

The Student Experience of Problem-based Learning in Real Estate Studies

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Abstract

The context of this work related to a group of 90 students in their third year, studying property-related courses. They were already accustomed, as part of their studies, to working on projects in groups and individually. It was perceived that the existing approaches to running projects, while successful at achieving the integration of knowledge and testing of professional skills, were lacking in attention to autonomy and problem-finding as opposed to problem-solving skills. The subject was redesigned and offered in a problem-based learning (PBL) format and incorporated the use of reflective journals. The new approach was evaluated by using student feedback questionnaires and the contents of reflective journals which had been completed by both students and staff. This paper describes the methodology and implementation of the subject, and presents an analysis of the results of the feedback. Amongst the significant findings were that the students enjoyed identifying on their own, the problems and learning issues, and that the context of the PBL approach enhanced the interactions among students, and between students and staff, at tutorials. The paper concludes with an assessment of the significance of these findings and the extent to which they can be generalised.

Introduction

This project was conducted with a group of approximately 90 undergraduate students enrolled in professional degree programmes in Building and Real Estate. The background to the project was that for over a decade large elements of Professional Studies had been taught through the use of projects, the teachers in these situations usually being professionals who had had working experience. There was a tendency over the years for the projects to become increasingly 'technical' with components being 'built in' to cover a variety of areas in the curricula of the subjects. The project briefs were often lengthy documents with detailed task lists and assessment criteria. In some cases the project brief itself could be used by the students to form a detailed list of actions necessary to complete the project. The aims of the projects were to integrate the knowledge acquired in a range of subjects, and to give the students some experience of solving problems in a professional context. The teaching team began to perceive at least three problems with the existing approach. First, as the projects themselves became more sophisticated and detailed, it was felt that they also became less realistic. Second, a key factor in 'real-world' settings was that the question of problem-identification was as important as that of problem-solving. Third, the existing technical projects were good at testing technical competencies in a narrow way but did little to encourage independent thinking on the part of the students.

The fundamental problems then, revolved around how to encourage deeper learning, student autonomy, and problem-finding skills. It became clear that in the subject Professional Studies it might be helpful to shift the focus away from the teacher and the 'text', towards the student and the problem. Therefore it was decided to adopt an action research approach by designing a new approach to Professional Studies and conducting a systematic evaluation of the results. We chose

to adopt a problem-based learning (PBL) approach in the subject and to incorporate the use of a reflective journal to be completed by both staff and students. This then became the basis of an action research project, the results of which had three components. First, the actual completed projects; second, the students' responses to detailed feedback questionnaires; and third, the writing of reflective journals during the process by both staff and students.

After outlining the objectives of the Action Learning Project, the remainder of the paper discusses the chosen methodology. This is followed by a description of the process of implementation of the action research after which the analysis and results are presented. The final section contains a reflection on the meaning of these results and attempts to assess the extent to which we can generalise from these findings to other professional/vocational programmes.

The Objectives of the Action Learning Project (ALP)

The three main objectives of the Action Learning Project were:

- to assess the applicability and learning and teaching effectiveness of a PBL approach in property-related Professional Studies;
- to experience and examine the process of the implementation of PBL in teaching;
- to learn how to improve the quality of: i) learning and teaching and ii) the design of the project brief with a PBL approach for the next implementation of this pedagogical approach.

Methodology

In previous years, either case-based projects or project-based coursework, with their integrative problem-solving nature, had been set in the subject module: Professional Studies. This subject was one of the main vehicles for imparting knowledge of professional practice. This knowledge could then be integrated with, and applied to, different subject disciplines for problem-solving in the professional context. Students' understanding of the interdisciplinary nature of the professional programme and the development of teamwork were also promoted in this setting. However, as the Building and Real Estate programmes were developing, the teaching team had reflected on the pedagogical approach and the learning and teaching effectiveness of this specific subject module. Certain educational issues were perceived. When reflecting upon these issues, changes were inevitable in the teaching approach, as well as in the learning environment, for the improvement of this subject. With the success of a PBL approach in some of the subjects taught in the School of Health Sciences, it was proposed to adopt the same approach to Professional Studies. The planning and implementation of PBL, as well as its feasibility, needed to be observed and considered during the implementation stage so that goals for improving learning and teaching when planning the subject for future cohorts of students, could be achieved. Whether this approach could be further improved, and more effectively implemented, in the second delivery of the subject would then again be evaluated. It was against this backdrop of cycles of implementation and evaluation that the action research methodology was subscribed.

