Investigation of the applicability of an e-portfolio tool to support final year engineering projects

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Abstract

This project investigated the extent to which e-portfolio tools can be applied to final year engineering projects with a view to supporting the experience from the perspective of supervisor and student respectively. E-portfolio tools allow students to generate, store and share evidence, minute meetings and record reflections as well as helping them to develop generic professional engineering skills. The research methodology combined qualitative and quantitative techniques. Semi-structured face-to-face interviews with eight supervisors and online questionnaires completed by 13 supervisors and 31 students provided the basis for the research. Training on the university's e-portfolio tool was provided for 19 members of staff, while a seminar introducing the project to the final year cohort was attended by 33 students. To conclude, an e-portfolio application was made available to students.

Keywords: e-portfolio, final year project, learning technology

Background

During the course of a final year engineering project (FYEP), students need to apply a variety of skills, including time management, project management and personal reflection. Students can use log-books to demonstrate progress to their supervisors, who may then provide feedback through formative assessment. At Bradford, the FYEP is worth 30 credits and concludes with an assessed report and poster presentation.

E-portfolio tools allow students to generate, store and share evidence, minute meetings and record reflections. To date, e-portfolio tools have primarily been employed for personal development planning (PDP) (HEA, 2005); however, the capabilities for users to generate, store and share evidence and reflections also offer opportunities for other applications (Sutherland, 2008). The university provides students with access to an e-portfolio tool (PebblePAD) for the duration of their studies (Hughes et al., 2010). PebblePAD (2010) features presentations that demonstrate the breadth of innovative applications that can be developed using the tool, while JISC (2008) highlights the use of e-portfolios. The project extended previous research at Bradford into the opportunities to develop learner autonomy offered by e-portfolios (University of Bradford, 2010).

Rationale

There is possible scope for improving the FYEP experience through the use of e-portfolio tools. Moreover, it is likely that students will increasingly undertake degree programmes via non-traditional routes in the future. In this respect, regular face-to-face FYEP meetings between supervisor and student may no longer be the norm. E-portfolio tools make use of the internet to provide the means for maintaining communication, monitoring progress and providing feedback.

The approach

An inductive research approach was adopted, incorporating an exploratory research method.

Prior to commencing the research activity, approval was obtained from the university's Committee for Ethics in Research.

The research methodology comprised qualitative and quantitative methods.

Qualitative data were gathered through semi-structured face-to-face interviews with project supervisors in order to determine their approach to FYEP supervision, their familiarity with e-portfolios and their views on the use of technology for teaching and learning. Eight face-to-face semi-structured interviews were conducted over the period 4 August to 19 September 2011. All interviewees were known to the interviewer. The interviews followed a common structure covering: background and experience, meetings with students, the role of technology and project skills and assessment. As far as possible, common interview questions were used, with deviations and additional questions where necessary to accommodate different perspectives. Project supervisors were interviewed in their office environment or in convenient meeting rooms.

Quantitative data were gathered through supervisors' and students' online questionnaires. Awareness of the availability of the surveys was raised via email. The surveys were made available for two weeks from 17 to 31 May 2011. Both supervisors' and students' questionnaires were divided into four sections. For supervisors these were: background and experience, meetings with students, technology and the final year engineering project, and project skills and assessment. For students, the titles of the first two sections were altered slightly to make them relevant to their needs ('background' in place of 'background and experience' and 'meetings with your supervisor' in place of 'meetings with students'). Each section comprised questions in various formats, including the facility for open-ended free-text input as a means of collecting qualitative data. Some questions were mandatory, while others were optional. Closed-ended questions were used to generate quantitative data. Nominal scales were applied when collecting demographic information. Whenever possible, the same questions were asked of supervisors and students. Returns for the questionnaires were anonymous and time stamped.

