Learning through doing:
A case study of project based learning in ICT at a third level institution in the Middle East

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Abstract

Bahrain Polytechnic is a new government-funded third level institution that offers a range of four year degree programmes. Problem Based Learning is one of the philosophies espoused by the institute to develop students' employability skills such as independent learning, teamwork, resilience and communication skills. The Bachelor of ICT programme adheres to this philosophy in a number of ways, one of which is through the implementation of a semester long practical project in the second semester of year three. The project ran for the first time from March to June 2012.

This paper documents the project, its aims, purpose and outcomes, as implemented and observed. The central aims of the project were to foster and develop technical and project management skills for an ICT project through implementation and participation. It considers the significant risk of dedicating a sizable portion of timetabled teaching and learning time to project work, and outlines in detail the associated measures which were put in place to ensure monitoring of student progress and to facilitate the move towards self efficacy in the specific skills sets – in line with graduate attributes and learning outcomes. We chart also the additional resource implications, mapping on to the institution's mission of creating work ready graduates through experiential learning. The paper further details the type of deliverables required of the students – linking in to the additional learning opportunities made available to participants in order to develop the so-called softer skills often cited by employers. This paper looks at the paradigm shift from a traditional didactic learning environment, so prevalent in the region, to the student centered environment, whilst considering the implications of cultural capital – and assesses how students performed in this new locus, and whether or not they developed the transferable skills necessary.

Keywords

project based learning, independent learning, employability skills, student centered learning

1. Introduction

As Middle Eastern governments attempt to diversify their economies away from their dependence on oil, education is at the forefront of this initiative. Founded in 2008, Bahrain Polytechnic is a government funded third level institution that provides a number of bachelor degree programmes in areas including engineering, business, information technology, web media, visual design and logistics. The institute was set up in response to an identified skills gap in the country (Allen Consulting, 2009). The first cohort of students are due to graduate in 2013.

Context

Bahrain Polytechnic aims to "transcend the traditional type of education" (Bahrain Polytechnic, 2012), effectively stating its mission as one of providing relevant education for work ready graduates in a region where the so-called "chalk and talk" approach to teaching has long been popular. The Polytechnic espouses a student centred learning (SCL) approach , specifically engaging with the pedagogy of Problem Based Learning, and places a high value on the development and delivery of curricula which foment workplace scenarios for the students through experiential learning. In this way, as a key focus of the institutes's Teaching and Learning, faculty work to embed employability skills into the curriculum, setting assessment tasks which map the processing of core knowledge and the acquisition of specific skill sets in a meaningful way - key to this, as Biggs and Tang (20011) advocate, is the constructive alignment of course content, assessment tasks and learning outcomes. The project described herein sought to provide students with a real-life work task, designed to address the development of the typically named employability or soft skills: communication, self-management, problem solving, team working; technical ability, initiative and enterprise, planning, self management, and independent thinking mapped to learning outcomes .

The Bachelor of ICT programme covers four majors – Networking, Databases, Programming and Management of Information Systems. The programme is delivered over four years, with a common first two years, after which students choose a major. Group work plays a significant role throughout the programme from first year through

to the final year. In keeping with the institute's philosophy of delivering applied programmes, there is a strong emphasis on practical work. All courses are delivered through the medium of English, with compulsory support classes in years one and two. In the third year of the programme, students undertake a semester long practical project that runs from March to July. This project ran for the first time in 2012 with fifty-five students, this paper documents our experiences.

The institute has two intakes of students per academic year. Depending on the results of entry tests, students may take either one or two semesters of a foundation course, with those scoring sufficiently high marks proceeding directly to the degree programme.

The Bachelor of ICT programme runs the semester long project only once per academic year. Due to the dual intake admissions policy, two different cohorts of students take the project at the same time. One group will have four semesters of the programme completed, the other cohort will have five semesters completed. Consequently, it was necessary to ensure the project was of a level suitable for students who had only completed two years (four semesters) of the programme.

