Evaluating the case for employing E-Portfolio tools during the final year engineering project

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Abstract

The Final Year Project is an integral part of an engineering degree programme. At the University of Bradford's School of Engineering, Design and Technology (SoEDT), the project spans two semesters and is worth 30 credits or the equivalent of 300 hours of work. A student works under the guidance of a supervisor on a particular topic that usually involves some experimental activity, and is required to apply a variety of personal and technical skills as part of the project process. At Bradford, the Final Year Engineering Project (FYEP) concludes with summative assessment, in terms of a technical report and poster presentation, both of which occur at the end of the second semester.

For most students the FYEP represents a new way of working, while the nature of supervision can vary from hugely rewarding to very disappointing. There is possible scope for improving the FYEP experience, from the perspectives of supervisor and student, through the use of e-portfolio tools, which make use of the Web to provide the means for maintaining communication, monitoring progress and developing a student's skills portfolio. If e-portfolio tools are to be considered as a possible integral part of the FYEP process, then an appreciation of the current FYEP experience among students and supervisors must first be gained.

In this paper, quantitative and qualitative results are presented based on face-to-face semi-structured interviews with academic supervisors and responses to on-line questionnaires from supervisors and final year engineering students at the SoEDT. The results provide an insight into the practices and techniques employed as part of the FYEP, and identify where training is needed to develop particular project skills. The results provide a basis for the development of an e-portfolio application that supports the FYEP experience, which is introduced to conclude the paper.

1. Introduction

The Final Year Engineering Project (FYEP) represents a significant component of engineering curricula. At University of Bradford's School of Engineering, Design and Technology (SoEDT), all Final Year students are required to complete an individual project, which amounts to 30 credits or the equivalent of 300 hours of activity, spanning both semesters of the academic year. For many, if not most students, the FYEP is a novel and challenging experience.

The FYEP provides students with the opportunity to apply and further develop fundamental technical skills accrued during the first two years of the engineering programme, as well as gain an appreciation of the more advanced concepts developed during the final year. Projects typically involve a practical element, which can be hardware or software based or sometimes a combination of the two. In addition, students need to apply a variety of personal transferrable skills, many of which may not have been taught in a formal environment. Typically, these skills might include time management, project management, communication and presentation techniques, research methods, as well as an appreciation of ethical principles and environmental considerations.

The FYEP requires students to work under the guidance of an academic supervisor. At Bradford, a supervisor can be expected to oversee the activities of typically between four and six students, although there is no set quota, as such. Regular meetings between supervisor and student provide the opportunity for the student to present progress, typically using a log-book, discuss technical matters and raise any concerns, and for the supervisor to provide feedback and motivation, identify progress and monitor engagement. At Bradford, the FYEP concludes with the submission of a technical report and a poster presentation, both of which occur at the end of the second semester. These two events form the basis for summative assessment.

Technology in higher education is increasingly being used to enhance many aspects of learning and teaching, principally as a result of developments in Internet capabilities, the availability of Web tools and applications, and the widespread availability of devices that can access such tools. For example, e-portfolio tools make use of the Web to develop a portfolio of skills, facilitate communication between individuals, and provide a means of record keeping. Such facilities suggest that e-portfolio tools have the possibility to enhance the FYEP experience from the perspectives of student and supervisor respectively. University of Bradford provides students with access to an e-portfolio tool (PebblePAD) for the duration of their studies (Hughes *et al*. 2010). To date, e-portfolio tools have primarily been employed for personal development planning (PDP) (HEA 2005), however, their capabilities, in allowing users to generate, store and share evidence and reflections (Sutherland 2008) offer opportunities for other applications.

In what follows, consideration is given to the case for employing e-portfolio tools as part of the FYEP experience.

2. Methodology

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 interviews were conducted over seven weeks during the summer of 2011. All interviewees were members of academic staff from SoEDT that were known to the interviewer. Interviewees were provided with an information sheet about the project prior to their interview. The interviews, which were recorded, 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 used to accommodate different views.

Quantitative data were gathered through on-line supervisor and student questionnaires, which were generated using the Google Docs application. Awareness of the availability of the surveys was made through e-mail. The surveys were available over the final two weeks of May 2011. Both supervisors' and students' questionnaires were divided into four sections, *viz*. for students: Background; Meetings with your Supervisor; Technology and the FYEP; Project Skills and Assessment.