This process of action research was first conceptualised by Lewin (1952) and further developed by Kolb (1984), Carr and Kemmis (1986) and others. In brief, it was a spiral of cycles of action and research consisting of four major processes: planning, acting, observing and reflecting (Zuber-Skerritt, 1992). Initial ideas were considered when planning the action. Observation was then made through the application (action), which lead to reflection. Ideas for improvement were then formulated and planned for the next application. The action research cyclical spiral was adopted for our research project: A Problem-based Learning Approach to Professional Studies for Construction and Real Estate students.

Phase 1: Plan

The plan included problem analysis and a strategic plan.

Problem Analysis

The case-based projects, or the project-based coursework, for the subject Professional Studies were based mainly on real-life cases/projects encountered by professionals in the construction industry. The settings of these projects in the past had been the responsibility of individual staff members, with no formal guidance or format being given to teachers in the delivery of the subject. Over years of practice, there was a tendency for the projects to become increasingly 'technical' with components being 'built in' to cover a variety of areas in the subject curriculum. The project briefs tended to be very lengthy, with great detail given to the required tasks and assessment criteria, resulting in them becoming too sophisticated and detailed to be authentic. The manner in which the subject was delivered meant that the focus was solely upon problem-solving, instead of on problem-identification, personal development in innovation, self-directed study, effective communication, etc. A balance was needed. The case-based and project-based delivery of 'Professional Studies' was effective at assessing and learning technical competencies but did little to encourage independent and innovative thinking. Moreover, there was a general ideological shift to student-centred learning from the teacher-centred and text-based teaching approach. The design of a new approach to Professional Studies was desirable in this context.

A Strategic Plan

A PBL strategy, then, was identified and adopted for the pedagogical approach to Professional Studies. Although PBL has its roots in professional education: medical education (Barrows, 1986); architectural education (Schön, 1983); and engineering (Woods, 1985), it was a completely new teaching approach to both students and staff in the Department of Building and Real Estate. One of the fundamental components of PBL is a shift from a teacher-centred to a student-centred approach to learning. In the PBL learning environment, the students are challenged to think independently and hence find problems on their own, the lecturers/tutors acting only as facilitators to guide the students' course of learning. The shift to student-centred learning also appeared to be the answer to the shortening of project briefs.

From past experiences of teaching practice, it was realised that students would regard the problem tasks in the project/case brief as a prescription to follow, without developing a 'probing mind'. The project brief was therefore planned without any listed specific tasks. Students were then free to question, imagine and identify the problems/issues from the given brief. They were, therefore, responsible for identifying a list of problems and, then solving them. Setting the brief for the students demanded that while adopting a PBL approach in guiding students' learning, the perceived deficiencies of the past project briefs were eliminated.

In this way, on the one hand, students learned the different facets of their own professional roles, e.g. in identifying problems and objectives for their prospective clients, working independently and using their initiatives, etc. On the other hand, they learned the need to integrate what they had learned from different subject disciplines and apply this knowledge to solve problems to meet objectives. Lecturers/teachers in this PBL approach were acting only as facilitators to guide the students' learning in the direction of the pre-determined underlying learning objectives.

Phase 2: Action

The action referred to the implementation of the strategic plan.

The Design of a PBL Approach to the Professional Studies Project

The design of the project brief presented the factual situation in general, with no particular emphasis on specific problems, so that students were stimulated to find the immediate problems/issues and solve them by utilising their integrated professional knowledge. Tutorials for the students with different facilitators were arranged to ensure appropriate learning progress and effective teaching in the form of facilitation and guidance. The assessment criteria were stated clearly.