2. Semester Structure

Mindful of the dual goals of the development and application of technical skills whilst enhancing employability skills, a simulated office environment was created, seating fifty-five students and accommodating two meeting rooms. The intention was to move all learning away from the traditional didactic, classroom based environment to a simulated, experiential work environment.

Students were offered a choice of projects, based on briefs written by academic staff. The briefs were purposefully vague, crafted to ensure specific technologies were not mentioned as far as possible. Students also had the option of submitting their own project proposals, which were vetted by a committee for approval. Each project was designed to be completed by one student; topics included web applications, networking, programming and mobile applications. Students were free to choose whichever technologies they wanted, even technologies they had not directly studied in the programme.

Each student was assigned a dedicated desk and computer for the duration of the project. To facilitate cooperative learning, students undertaking similar projects were grouped together as much as possible. The full range of equipment used by the faculty was made available to students, including networking equipment, mobile devices and specialist hardware. Students also had access to a cloud based development environment for purely software-based projects.

As the project ran for the whole semester, significant support structures were put in place for students. Each student had a project supervisor, along with a project client. In most cases, the client was a different member of faculty, and there were occasions where a non-faculty member of staff had suggested a project and therefore assumed a client role. The supervisor acted in an advisory capacity, with a mandate not to provide any technical assistance to students. Clients, in their non-technical role, assumed a focus that mirrored the real life scenario in which they would be solely concerned with the usability of any solution and ultimately, the end product. A weekly meeting with supervisors ensured the project was kept on track and provided a forum for advice and discussion of progress.

Students were also provided with technical writing and project management workshops to assist them with documentation and planning. Project management workshops were front-loaded, with the frequency decreasing as the semester progressed. Technical writing workshops were initially less frequent, increasing as the semester progressed in line with the planning and documenting phases of the project.

At the end of the semester, students were required to undertake a project demonstration along with delivering the project thesis. In order to ensure consistency in marking, each student presented their work to a panel of five staff members representing the major. Presentation were scheduled to include 20 minutes of demonstration, 10 minutes of questions and 10 minutes of deliberation.

Students were asked to discuss a number of items including the project objectives, product features, technologies used and to reflect on their learning considering what they could have done differently.

The final stage of the semester was a project demonstration evening. Selected senior academics, industry leaders and family members were invited to view the range of student projects. A preselected group of industry experts were asked to rate students' ability to demonstrate and answer questions on their projects. The top male and female project was awarded a prize, sponsored by industry.

3. Findings

The move away from the traditional didactic learning method so prevalent in the region presented a range of potential issues for students who were not used to such autonomy. Students expressed concerns such as uncertainty regarding how to approach such a significant task and issues around the comprehension of project briefs. They also displayed a perceived lack of self efficacy - at the project inception stage, we identified a recurring challenge for the students who repeatedly overestimated the resources and technologies required. The resultant projects presented at the end of semester suggested that the students overcame these initial fears and were actively engaged and enthusiastic about the project course.

Student perceptions of the project course appear to be generally quite positive, as indicated in Table 3.1, below. It is noted that all students felt they understood why they were undertaking such a project, which may be a factor in their commitment and level of engagement. Student workload was highlighted by the survey as an area of concern.

Statement	**Level of Agreement**
I know what I need to do to pass this course	0.98
I understand how this course may lead to a job	0.95
I understand why this course is part of my studies	1.00
I have been able to contact staff when I needed to	0.93
The resources (computers, laboratory equipment etc) for this course are available when needed	0.95
The projects available are challenging.	0.93
Assessments are related to what is studied in this course	0.93
Working on similar projects and in the same environment helps me learn from other students	0.88

The teaching materials (handouts, textbooks, workbooks) for this course are useful	0.80
The course is well organized	0.80
The projects incorporate relevant aspects of (a) course(s) I have studied on the programme	0.83
The amount of work for this course is manageable	0.66

Table 3.1 - Student perceptions of the project course

The relationship between the student and supervisor was key to the success of the project. Given the level of autonomy afforded to students, it was important that the supervisor gave clear guidance, direction and assistance, without resorting to directly instructing the student. Students' perceptions of their supervisor, and the role the supervisor played, was an important focus of the data gathering process. As indicated in Table 3.2, students generally felt the level of support provided by supervisors was sufficient for the project.