For supervisors, the titles of the first two sections were slightly altered to make them relevant to their needs, *viz*.: Background and Experience in place of Background; and Meetings with Students in place of Meetings with your Supervisor. Each section comprised questions of various formats, including the facility for open-ended free-form text input, as a means of collecting qualitative data. Some questions were optional, while others were mandatory. Nominal scales were applied when collecting demographic information. Closed-ended questions were used to generate quantitative data. Whenever possible, the same questions were asked of supervisors and students.

3. Results

Altogether, 234 minutes of recordings were made, with an interview on average lasting 29.25 minutes.

All interviews were transcribed and subsequently indexed. Quotations from the interviews are interspersed among the results from the on-line questionnaires presented in this section.

Some of 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)

Several of the interviews also revealed the importance of face-to-face meetings.

"I think it is very much easier to gauge where the student is in a face-to-face meeting and to respond to particular technical issues, to explain complicated points and so on …"
(Member of Academic Staff)

Thirteen of SoEDT's academic staff completed the on-line questionnaire. Overall, a response rate of 27% was achieved. All returns were considered valid.

Just over half of the academic staff that completed the on-line survey had been supervising FYEPs for more than 10 years. None of the academic staff had been supervising students for fewer than 3 years. More than 60% of academic staff supervised between 5 and 6 FYEP students each year, with the minimum number being between 3 and 4. All bar one of the respondents indicated that e-mail was the main means of communicating with students.

When considering where students would benefit from training, as shown in Figure 1, 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 receiving 76%. Training on 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 …"
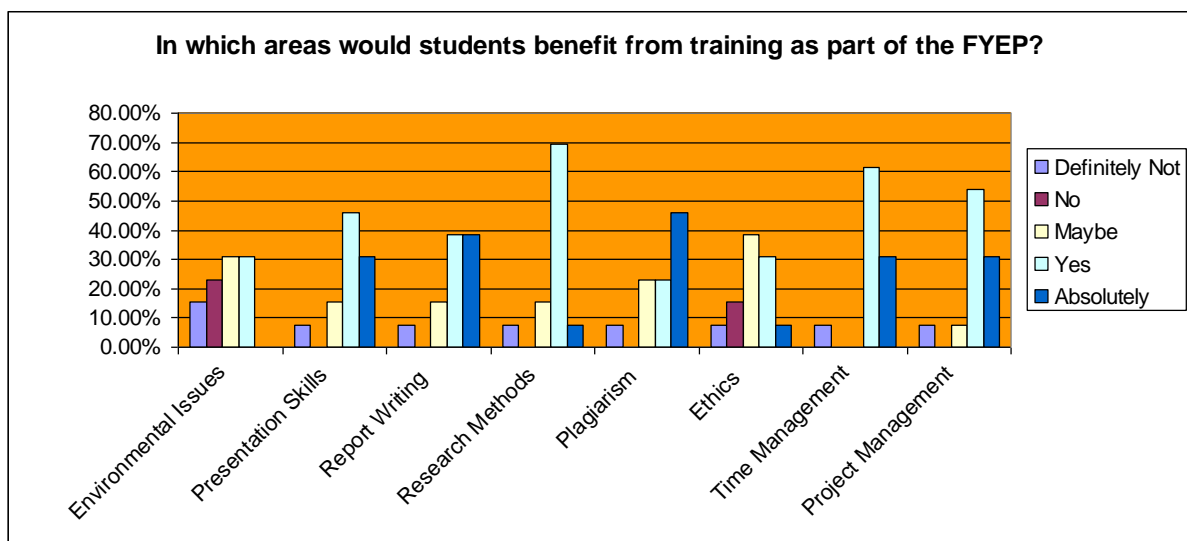(Member of Academic Staff)

Figure 1: Project supervisors' views on where students would benefit from training