Participants

Following the traditional practice of the subject, Professional Studies, all students of the selected programmes were required to participate in the first Action Learning Project in the department. Also, in view of the emphasis on skillful facilitation in PBL a team of tutors acting as facilitators, were to provide a stimulating learning atmosphere to demonstrate professional experience. They were also charged with attempting to improve student performance in the project and to maintain their continuing interest in learning after the completion of the subject.

Duration

A preliminary session emphasising the essence of the PBL approach in teaching and learning, was given to students and staff separately. There were four tutorials given to students, with the whole PBL project lasting six weeks. At the conclusion of the subject, students designed and prepared the formats of the presentations of their projects. Feedback was given to the students either immediately (in the case of oral/visual presentation) or within two weeks' (in the case of electronic or report submissions), depending on the method of presentation.

Details of the actual implementation for this stage 2 action process are discussed in the following section.

Phase 3: Observation

Observation included an evaluation of the action by appropriate methods and techniques.

The main objectives of the evaluation were:

- to contemplate the structure of the PBL approach based on such criteria as: the pertinent learning issues, the interactive forum between staff and students, and discussion amongst students with the tutors being the facilitators;
- to evaluate whether the PBL approach was applied appropriately to facilitate the delivery of the Professional Studies subject in terms of professional relevance and the integrity and integration of knowledge from different disciplines;
- to collect feedback from the students so that their attitude towards the PBL approach and their difficulties with the adoption of such a teaching approach could be identified;
- to identify, by the reflection of the staff, the shortcomings of this pedagogical method, thus giving the potential for improvement in teaching;
- to evaluate the potential for applying the PBL approach to other subject disciplines.

Observations were made by a) examining the students' PBL project reports; b) receiving student feedback using a combination of closed and open ended questions in the questionnaires; c) considering the reflective journals of both students and staff.

a) The immediate feedback on the practicality and applicability of a PBL approach to Professional Studies was given through the submission of project reports which were used as the

'first-line' of evaluation. Students' project reports were submitted at the end of the 6-week duration of the Professional Studies project. Their submissions were evaluated according to the assessment criteria set in the PBL project brief. The extent of the meeting of the objectives of the assessment criteria were a clear indication of the effectiveness of students' learning, particularly in relation to problem-finding and solving, and in innovative thinking.

b) The combination of open-ended and closed questions in the questionnaire was instrumental in the evaluation of the students' whole learning process. The questionnaire took into account other relevant learning environments such as the classroom situation, group size, tutor's performance as facilitators, etc. This evaluation method was intended to collect descriptive statistics to analyse: i) students' observations of their learning activities and outcomes of PBL; ii) the feasibility of applying PBL to Construction Professional Studies; and iii) the indicative direction for further learning and teaching improvement. The questionnaires were distributed to the participating students at the end of the PBL process.

Both of these evaluation methods were summative in the process of observation. However, observation during the learning and teaching process of PBL was also important. So the keeping of a reflective journal was built-in to collect more immediate observations. Both students and staff were required to write and submit individual reflective journals at the end of each tutorial. A final group reflective journal from the students was to be submitted together with the submission of the group project report. The reflective journal was regarded, therefore, as an important and powerful instrument in both formative and summative evaluation.

c) The reflective journals were used as a means to triangulate/reinforce the analysis and results of the evaluation of the project submissions and questionnaires. They were diaries or records of happenings and reactions during the process of the activities and reflected the students' behaviours/observations, and hence the corresponding responses/reactions, during that learning process. The preparation of the reflective journal was designed to cause the participating students to reflect explicitly upon their learning experiences/difficulties and their corresponding learning attitudes and expectations. In the case of the teaching staff (the facilitators) they reflected on their own teaching experience in the conduct of the sessions.

Both students and staff asked to reflect, *inter alia*, on specific issues, presented representative quotes. In addition, other themes, unrelated to those issues, emerged in the content analysis.

Phase 4: Reflection

Reflection involves reflecting on the results of the evaluation as well as on the whole action and research process.

