way of working where images in the mind can be quickly recorded.

**Beyond 'portfolios'**

Is the very term 'portfolio' a constraint on the development of capability? Historically portfolios have been linear artefacts of a particular structure for high-stakes assessment by external organisations. The traditional linear nature of paper-based folios does not reflect current thinking on the nature of design and technological activity (DfES 2004) and a new way of looking at pupils work is required. The avoidance of using the very term ‘portfolio’ could be one way to break away from the pitfalls of linear processes.

Developing and storing digital artefacts as a way of working is possible with the current technology and the creation of digital design space can be achieved where all elements of the designing processes are stored. In order to demonstrate capability to others a selection of artefacts can be made and viewed with an appropriate indexing system which need not be linear in nature. The digital space can contain additional evidence of work that is not viewable directly from the index but is presented to support the assessment of pupils capability, very much like the job bag that Welch and Barlex (2004) refer to.

**Conclusion**

Overall, this small review of electronic portfolios, in a particular context, highlights a number of issues that those involved in design and technology education need to address as the trend towards electronic portfolios continues. It is now not a question whether we should use them or not be one of finding the appropriate pedagogical and assessment approaches that work for design and technology to support pupils in the future.

**References**