The survey, in addressing supervisors' familiarity with technology highlighted limited expertise in a number of the packages, as shown in Figure 2. While most supervisors are at least competent in the use of the Learning Management System (LMS) package Blackboard, other applications such as the social networking tool Facebook, as well as the University supported e-portfolio tool PebblePAD have very little exposure among supervisors, as underlined in 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."
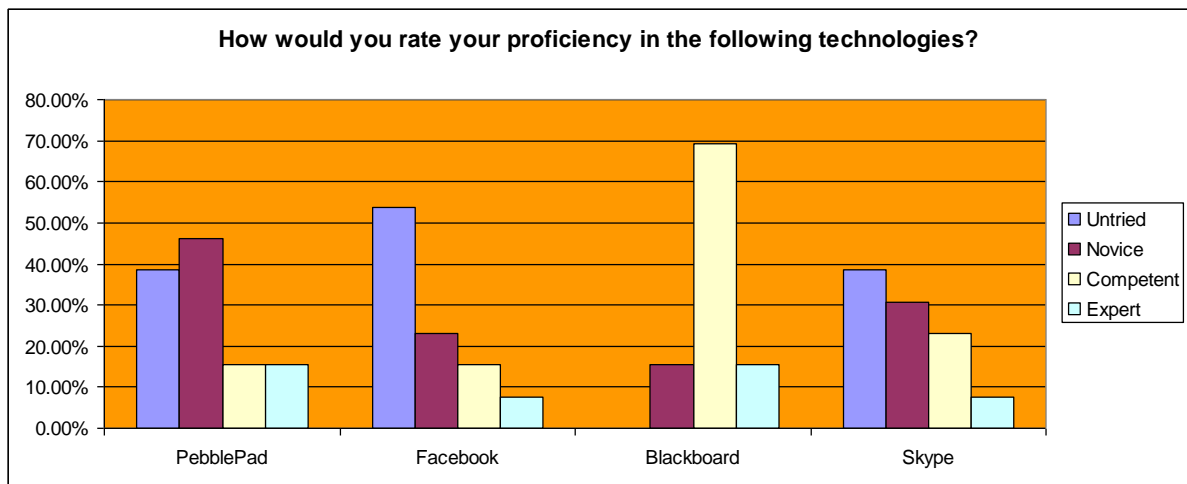(Member of Academic Staff)

Figure 2: Project supervisors' usage of technology

When considering FYEP practice, 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. 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.

"*if they are using the log-book, there is at least some written indication of what they have done.*" (Member of Academic Staff)

In total, 31 students completed the survey, corresponding to a response rate of roughly 13%. Mechanical and Medical Engineering had the greatest student representation, at 39%, followed by Electronics and Telecommunications with 26%.

When asked where they would benefit from training, as indicated in Figure 3, the most desired activity was Research Methods, with 90% of students indicating an interest. This was followed closely by Report Writing and Presentation Skills with 86% and 83%, respectively. Time Management and Project Management also attracted roughly 80% of students indicating a positive view on training.
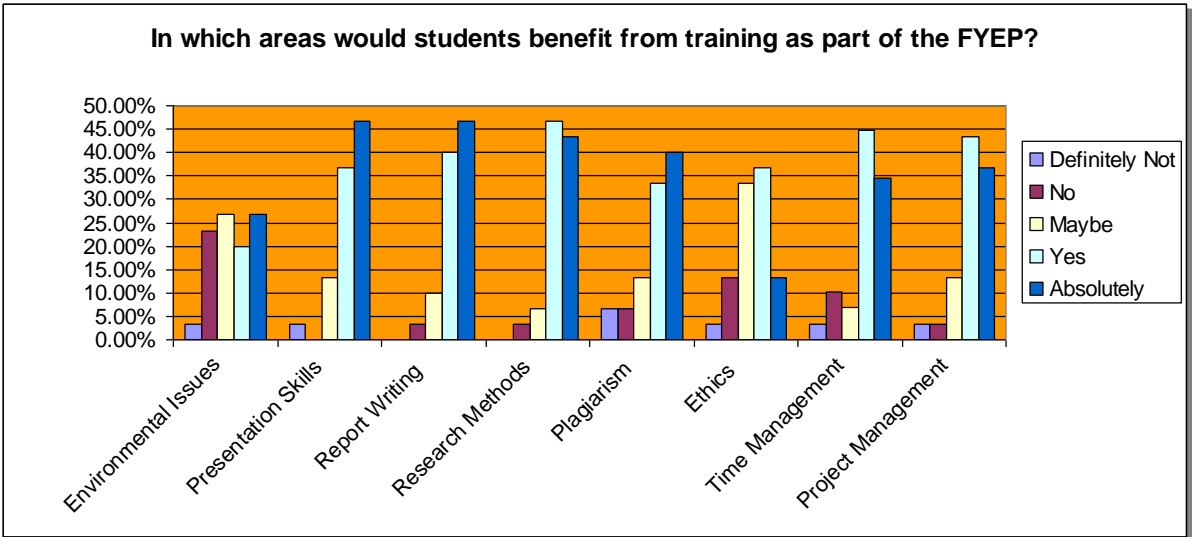
In which areas would students benefit from training as part of the FYEP?