Students' reflective journals allowed them to: examine their PBL experience, contribute to their new learning in a positive manner, clarify learning issues and develop new perspectives (Boud et al, 1985). Reflection in learning was also in line with the tutors' teaching and facilitation using the PBL approach. Tutors' reflective journals allowed them to examine their teaching/communication skills and facilitation techniques in the tutorials which could then reinforce, modify and improve or even change their teaching practice in future.

Implementation

To realise the four phases of the action research cyclical spiral (plan, action, observation and reflection), the implementation of the strategic plan was arranged as follows: -

Plan

Participants

- There were six teaching staff and 96 students from two degree programmes - 47 students from the final year of B.Sc. (Hons.) Building Surveying (BS) programme, and 49 students from final year of the B.Sc. (Hons.) Construction Economics & Management (CEM) programme forming 12 tutorial groups.
- One of the main course objectives of Professional Studies was to acknowledge the inter-disciplinary nature of the property development process. Therefore, inter-disciplinary student groups were formed and each of them was composed of four BS students and four CEM students.

Duration of Project

The total duration of the project, from the project briefing session to the final submission of project reports, lasted for a period of six weeks. A detailed time-line outlining the time spent on each step of the project is presented as follows.

- Two months were spent by all tutors to familiarise themselves with the concepts and principles of PBL.
- A project briefing session was held for students one week before the tutorials to explain the process of, and the reasons for, the adoption of the PBL approach in teaching and learning.
- Four consecutive tutorials, each of two-hour duration, were held weekly. The last 30 minutes of each tutorial were reserved for both students and staff to write their individual reflective journals. These were collected at the end of each consecutive week.
- The fourth tutorial was to gather the final perceptions and conclusions of students about the learning and teaching in Professional Studies.
- The fifth week was allocated to the submission of the students' projects together and the group reflective journal.
- Questionnaires were completed in the last 30 minutes of the fourth tutorial to collect students' overall feedback.

Evaluation Instrument

Evaluation of the PBL approach in Professional Studies used both formative and summative tools.

- The formative evaluation instrument included individual reflection journals by both students and tutors.
- The summative evaluation instruments included group submissions of the project, group reflective journals and the completed questionnaires.

Design of the PBL Project Brief

The following information from the PBL project brief provides a background of the general picture of Hong Kong building economy:

“Integrated Project

Background:

In Hong Kong, most of the commercial development districts such as Tsim Sha Tsui, Jordan and

Wanchai were constructed 15 – 20 years ago. Refurbishment, development and maintaining existing conditions are critical to the financial health and returns of the properties.

Brief:

Your client is an investment and development firm of medium-size based locally. With the return of the sovereignty of Hong Kong and the recent downturn of the local economy, your client does not necessarily wish to sell the properties but does want to maximise the benefits of the properties. At present the company is holding the following properties and all of which are leased with a variety of expiry dates:

- Tsim Sha Tsui Centre, Mody Road;
- Cheung Lee Commercial Building, 25 Kimberley Road;
- Kimbry Court, 58 – 60, Kimberley Road.”

The inter-disciplinary groups of students performed as multi-disciplinary consultants responsible for reviewing investment and development portfolios for the client. The portfolios were devised from three blocks of properties depicting variety in building age, building type, location, accommodation area and expiry date of lease etc. In the previous approach to subject delivery, several options of solutions from which students could choose were given. For instance, they would be expected to choose from whether it was a general maintenance project, a refurbishment project or a redevelopment project. In this PBL-based exercise students were no longer given the suggested options from which to choose. They were encouraged instead to analyse the given situation, to trace the reasons, to identify the problems, to set out learning objectives and learning issues by themselves, and to put the acquired concept and knowledge into practice reflecting on their learning at the completion of their studies.

Role of Tutors in PBL

Tutors playing the role of facilitators in tutorials were expected to:

- conduct the tutorials according to the scheduled activities proposed in each of the tutorials, which was subject to the learning progress of the students;
- demonstrate to students how to question;
- stimulate learning initiatives of students;
- help students to refine their questions and develop their ability to question and synthesise;
- encourage students to identify independently problem and learning issues and hence to learn by using their own initiative;
- monitor the group dynamics;
- provide guidance in the use of learning resources and time/project management skills.

