Impact of project based learning on recruitment of engineering students

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ABSTRACT

Project based learning (PBL) is a learner-centric pedagogy where the learner is expected to take responsibility for their own learning. Research was undertaken to analyse the role of PBL in a leading technical institute "Jaipur Engineering College and research Centre" Jaipur, India (JECRC) approved by All India Council for Technical Education (AICTE) and affiliated to Rajasthan Technical education (RTU). Students from all engineering courses viz. Electronics and communication, Electrical, Computer science, Information technology, Mechanical and Biotechnology, have projects as a compulsory task course in the final semester under the RTU syllabus. The ability to acquire knowledge and skill during their project, gives a student an opportunity to develop their weaker skills and enhance their practical knowledge of engineering. This trial has been very successful in acquiring a high rate of student actual skill and technical learning. The learning outcomes of the PBL course can be correlated with their recruitment status and academic performances. PBL can be seen as a pedagogical innovation for better recruitment drives for on - campus recruitments.

***Keywords**: Project based learning, recruitment, engineering college, JECRC*

INTRODUCTION

Today's students need to see and understand the relevance, reality, and authenticity of concepts both in the classroom and in the real world. One unique teaching method that is proving to be effective in the classroom is project-based learning (PBL). PBL is a hands-on approach to learning. It incorporates a number of need-to-know concepts that they must learn, understand, and apply in order to complete the project. After all, the idea of assigning projects to students is not a new one. Project-based education is one of the learning environments (Van de Bergh et *al*., 2006) congruent with the principles of student- and competence-centered vision. It can be seen as a pedagogical innovation which integrates theory and practice by means of problem solving of working life issues (Laynea *et al.*, 2008).

Bransford and Stein (1993) have defined PBL as a comprehensive instructional approach to engage students in sustained, cooperative investigation. The PBL approach is appropriate to acquire generic skills such as problem solving, communication and teamwork (Wolfs *et al.*, 1997). The benefits of PBL include enhanced student participation in the learning process (active learning and self-learning), enhanced communication skills, addressing of a wider set of learning styles, and promotion of critical and proactive thinking. PBL also facilitates the development of many of the "soft skills" demanded from engineering graduates (Hadim and Esche, 2002). Soft skills' and "generic skills" are interchangeable phrases in terms of the categorization of non-technical skills. Application of principles and practices of these skills is integral to the learning process. The practice educator requires an understanding of the principles of these skills and their application to and in the workplace. An important piece of PBL is incorporating technology into projects. The team projects in PBL have a contextual focus enabling students to understand why they are learning the particular content and how it

will be applied in the 'real world'. The project needs to allow students to make real life connections but also implement decision making skills, learning and applying new concepts and using their knowledge through a variety of education contexts.

PBL goes beyond generating student interest. Well-designed projects encourage active inquiry and higher-level thinking (Thomas, 1998). The students' abilities to acquire new understanding are enhanced when they are connected to meaningful problem-solving activities. The students are helped to understand why, when, and how those facts and skills are relevant (Bransford *et al.,* 2000). Working together with others, collaborating with other students is a key element of Project based learning. Implementing research in a variety of environmental contexts is imperative through the application of several technologies including, computer programs, audio visual equipment and real life research to ensure that the full experience of the project is gained.

Program assessment is a vital activity in order to determine the outcomes of student engagement in PBL. These outcomes include programme issues, knowledge, skills, attitudes and identity and post educational professional performance. Knowledge and skills are, generally, easy to directly measure by common assessments used in nearly all engineering courses; usually conducted via graded reports, presentation, and other student work. Attitudes are often hard to measure, particularly within the timeframe of a single course where changes often manifest later upon self-reflection. General use of these assessment tools to measure the skills, outcomes and competencies developed from participation in PBL requires further evaluation. All these outcomes can be directly related to the recruitment and post educational professional performance (Swan et al., 2009).