From the results of the data gathering exercise, a pilot trial phase was devised and implemented halfway through the first semester of the 2011/12 session. The pilot trial involved the adaptation of an existing PebblePAD application that had been developed for first year students by members of staff from the Centre for Education Development, namely the Skills and Personal Reflective Activity (SaPRA). A diagram illustrating a skill statement page that was employed by the developed application, termed Final Year Project: Skills and Personal Reflective Activity (FYP:SPA), is shown in Figure 1.

Figure 1. Example skill statement page: extract from Academic Writing Skills

Upon initial access, students are asked to self-evaluate their competence on a scale of 1 to 5 under various activities clustered under six skill statements similar to that shown in Figure 1 (Academic Writing, Academic Reading, Communication and Presentation, Individual and Learning Strategies, Research, and Library and Referencing). Resources within each skill set are used to inform students of freely available training opportunities based on internal training events or open educational resources made available via the internet. As a student undertakes training and collects evidence, self-evaluation can be re-performed to demonstrate personal development and learning progression. The student has the option to share this development with their supervisor.

Evaluation

The semi-structured face-to-face interviews and the online questionnaires provided the mechanisms for gathering quantitative and qualitative data.

In total, interviews with eight project supervisors were performed, representing in the region of 13% of the school's academic staff. Altogether, 234 minutes of recordings were made, with an interview lasting on average 29.25 minutes with a standard deviation of 6.5 minutes. All interviews were transcribed *verbatim* and subsequently indexed.

Thirteen members of academic staff completed the online questionnaire. Overall, a response rate of 27% was achieved. All returns were considered valid. 31 students completed the survey, corresponding to a response rate of about 13%. Mechanical and medical engineering had the greatest student representation (at 39%), followed by electronics and telecommunications with 26%.

The FYP:SPA application was developed to conclude the project and was accessible to all FYEP students from a PebblePAD gateway. The FYP:SPA application was launched in Week 6 of Semester 1 during a dedicated hour-long seminar, attended by 33 students.

Just over half of the academic staff that completed the online survey had been supervising FYEPs for more than ten years. None of the academic staff had been supervising students for fewer than three years. More than 60% of the academic staff supervise between five and six FYEP students each year, with the minimum number being between three and four: "Usually five, minimum, possibly a few more, seven, eight, I also cover part-time students as well" (member of academic staff).

More than 20% of academic staff indicated that they supervise more than six students each year, with half of returns indicating that project meetings last for between 21 and 30 minutes: "[I] put it in the diary for half an hour a week and if it goes over, it goes over" (member of academic staff).

The interviews revealed the practice of scheduling meetings in groups to increase efficiency and create a peer pressure atmosphere to encourage progress: "So every week I meet with all my project students at the same time and every student gives a short presentation about the work they have done the week before" (member of academic staff).
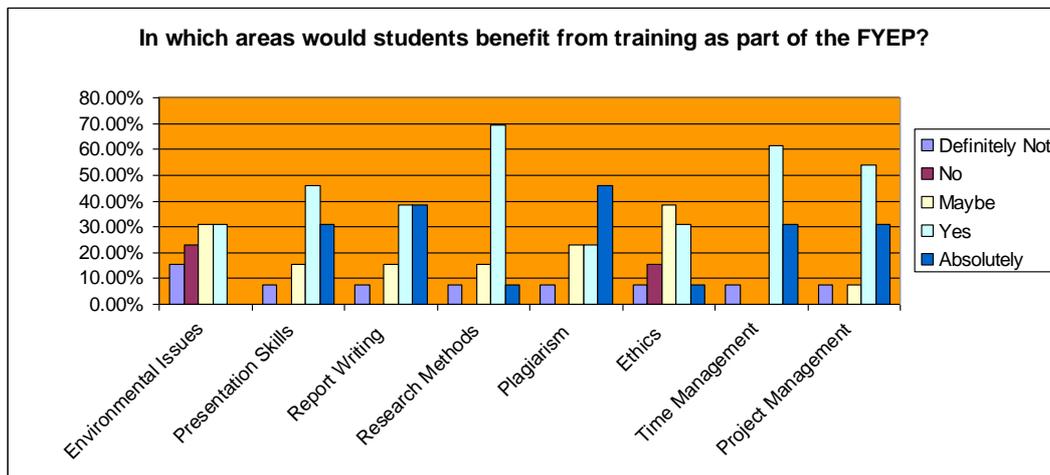
Figure 2. Project supervisors' views on where students would benefit from training