A set of guidelines were provided for tutors aimed at:

- summarising the concept of the PBL approach;
- reiterating the roles of tutors and students with respect to the principles and practice of PBL;
- highlighting the specific activities carried out by the tutors and students, the objectives of teaching and learning process and expected learning outcomes in the weekly tutorials;
- providing a consensus on possible learning outcomes, allowing for any slight individual differences in content expertise among the tutors, together with a list of course specific tasks.

Action and Observation

Experiencing PBL Practice by Tutors

All staff had begun participating in PBL seminars and workshops in the Education Development Unit (EDU) at the Hong Kong Polytechnic University two months prior to the commencement of the project.

Holding PBL Tutorials for Students

Each inter-disciplinary group performed as multi-disciplinary consultants with each teaching staff member acting as a facilitator in tutorials. The tutors guided 16 students, formed into two inter-disciplinary groups, each comprising of four BS and four CEM students, in each tutorial session.

Tutors and students undertook the following activities in the first one and a half-hours of each tutorial:

- 1st tutorial: Probing questions and problem identification.

A brief introduction of the PBL approach was given in the tutorial together with an explanatory note. The professional practices of each discipline involved were identified, followed by identification and analysis of the situation and problem. Possible options and methods of dealing with the problems were then identified.

- 2nd tutorial: Problem analysis, and identification of learning issues and objectives.

An informal tentative report of data was made. This included the giving of information and making assumptions, verification of information, and tentative decisions made in preparation for formulating recommendations.

- 3rd tutorial: Reconciliation of the solutions and assessing learning progress.

In this tutorial the scenario of the client including the physical, financial and legal implications of the options were reported. Discussions took place on the proposed options for the portfolio and outlining a tentative report.

- 4th tutorial: Finalising the learning outcomes and checks on learning effectiveness

A progress report of work was made in this tutorial and included modifying and finalising the decision of options, confirming the format of submission, and final checks on all learning issues throughout the process.

Writing Weekly Reflective Journals (staff and students) Together with Group Reflective Journals, Completing Questionnaires, and Submitting Group Project Reports

All students and tutors wrote one-page individual reflective journals during the last 30 minutes of each of the first three tutorials. In the fourth tutorial, all students completed a questionnaire for the purpose of collecting individual overall reflections of learning for evaluation. With respect to the collective reflection, all groups of students submitted group reflective journals together with their group project reports.

Designing the Questionnaire

A set of questions was formulated to examine the students' perceptions of the learning process using a PBL approach.

There were 23 closed questions intended to determine the intensity of agreement with each question. Areas of questions included appreciation of the PBL approach, the difficulties of the

problem, the size of tutorial groups, the arrangement of tutorials and the role of tutors. There were also three open-ended questions aimed at soliciting student perceptions of the strengths and weaknesses of PBL and seeking their opinions on any related area.

Reflection

Throughout the PBL process, students and tutors had reflected both individually and in groups.

With the learning process in each of the first three tutorials, students writing individual reflective journals reviewed and examined their learning experience, highlighting their learning difficulties and their general experiences of PBL. Similarly, tutors examined and reflected on their skills of facilitation, their ability to stimulate students, their techniques of guidance and communication, and their improvement in, and reinforcement of, their teaching practice. This was recorded in individual reflective journals at the end of each of the first three tutorials. Feedback from tutors was then given to students on their individual reflective journals. From this, students could then re-examine their learning experiences before their next time of reflection. On the basis of combined quantitative and qualitative analysis of questionnaires, and the thematic analysis of reflective journals, the tutors examined some of the implications of the students' perceptions and the value of using PBL.

Analysis and Results

Student Perceptions of the Value of Using PBL

95 students (99%) anonymously completed questionnaire. The majority of respondents felt positively about this PBL project. More than half of them agreed or strongly agreed that the PBL project was challenging enough and relevant to their professions and that they enjoyed the tutorials.