Figure 3: FYEP students' views on where they would benefit from training

Technology usage among FYEP students, as shown in Figure 4, illustrated a high level of expertise in the University's LMS, 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.
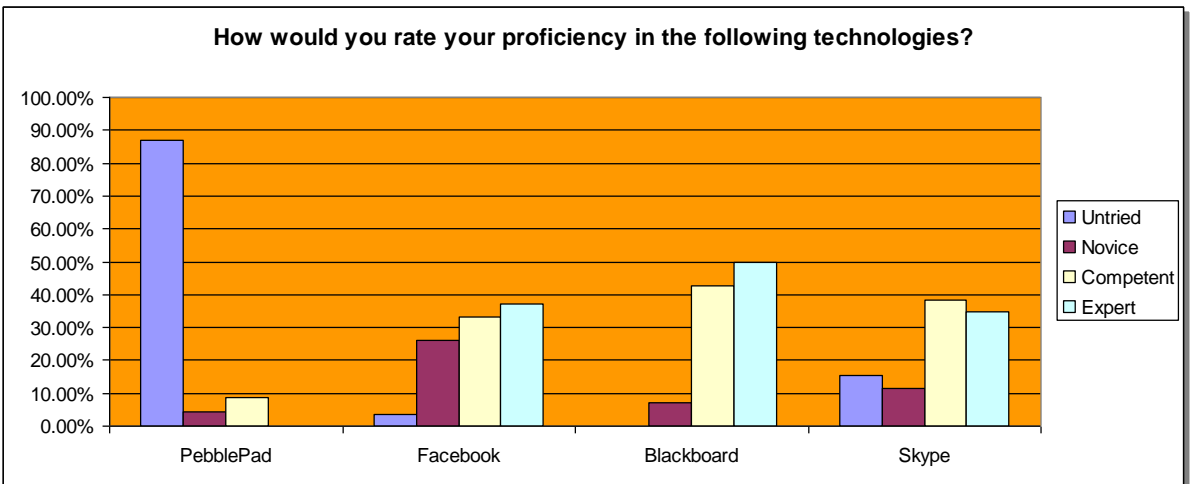

How would you rate your proficiency in the following technologies?

Figure 4: FYEP students' usage of technology

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, while maintaining log-books as part of good practice was supported by 90% of all students.

From the results of the data gathering exercise, a pilot trial phase was devised and implemented involving the adaptation of an existing University PebblePAD application (SaPRA 2012). The new application is known as *Final Year Project: Skills and Personal Reflective Activity (FYP:SPA)*. Upon initial access to FYP:SPA, at the start of their FYEP, students are prompted to self-evaluate their competence on a scale of 1 to 5 under various activities, clustered under six *Skill Statements*, *viz*.: Academic Writing; Academic Reading; Communication and Presentation; Individual and Learning Strategies; Library and Referencing; and Research. 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 Web. As a student undertakes training and collects evidence, self-evaluation can be re-performed to demonstrate personal development and learning progression. The student then has the option to share this development in the form of a portfolio of work with their supervisor.

4. Conclusion

E-portfolio tools facilitate communication and record keeping, while the FYP:SPA application offers the opportunity to introduce a structured approach to training and personal development. There are, however, barriers to be overcome if e-portfolio tools are to be considered relevant to today's FYEP experience. The questionnaires illustrated a lack of awareness of the capabilities of the University's e-portfolio tool among supervisors and students. A lack of exposure to the potential benefits of e-portfolio tools will need to be addressed if FYEP usage is to move from early adoption to mainstream.

While this paper has addressed the FYEP, the approach could equally be applied to other disciplines.

5. References

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