When considering where students would benefit from training, as shown in Figure 2, more than 90% of supervisors agreed that time management was important, followed closely by project management (with 84% in agreement) and research methods and presentation skills (both 76%). Training in ethics and environmental issues received low levels of support: "I think one thing that probably is definitely missing is presentation skills or public speaking skills especially when we are trying to assess them on posters and on how confident they were and how they answered" (member of academic staff).

The project investigated the use of technology in the FYEP and, in particular, the employment of an e-portfolio application (FYP:SPA) developed for the PebblePAD package. The survey, in addressing supervisors' familiarity with technology, highlighted limited expertise in a number of the packages, as shown in Figure 3. While most supervisors are at least competent in the use of Blackboard, other applications such as the social networking tools Facebook and Ning and university-supported packages Elluminate and PebblePAD have very little exposure among supervisors, as underlined by the interviews: "I suspect PebblePAD might be useful but again I have not got a clear vision of how it is supposed to be used and how it might be implemented" (member of academic staff).

A three-hour training session on PebblePAD, attended by 31 members of staff, was provided in September 2011.
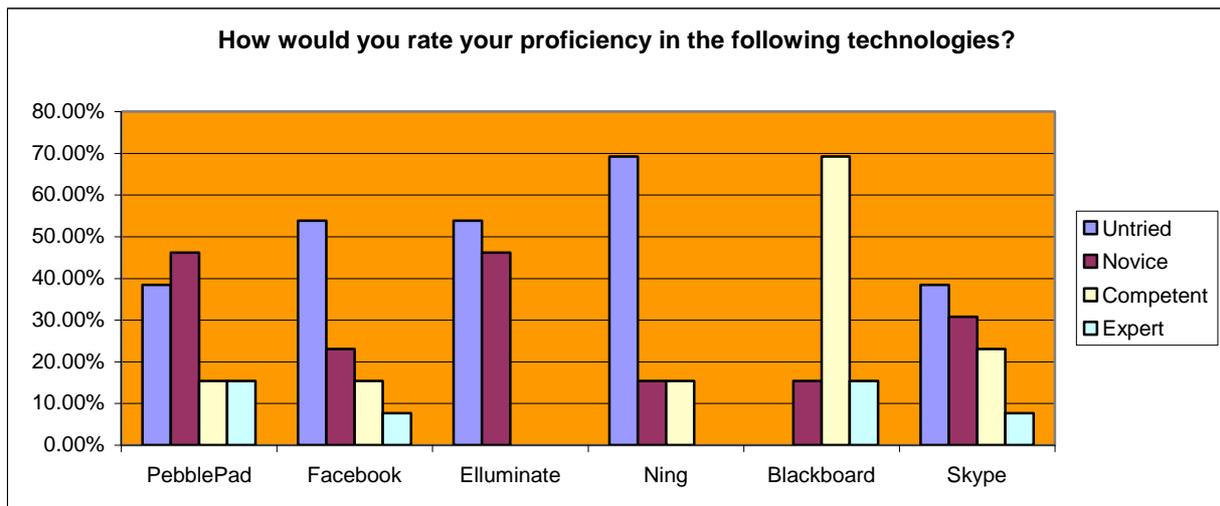