More students enjoyed the PBL project than other non-PBL ones. More than half of the respondents said that they would support the use of PBL in future Professional Studies, many of them commenting during tutorials that the PBL approach should have been adopted from the beginning of the course, that is, the first term of their first year. They supported the PBL approach because, again according to more than half of them, they learned more through the PBL approach than they would have otherwise. In general, it also appears that they understood the objectives of the PBL approach. More than four-fifths of them agreed that it was worthwhile identifying learning objectives and issues by themselves rather than to have them given by tutors.

Student Perception of Workload and Tutorials

There was clear indication that most of the students (70%) found the PBL project challenging enough. Of all the 23 questions asked, this question resulted in the highest proportion of agreement, indicating that the majority found the project relevant to their respective professions of quantity surveying and building surveying. Almost 90% of them agreed that the PBL project encouraged the integration of knowledge from other subjects, and that the project together with the tutorials allowed them to learn more about the related disciplines of quantity surveying, building surveying and general practice surveying.

From their positive perception towards the importance and value of the PBL project, it was found that almost 70% of them found their workload heavier than on previous similar projects which were not based on PBL. These 70% of the respondents reported that they had to prepare a lot

before attending each tutorial. An even greater percentage, 85%, said that this project made them participate more actively in their respective groups.

Thus there was sufficient evidence to show that they worked 'harder' than before and they valued this challenge. These positive perceptions may have resulted from the pleasant experiences in the tutorials. Again, more than half of them agreed that the number of tutorials and tutors were about right, and so was the frequency of meetings and group size. The majority of respondents found that the tutorials were useful in helping them to understand what PBL was in general and to tackle the problems in particular. Almost 90% of them found that the questions and discussions raised by the tutors were useful in helping them to develop their ideas. The discussions with tutors and among themselves were useful and were in fact encouraged. More than four-fifths of respondents enjoyed having worked in their group. That was to them a positive experience.

Written Comments

Students were asked in open-ended questions, to write: i) what they liked most about the PBL approach, ii) areas for improvement, and iii) any additional comments and suggestions. When asked what they liked most about the PBL approach, almost 70% of the responses made one of the following three comments:

1. enjoyed identifying problems and learning issues on their own;
2. regarded PBL project as an intellectual exercise of logical thinking, brainstorming and creativity; and
3. enjoyed discussion among group members and with tutors in tutorials.

Their written comments reflected their positive attitude, confirming the results of the questionnaire. However, when asked for areas for improvement, many of those who responded asked for more guidelines, probably demonstrating that while most of them appreciated the intellectual challenge of PBL and enjoyed the process, they were still not confident about participating in this methodology. About 44% of those who commented said that direction and guidance from tutors was insufficient, and the brief should have provided more instruction and guidelines. More than half of the respondents did not volunteer any additional comments and suggestions. Of those who did, most suggestions were of the 'house-keeping' nature such as the provision of classroom furniture that should have been more conducive to group discussion.

Reflective Journals

The students' response towards the reflective journal counting 30% towards their assessment was rather mixed. While about half of the entire group agreed that it was a fair allocation, the other half disagreed. This might imply that what students wrote in the journals might not fully reflect what they truly thought, but rather, what they thought might secure higher grades from the tutors. Nevertheless, the general impression was that the journals on the whole corroborated the findings of the questionnaire. The majority stated that in the initial tutorials they were "not sure about what PBL was all about". Many of them even complained that tutors did not make the questions explicit enough. In later journal entries, following thorough discussion amongst themselves and tutors, most said that they appreciated the importance of practice at problem-identification. It was generally agreed that the application of a PBL approach to Professional Studies was appropriate, even recommending that it should start in year one with students being given an appropriate workload. However, it remained to be seen whether they had been convinced of the benefit of PBL, or whether they had responded with statements which they thought the tutors would like to read.

PBL or the Tutors?

Another observation made was that the perception of the students, as reflected in some of the answers to the questions in the questionnaire, depended somewhat on who the tutors were. An analysis of variance was conducted for each of the questions, with the null hypothesis being that there was no difference in the perception of students from the five tutorial classes of the tutorials and tutors.