CASE STUDY: PROJECT BASED LEARNING AT JECRC

A number of engineering schools have reframed their education around project-based or active learning but recruitment is always the major motivator for professional study. To establish a relationship of PBL with recruitment, the 444 students of Jaipur Engineering College and Research Centre (JECRC), final year, batch 2010, were taken as subjects and their project based learning was critically assessed. JECRC is one of the leading technical institutions in North India .The institute offers a 4 year Bachelor of Engineering degree in Electronics and Communication engineering (ECE), Electrical Engineering (EE), Computer science and Engineering (CS), Biotechnology engineering (BT), Information Technology (IT) and Mechanical Engineering (ME). All the courses are approved by All India Council for Technical Education (AICTE) and affiliated to Rajasthan Technical University (RTU), Kota. The admissions are on the basis of ranking in the various competitive examinations like All India Engineering Entrance exam (AIEEE) and Rajasthan Pre-Engineering Exam (RPET). The institute nurtures the essence of growth in education and its holistic approach focuses on the overall development of its students. According to the curriculum, all the students pursuing engineering courses under the RTU have to pursue a definitive project. The duration of the project based learning varies from 45 days to even 6 months. During the recent mock interview session of the on-campus recruitment drive, the author was exposed to some surprising facts. The academic performance could not be directly correlated with the technical skills and hands on expertise for some of the students. Additionally, the efficiency, sincerity and innovativeness of PBL may be directly correlated with performance in on-campus recruitment.

So, the proposed model to correlate PBL with academic proficiency and recruitment would now depend on two major concepts. The first is to believe that academic performance is not always associated with skill and technical expertise. The second concept is the students who are innovative and sincere in their project work have an interdisciplinary learning approach. Due to this interdisciplinary approach, these students are well placed in the on-campus recruitment drives. The research question addressed here is the suitability of PBL in achieving the desired learning outcomes i.e. practical knowledge of engineering, basic knowledge of engineering design, and generic skills or personal competences and their impact on the student's performance in on-campus recruitment drive.

STRATEGIC RELEVANCE OF RECRUITMENT WITH PBL IN JECRC

An assessment of the impact of project based learning on the on-campus recruitment of the final year, 2010 batch of JECRC Engineering students was performed. The parameter taken were skills learnt during PBL, hands-on-training, innovation in the project, and practical application of the project. A grading scale for PBL was scored for below average (10), average (20), good (30) and excellent (40)

projects. The assessment grades were collected from the respective departments. It was also noted that students performed the projects, both in small groups and also individually. Again, the projects were completed in various companies or institutes. But some projects were also completed in the Institute itself. The academic performance was also correlated taking into consideration their performance in school, high school and engineering studies and given a grading scale (below 60 % =5; 60-69%=10; 70-79%=15; 80-89%=20; 90-100%=25). JECRC students have shown their potentiality to get placed in top companies .They are usually placed when they are still studying in the JECRC college and are in their final year. In 2010, 21 companies visited the campus for recruitments. To grade the recruitment, scaling was done on the basis of the status of the company in terms of the salary package (excellent pay =15; moderate =10; average =5) and also the attempt the candidate made in securing the job (first attempt 21; second attempt 20 and so on).

On the basis of the aggregate scoring for academic performance, PBL and recruitment status of individual candidate, all students were further categorized for their very high (150-200), high (120-149), moderate (80-119 and low (below 80) probability for recruitment in the on campus placement drives (Table 1).