Figure 3. Project supervisors' usage of technology

When asked whether PDP would add value to the FYEP there was no strong opinion among academic supervisors, with 46% of returns agreeing and 30% disagreeing, as illustrated in Figure 4. Adding a reflective account gained some support with supervisors (with 61% in favour), while maintaining log-books as part of good practice had overwhelming support from 84% of supervisors'

returns: "if they are using the log-book, there is at least some written indication of what they have done" (member of academic staff).
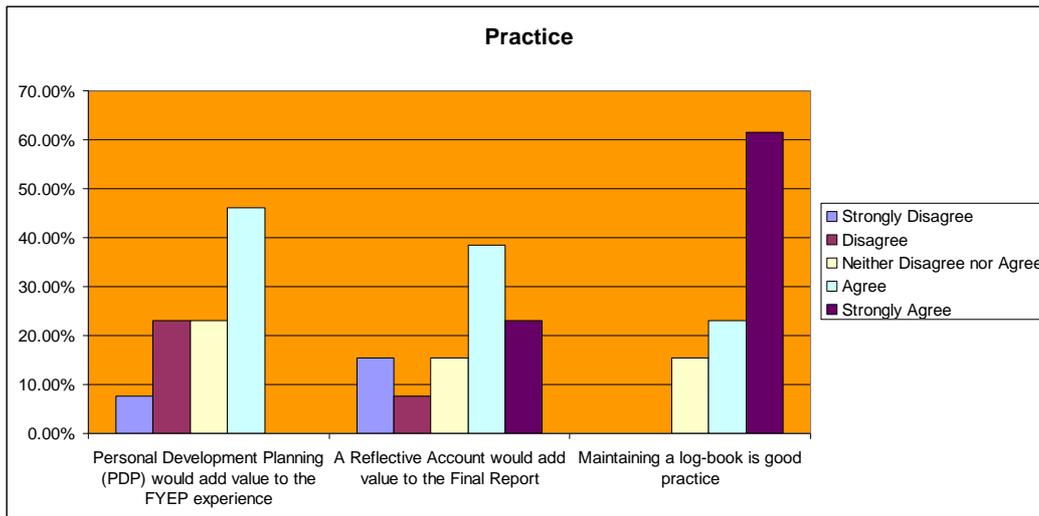

Figure 4. Project supervisors' views on project practice

Students who completed the survey were drawn from most of the school's programme teams, with mechanical engineering (at 39%) and electronics and telecommunications (at 26%) providing the largest cohorts.

When asked where they would benefit from training, the most popular activity was research methods, with 90% of students expressing an interest, as indicated in Figure 5. This was followed closely by report writing (86%) and presentation skills (83%). Time management and project management also attracted roughly 80% of students indicating a positive view on training.
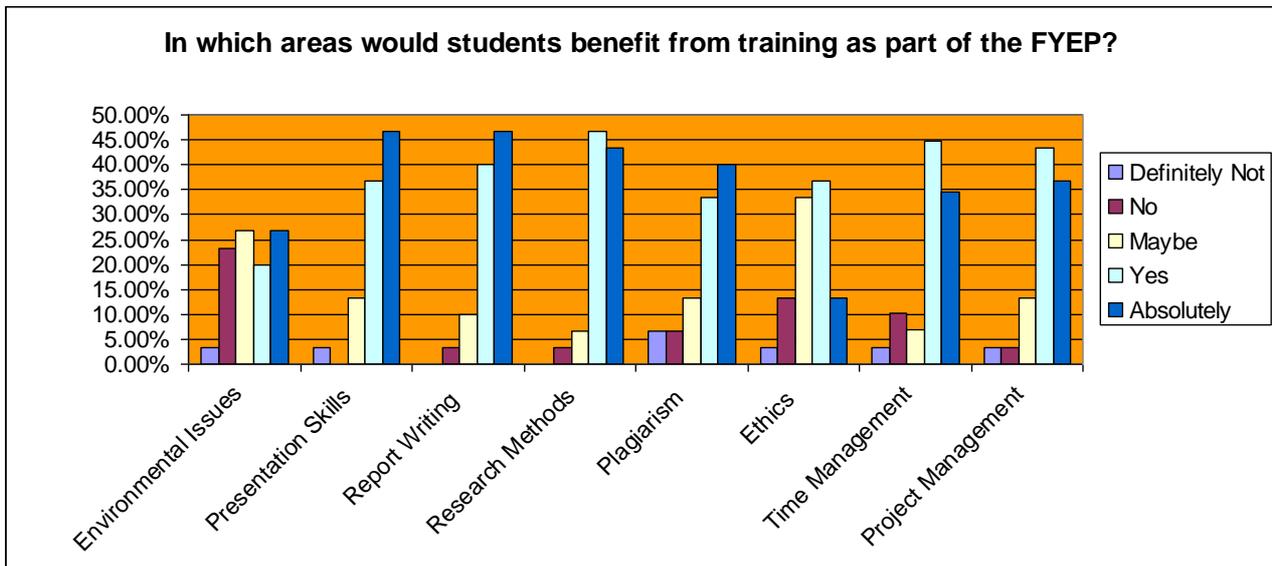