It was found that irrespective of who had been their tutors, the students generally had enjoyed and learnt more from the PBL project, thus supporting the use of PBL in future Professional Studies. Conversely, the survey results indicated, with a significance level of 0.005, that whether the tutorials were useful and whether students felt that they had to work and prepare a lot, depended very much on who the tutors were. It was also found when considering: i) whether tutors had influence on students' perceptions of whether the PBL project was challenging enough, or relevant to their respective professions, ii) whether the PBL project encouraged integration of knowledge, and iii) the weighting of reflective journal in coursework assessment, that the perception of two tutorial classes were statistically different from that of the remaining three, and the null hypothesis could not be rejected at a significance level of 0.010 (using the Bonferroni multiple comparison test). For the remaining questions, there was no clear indication about whether the perception of students was tutor-specific. Such questions were concerned with the administration of tutorials, with the identification of learning objectives, and with the usefulness of discussions in tutorials.

Thematic Analysis of Reflective Journals

The empirical studies have been further supplemented by the qualitative analysis (below) of the reflective journals. A thematic approach was adopted to analyse the observations and reflections of both students and tutors. The themes were categorised into a) learning effectiveness, b) teaching effectiveness, and c) other issues.

(Note: T = quotations from the tutors, S = quotations from the students)

a) Learning Effectiveness

1. Questioning Ability/Problem Identification

Students struggled with the process of consideration when making decisions.

Some decisions have been changed many times. Although every time I need to revise the project, I can know more what I don't know before. (S)

The tutor gave us some of his valuable ideas, but we found that we can also ask for his comment on our proposal on ordinary professional studies. Also, we are just using our knowledge from the past two years in solving the task. (S)

2. Knowledge Acquisition/Interdisciplinary Professional Practice

The project enabled students to discover the breadth of professional practice.

The most important thing that I know after this tutorial is that we should not clearly divide the works between BS and CEM when doing this project. (S)

Through the PBL learning, we have wider knowledge [of the] construction industry. We are not concerning [with] our field only. We come to know more about the related field. I understand that the prospective client will not ask questions subject to the field that you belong to. (S)

I can't find anything that relates to BS/CEM field. I am not drawing the [border] of BS/CEM, but is there anything in this question relating to our field. (S)

3) Group Dynamics/Learning Environment/Student Participation

Students took the initiative to learn when participating in the group project.

Although we still have no decision on options for each property, we know what direction we should go. (S)

Next time, I should encourage others, especially those who don't speak much of their opinion. And we can express our opinion in turn. (S)

With the tight schedule and significance of the dissertation, though I am fully impressed by PBL yet I cannot fully put myself into the project and feel the good of PBL. (S)

Throughout the tutorial, I have given a lot of hints to students. However, students' attitude remained to wait for [the] answer without working hard to think of it. Probably, it was still at a preliminary stage of the project using the new PBL approach. (T)

b) Teaching Effectiveness

1. Creating an Optimal Learning Environment thus Enhancing Teaching Effectiveness.

Tutors reflected that they had considered different factors that could create a forum atmosphere conducive to developing an interest in learning.

CEM and BS students (even in group) would discuss only among their own disciplines. I think seating of students in groups needs to be re-arranged. (T)

Some groups had well prepared themselves so they participated actively and learned in the right direction whilst others need to be pushed a bit. (T)

Pace was better than the last tutorial session but still time was not enough for guiding students to learn. (T)

We come up with the term 'locally' in the brief. Although I cannot contribute to the right answer of it, I know this is not a problem of it. PBL gives me a golden opportunity to take an active role and think it over. (S)

In PBL, it starts with problem and drive students towards the acquisition of knowledge and skills through a staged sequence of problems presented and identified in context. (S)

2. Learning Facilitation

When reflecting on the ability to facilitate questioning and guidance, tutors had encountered the challenge of arousing students to learn by various methods of persuasion and encouragement.