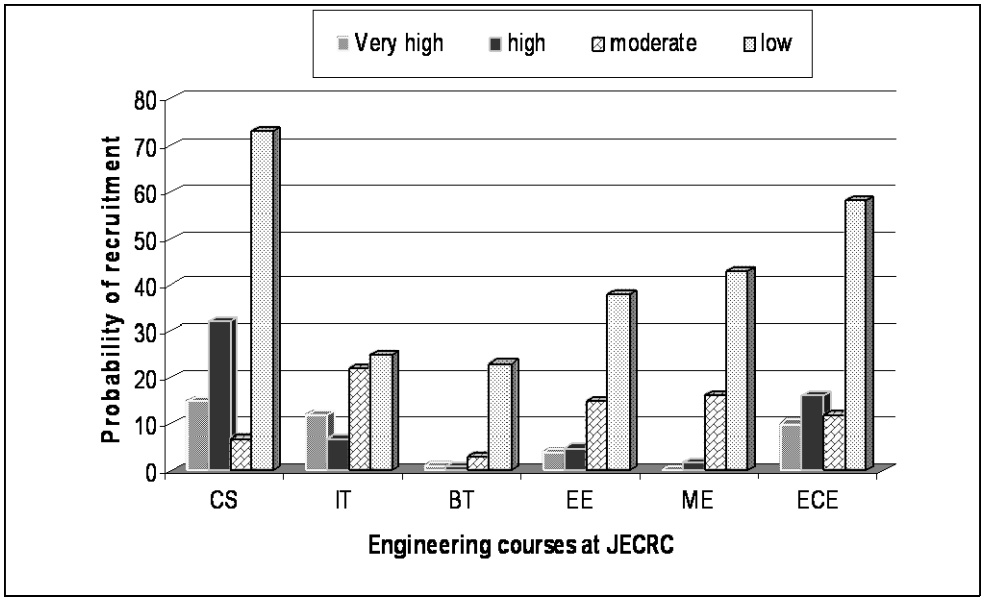

Figure 1: Probability of recruitment in engineering department of JECRC.
{Electronics and Communication engineering (ECE), Electrical Engineering (EE), Computer science and Engineering (CS), Biotechnology engineering (BT), Information Technology (IT) and Mechanical Engineering (ME)}

It was found that CS, IT and ECE had a very high probability of getting placed in good companies followed by ME and EE whereas BT had a low chance of recruitment (Figure 1). This was further investigated considering each variable (Table 1).

A relationship of PBL with recruitment was assessed. When the average of the variables were plotted, in almost all the departments, a direct relationship of an increase in the PBL performance could be seen with that of the recruitment status except for the BT (Figure 2).It was found that in the year 2010, most of the on-campus recruitments were for IT and software based companies where BT students could not perform better in comparison to the other students. It was obvious that students with high academic performance would be good in PBL and hence a correlation between the academic performance and PBL was also analyzed (Table 1). Except in EE and BT, there was no direct correlation between the variables. It was revealed that only in the BT and EE branch, those students who were academically good were research oriented and showed better performance in PBL. Most of the departments except BT, worked on PBL in teams ranging from 2 to 6. The team spirit, networking along with on-site hands-on guidance for building practical skills helped the students to gain all the qualities required to be hired. It was suggested that in future if BT students were exposed to IT related PBL then the recruitment status for software and IT companies could be better.

Table 1: Data analysis of the engineering departments on the basis of academics, PBL and recruitment status in JECRC.

Department	Probability of Recruitment	Project Based Learning	Recruitment status	Academics	Total
CS	Very high	30	86.86	51.33	168.19
	high	29.14	54.68	46.9	130.72
	Moderate	25.71	23.71	45	94.42
	low	28	0	41.36	69.36
IT	Very high	25	88.16	51.25	164.41
	high	27.14	62.57	46.42	136.13
	Moderate	20.45	29.13	41.36	90.94
	low	23.6	0	39.2	62.8
ECE	Very high	29	87.8	53.5	170.3
	high	27.5	55.87	52.18	135.55
	Moderate	26.66	33.55	43.88	104.09
	low	26.72	0	39.83	66.55
ME	high	30	46	50	126
	Moderate	25.55	19.82	41.94	87.31
	low	26.58	0	33.47	60.05
EE	Very high	37.5	85.25	55	177.75
	high	26.66	55	46.66	128.32
	Moderate	28.23	20.23	40	88.46
	low	23.68	0	32.5	56.18
BT	Very high	40	61	50	151
	high	30	61	50	141
	Moderate	40	0	53.33	93.33
	low	21	0	41.5	62.5

{ Electronics and Communication engineering (ECE), Electrical Engineering (EE), Computer science and Engineering (CS), Biotechnology engineering (BT), Information Technology (IT) and Mechanical Engineering (ME)}