Statement	Level of Agreement
I am clear about the aims for this course	0.93
My supervisor encourages me to take responsibility for my learning	0.89
Checks with me to make sure I am learning	0.87
Clearly explains ideas and instructions to me	0.83
Gives me feedback in a timely manner	0.83
Gives me feedback that I can use to help me learn	0.78
Guides me to identify sections of the project where issues might arise	0.80
Provides links to tutorials/material as required	0.87

Table 3.2 - Student perceptions of thier supervisor

Evidence gathered from staff indicates a positive perception of the project course. Three key themes emerged from a post-project course review session, attended by all project supervisors - students enjoyed the office environment and the autonomy it afforded them, creating a positive attitude towards the project; students enjoyed the individual nature of the projects; the workload was unnecessarily high for students, especially during the implementation phase.

The range and quality of projects developed by students was reasonably high, with a course pass rate of 94%. The practical nature of the projects, along with the extended

duration, provided an immersive experience that we think would be difficult to replicate in a normal classroom environment. The project course also tied in directly with the institution's ethos of applied learning.

The project briefs proved to be somewhat problematic at the outset. Student's interpretation of what they were being asked to do tended to vary considerably, with a number of students completely misinterpreting what a project entailed. One of the key learnings here was that the balance between giving too much and too little information is critical and that particular attention must be paid to the English moderation process. Staff also raised concerns around the description of project requirements being insufficiently detailed, especially in relation to project proposals they did not develop. This had implications for direction given to students they were supervising.

With reference to with language skills, academic staff felt that students were required to produce too much documentation at the expense of project implementation. While the intention of documenting the planning, design, implementation and testing phases was to scaffold students, it appears that insufficient balance was struck between these two conflicting demands.

Other scaffolding, however, proved invaluable. A combination of regular mandatory weekly meetings with project supervisors, technical writing and project management workshops and weekly submissions appeared to have the desired effect of keeping the vast majority of student projects on track. Key submission dates were provided to students in advance to facilitate accurate planning sessions. Document templates were provided for specific documents to ensure students focused on content rather than visual aesthetics.

The goal of a final project demonstration, along with the open evening where friends, family and industry were invited, appears to have contributed to focusing the students on delivery of a quality end product. The demonstration of student projects to the academic panels proved extremely time consuming with questionable benefit. It was felt that the student demonstrations in future should be tied in directly with the open evening to ensure more efficient use of time. The open evening proved extremely enjoyable and beneficial with a number of students being offered work placements for the following semester, based on the quality of their projects.

The intention of marking the process students undertook to deliver the final product, rather than the actual final product proved somewhat problematic. As the semester progressed, it became obvious that a student could essentially deliver a sub-standard project, yet meet the overall learning outcomes of the course and consequently pass. It necessitated a redesign of a number of marking rubrics to ensure that the focus shifted towards the product, rather than the process.

4. Conclusions and Future Work

Dedicating a full semester to one project course was deemed quite risky by the academic committee who developed the course. However, it was also felt that the project course fitted in well with the ethos of the institution and the dual mandate of developing technical and employability skills in students. It appears the risk was well worth it as evidenced by the generally high standard and diversity of student projects. The overwhelmingly positive perceptions of the students regarding the project and their experience is a notable point for future delivery and should be considered carefully prior to any significant structural changes to the course.

While it was implicitly acknowledged that students would develop a range of employability skills during the project course, no attempt was made to measure these explicitly. It raises the question of how such skills are defined and quantified, an area that provides fertile ground for future work and indeed is an area of continuing development at Bahrain Polytechnic, and a priority for the Higher Education Council of Bahrain. This engagement with a continuous discourse around employability is a key area for consideration with implications for course design - not least in making these measures and descriptors explicit to all members of the teaching and learning community. Equally, consideration should be given to establishing a robust framework of quantitative and qualitative data collection - prior to, during and after the project in order to assess the success of the project on an institutional and departmental level.

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