Figure 5. FYEP students' views on where they would benefit from training

Technology usage amongst FYEP students, as shown in Figure 6, illustrated a high level of expertise in the university's virtual learning environment (Blackboard), with 92% of students being at least competent. Of the other packages, 70% and 73% of students indicated at least competence in Facebook and Skype respectively. PebblePAD, the university's e-portfolio tool, was untried by 87% of returns, with similar lack of exposure being recorded for Elluminate and the social network package Ning.
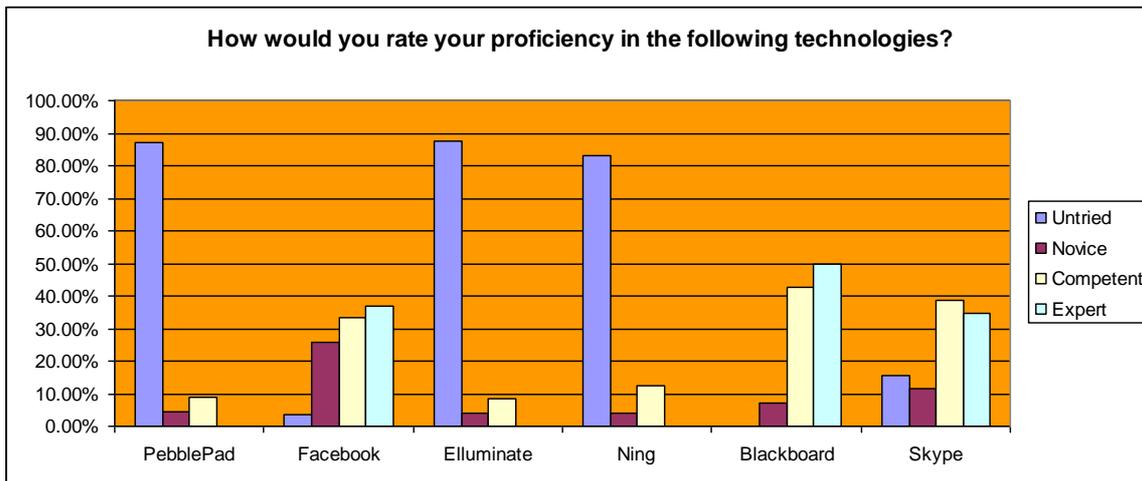
Figure 6. FYEP students' usage of technology