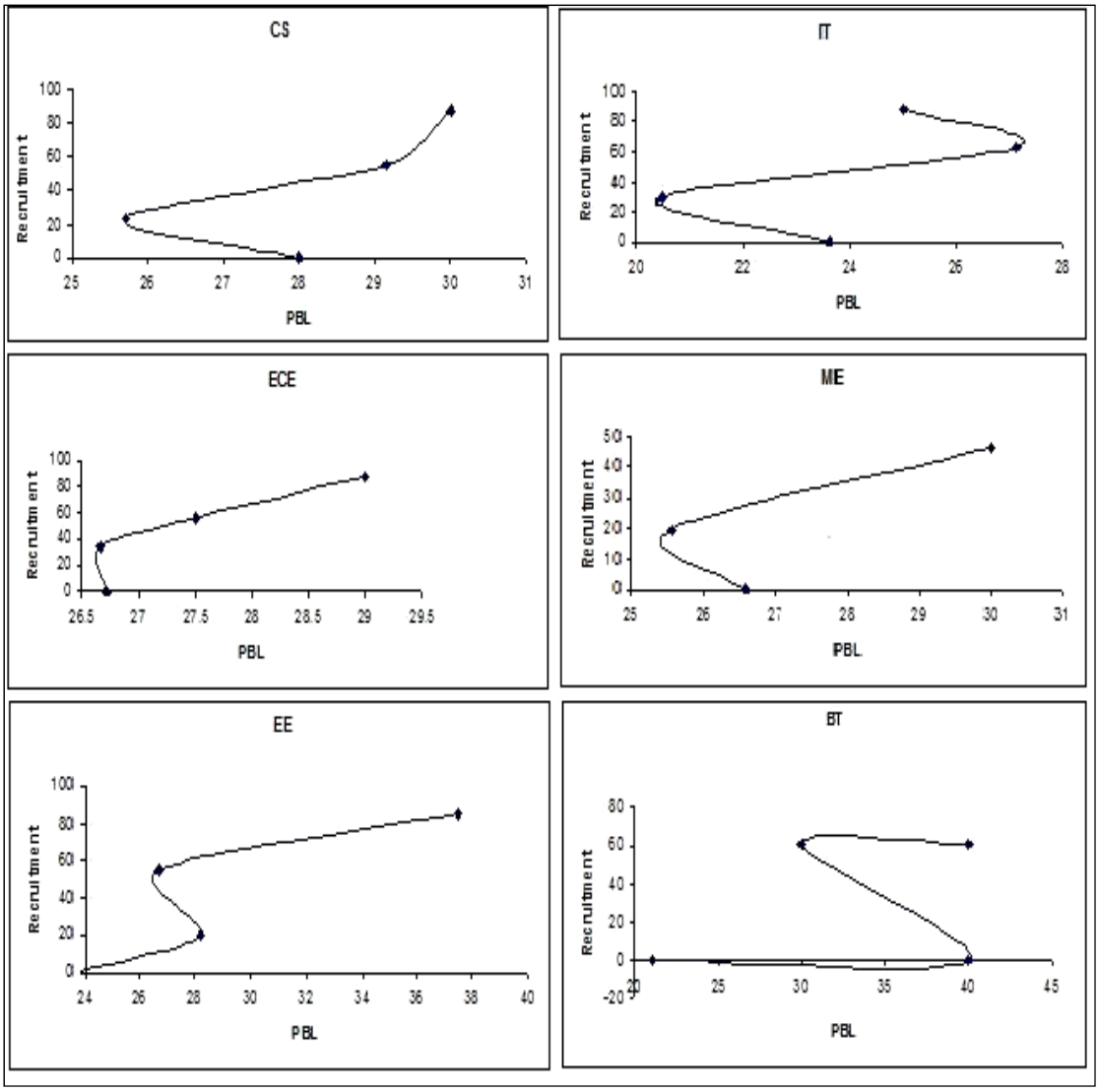

Figure 2: Relationship of recruitment and PBL in different engineering departments in JECRC.

CONCLUSION

PBL emphasizes on students' learning in cooperation with others, and on their own participation in the act of learning. It stresses the social dimension of learning, its negotiated nature, the need for a process in which learning is "anchored" in the real world. From the onset, it was realized that offering a PBL course such as project dissertations/training would require different teaching and learning strategies. Students and teaching faculty also acknowledged the same conclusion. From the study, it was concluded that the probability of recruitment increases for those students who are innovative, skillful, disciplined and dedicated to PBL. These students acquire the skills and competencies during PBL and this experience helps them to secure a job in the on-campus recruitment drive .Thus, such an educational system allows students to obtain an acknowledged degree in an academic education, acquire specialised hands-on-training at the same time gain confidence for their recruitment programmes for their professional growth.

It's important to note that throughout the project, the students have to employ their innovative skills and improvise the technique. During PBL, the students have to learn to jump from common-sense ideas to more substantiated ideas based on practical experience and theoretical reflection – after all, that's what engineering is all about. A number of items need to be evaluated with respect to the skills that the students develop by their involvement in PBL efforts. Answers to these questions can provide evidence that PBL is of value for a sustainable engineering education across a career.

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