To me they were so easily convinced and even indoctrinated, and were ready to accept anything their teachers said without much discerning thinking, not even with some scepticism. (T)

I used to invite individual students to speak out; otherwise any discussion would come to be a dialogue between me and one or two students. (T)

As reflected in the discussion, they bought the ideas that sometimes it would be necessary to do creative destruction of preconceived ideas in order to explore more effective and efficient ways of doing things. (T)

What is more important, I think, in this project is the argument or reasoning that we use to argue whether the project (*is*) worth to be carried out. (S)

In the past professional studies, after we got the question of assignment, everyone will run to the library to get some data immediately. But in this professional studies, no such thing happened. It is because data collection is not important while thinking is the most important. Under our own ideas, we need to give some supportive arguments and reasoning. (S)

c) Other Issues

1. *The Scope and Depth of Learning when using a PBL Approach*

When Considering the Scope and Depth of Learning when using a PBL Approach, students stated:

It is different from before in which various specified tasks were assigned. I feel that PBL is quite good. It really stimulates me to think and to have brainstorming. (S)

Thinking almost to every question that make me feeling a little bit tired and difficult. But it is exciting and a pleasure when I can imagine a good and correct answer. It can give a chance for me to review my knowledge during these three years of university studies. (S)

Within these three weeks, I think that the most difficult task is time management. We have to spend lots of effort on arranging time of meeting, deadline of submission and distributing works among group members. (S)

What I learn from PBL is to think logically and to do things step by step. (S)

I feel that PBL is essential to me for my future career and further study. Since I can work independently and think logically. Therefore I suggest that next professional studies or other assignment can adopt this method to allow student working independently. (S)

In brief, I found this session is fruitful to me and hope other subjects other than professional studies can adopt this approach as the core learning method. (S)

I suggest that this teaching approach should apply to the first year of the programme. We can select some subjects and project to apply this method. If so, we will have 3 years of experience and can apply to the future career. (S)

2. *Comments about the Classroom Situation and Group Size*

Comments about the classroom situation and group size are exemplified in the following quotes from students:

During lesson, our class decided that tutor facilitate each group in turn. This approach could be more helpful and useful to us. One of the reasons is that I do dare to express my views. If all students sit in the same classroom, I feel shy and afraid to express my opinion. (S)

Because of time limit, we cannot hear about the opinion of the other groups, I think this is not very good. Since if we know the ideas of the other groups, we can absorb some opinions

which we may not think before. And then we can make some improvement to make a better result. (S)

3. Perception of Prejudice in the Tutors' Expectations vs. the Design Requirements of the PBL Project

There was also a perception of prejudice in the tutors' expectations vs. the design requirements of the PBL project

The basis of the assessment is not clear enough, i.e. on what aspects the students can score high marks. Is reflective journals as a part of assessment, it will be quite odds if students do not know the criteria of assessment at all. (S)

I found that different tutors give different guidance to different groups. It makes that we have difficulties in defining the scope of the project. I think it is one of the greatest difficulties to apply PBL. (S)

Conclusion

The survey suggested that most of the students enjoyed the experimental PBL exercise, irrespective of who the tutors were, suggesting that we should engage in more PBL activities. However, there was sufficient evidence to show that, perhaps as expected, the usefulness of the tutorials would be very much dependent on who conducted the tutorials. This was not surprising, since tutors played important roles as facilitators, introducing and explaining the concept of PBL which was new to the students. Since a great majority of them seemed to have a positive attitude towards the PBL approach, perhaps at least the tutors had succeeded in 'selling' the idea of PBL. We should give feedback of these results in detail to the tutorial team.

Many of the students commented that there were not enough instructions. Whilst students appreciated that problem-identification was a prime objective of PBL, many of them still did not want to identify the problems themselves. In the tutors' reflective journals, there were comments that when students realised that they had to identify the problems in discussions between themselves, their facial expressions showed that they were sceptical to say the least, though they responded positively nevertheless. As a consequence, students subsequently needed to be given many hints. It was also found that their attitude towards rote learning remained firm, supporting the findings of other PBL studies.

In conclusion, some aspects of our implementation of PBL could have been improved. The key lessons we have learned from this experience are that:

- the PBL approach should be applied in the first year studies of the programmes;
- the training of tutors in facilitating skills should be enhanced;
- a detailed record of this project should be kept for future reference;
- assessment for the Professional Studies student reports needs to be considered because PBL is student-centred and therefore, self-assessment of students may be more relevant than assessment by the tutors.

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