As shown in Figure 7, FYEP students were supportive of the use of PDP as part of the FYEP experience, with 80% agreeing that this would add value to the project. Reflective writing also received good support, with more than three-quarters of returns in agreement, and the maintenance of log-books as part of good practice was agreed by 90% of all students.
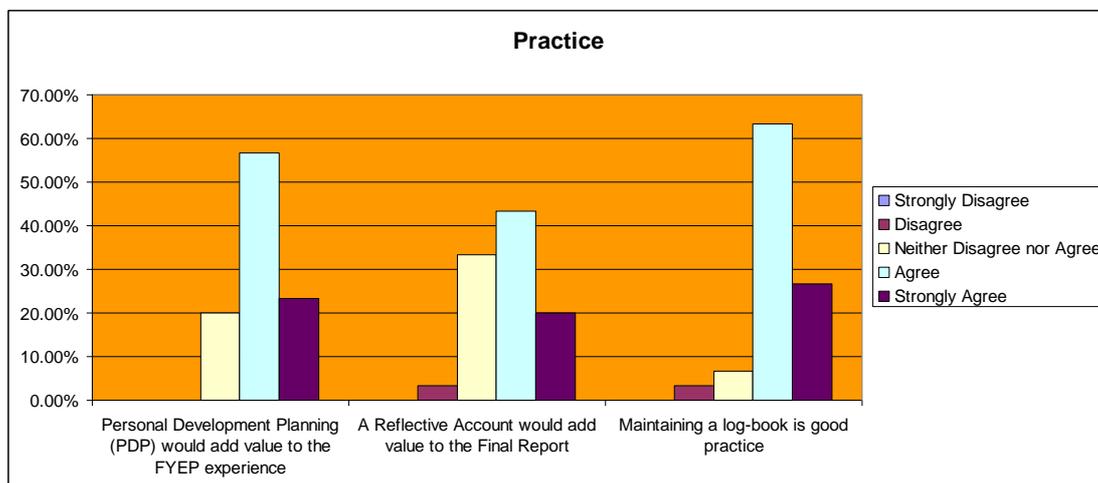

Figure 7. FYEP students' views on project practice

Discussion, summary

The use of e-portfolio tools to enhance the FYEP has been shown to be viable, with the launch of the FYP:SPA application towards the end of the project. There are, however, barriers to be overcome if such an approach is to be seen to be worthwhile and relevant to today's FYEP experience. The online questionnaires demonstrated students' readiness to incorporate PDP into the FYEP, but there was less enthusiasm from supervisors, as reinforced during interviews when concerns about increased assessment load, as well as the need for PDP at levels 4 and 5 as a precursor to the FYEP, were identified. The reasons for students' enthusiasm for PDP inclusion in the FYEP is less clear and additional investigation into their views on the relevance and value of embedding PDP within engineering curricula would, in this respect, be beneficial. The questionnaires illustrated a crucial lack of awareness of the capabilities of the university's e-portfolio tool (PebblePAD) among supervisors and students, while there was a clear difference in the use of the social media tool Facebook and internet communication tool Skype between supervisors (who had little experience) and students (many of whom considered themselves to be experts). A lack of exposure among supervisors and students to the potential benefits of e-portfolio tools needs to be addressed if such tools are to be integrated into the FYEP in the long term, while disparity in the use of Facebook and Skype (two potentially useful FYEP applications) may not

simply be due to the age difference between supervisor and student but also due to factors such as breadth of internet use and experience of using internet technologies (Margaryan et al., 2011).

While the project focused on FYEP students, the approach could equally be applied to other disciplines. Also, in raising awareness, the project provided the momentum to further deploy e-portfolios across all years of study.

Further development

The FYP:SPA application provides the first step towards the development of a fully integrated e-portfolio tool that can be employed for PDP as part of the project process. The FYP:SPA application builds on a first year (level 4) induction tool, SaPRA, and there may be the opportunity to integrate the two, along with an application specifically developed for level 5 training, to provide a fully integrated levels 4 to 6 PDP package. There is also a natural extension of the FYP:SPA application to postgraduate taught programmes and research activities, with suitable modifications to reflect the skills needs of these particular cohorts.

The key to future development is to illustrate the added value that such an approach can provide for supervisors and students alike. The launch of the FYP:SPA application halfway through the first semester, shortly after students had received confirmation of their projects, proved to be too late in the project and too early in the FYEP process for students and supervisors to provide informed assessments of the value of the developed application. Further work in determining students' and supervisors' practical experiences of the FYP:SPA application would be required to help further develop and refine the application's capabilities.

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Further reading/bibliography

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