Chapter 27
Enhancing Engineering Education Learning Outcomes Using Project-Based Learning: A Case Study

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ABSTRACT

This paper presents a case study of how project-based learning (PBL) can be seen as a pedagogical innovation for Jaipur Engineering College and Research Centre, Jaipur, India (JECRC) for better recruitment drives for on-campus recruitments. The practical knowledge of engineering, basic knowledge of engineering design, soft skills or personal competences can be correlated with the academic performance and recruitment status. Project based learning (PBL) is a learner-centric pedagogy where the learner is expected to take responsibility for his or her own learning. PBL uses in-depth and rigorous classroom projects to facilitate learning and assess student competence. Students have projects as a compulsory course in their curriculum in the final semester of engineering. The challenge to acquire knowledge and skills during their project gives a student an opportunity to develop their weaker skills and enhance their practical knowledge of engineering. This study has been successful in helping students acquire a high rate of actual skill and technical learning. The learning outcomes of the PBL-course can be correlated with their success in recruitment and academic performances.

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INTRODUCTION

Today's students need to see and understand the relevance, reality, and authenticity of concepts and apply them to their lives 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 use technology and inquiry to respond to a complex issue, problem or challenge, understand, and apply in order to complete the project. Project-based education is a learning environment congruent with the principles of student-and competence-centred vision. This has been an ongoing innovation since last 40 years. It can be seen as a pedagogical method 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). 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'.

PBL goes beyond generating student interest. Well-designed projects encourage active inquiry and higher-level thinking (Thomas, 1998). The students' major challenge is to acquire new understanding. PBL helps to enhance creative thinking skills by showing that there are many ways to solve a problem when they are connected to problem-solving activities. The students are helped to understand why, when, and how those facts and skills are relevant (Bransford *et al.,* 2000). Within the project based learning framework students collaborate, work together, and take responsibility for their own learning.

CHALLENGES OF PROJECT BASED LEARNING

Because of an increasing quality concern for higher education, additional attention is being paid to new educational principles with a more student- and competence-centred vision (Van der Bergh *et al.,* 2006). Project-based learning is one of the learning environments congruent with these principles (Van de Bergh *et al*., 2006). Project-based learning offers a wide range of benefits to both students and teachers. Academic research supports the use of project-based learning in college/school to engage students, cut absenteeism, boost cooperative learning skills, and improve academic performance. The major challenges 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 and finally making them more competent to get jobs in on campus recruitment drives. The real-world problems capture students' interest and provoke serious thinking and motivate them for self-learning process. PBL also facilitates the development of many of the "soft skills" demanded from engineering graduates (Hadim & Esche, 2002). Soft skills and "generic skills" are interchangeable phrases in terms of the categorization of non-technical skills. For students, project-based learning helps to overcome all challenges and convert them into their major success. They include:

- Increased attendance, growth in self-reliance, and improved attitudes toward learning (Thomas, 2000).
- Academic gains equal to or better than those generated by other models, with students involved in projects taking greater responsibility for their own learning than during more traditional classroom activities (Boaler, 1999; SRI International, 2000).