

Teacher's perception towards their role in Course Level Project-Based Learning environment

Bhaveshkumar N. Pasi¹, Vikas V. Shinde², Mayuri R. Chavan³

¹Mechanical Engineering Department, Vishwaniketan's iMEET, Khalapur – 410 202, India. **(Corresponding Author)***

²Project Based Learning Centre of Excellence, Vishwaniketan's iMEET, Khalapur – 410 202, India.

³Cold Chain Logistics Department, Stellar Value Chain Solutions, Mumbai, India.

¹bnpasi@vishwaniketan.edu.in

²vvshinde@vishwaniketan.edu.in

³mayuri.chavan@stellarvaluechain.com

Abstract: This research article focuses on survey of teachers of Vishwaniketan Institute of Management, Entrepreneurship and Engineering Technology (ViMEET), affiliated to Mumbai University, India who are implementing Course Level Project-Based Learning (CLPBL). ViMEET has to follow the curriculum given by Mumbai University, India. To make students industry ready with more practical knowledge, management of ViMEET introduces CLPBL in every semester for specific subjects along with the curriculum defined by Mumbai University, India. As there is no scope of CLPBL in Mumbai University curriculum therefore teachers of ViMEET have to deliver different roles while curriculum delivery along with CLPBL implementation. Therefore, this survey was carried out to understand teacher's role clearly while implementing CLPBL to make CLPBL successful. In the present survey, quantitative research design method was used to understand teacher's role in CLPBL. The survey was conducted to find out what teachers know about their role while implementing CLPBL and how they are implementing PBL at course level in Vishwaniketan iMEET, India. A total of 16 teachers of Vishwaniketan iMEET, India have implemented CLPBL in the even semester of academic year 2018-19 and participated in question based survey. Quantitative data were collected by sending emails to the teachers. About 54% participants agreed that CLPBL supervisor should have leadership skill. 45% participants believes that CLPBL implementer should have passion to do mentorship, whereas 50% participants felt that CLPBL implementer should use different approach to deal with students of different skill set. 48% of participants believes that the purpose of CLPBL was to make students compulsory to do any project. Frequency analysis of participant responses shows that teachers are not aware about their roles in CLPBL. Almost half of the participants in present study stated that the main motive of CLPBL was to make students compulsory to do any project, which does not match with the definition of PBL. Also, respondents agreed that more training is required to teachers to understand their roles clearly while implementing CLPBL.

Keywords: Project-based Learning (PBL), Course Level Project-based Learning (CLPBL), Leadership, Technical Skill.

1. Introduction

Since many years, teaching methodology of engineering courses is same. The lecture-based approach is adopted to control the learning practices (Akao, 2012). Now-a-days, engineering students should have questioning and critical thinking skills to solve complex practical problems (Alves et al., 2016). Also, engineering students should have good communication skill as well as ability to work in team (Bacarin et al., 2014). In recent years, industry requirements from engineering graduates have been changed. Industry requires graduate engineers with practical knowledge. Therefore, it is need of time to improve teaching-learning process. Teaching-learning process can become more effective by implementing CLPBL in curriculum (Baytiyeh and Naja 2016).

Research and new trends in engineering education clearly emphasize the importance of practical application of theory, creativity and innovation as key skills required for problem solving (Carpenter et al., 2016). The world has changed rapidly in the last decade and major changes such as globalization, technological advances, inter-connectedness, and accessibility to information influence the way current and future generations of students learn. Educators are finding it challenging to fit in new material into a full curriculum in a timely manner (Chau, 2015). For a long time the focus in engineering education was mainly on disciplinary knowledge only, but recently there has been a significant shift in focus to include more design thinking and professional practice elements, as highlighted by professional industry bodies (Chau, 2014). Interaction with industry professionals indicates that they require engineering graduates to be able to think critically, analyse problems, create innovative solutions and communicate effectively (Chau et al., 2014). Therefore, it has been found that there is a need of PBL in engineering courses.

PBL is a technique which motivates students to study the concepts in detail which may or may not be given in curriculum. PBL needs considerable understanding of technical subjects, team work and determination on the part of the students and CLPBL implementer (Cooper, 2013). Implementer of CLPBL plays an important role in guiding students from idea generation to project completion.

It has been found that in PBL teacher's role changes from instructor to project guide. Instructor transmits information and organizes activities for practice. To understand the learner's interest is the need of PBL. The teacher should act as a good listener when the learner is eager during solving the issue and start asking the questions. PBL implementer requires to enable the skill in the group of learners for moving in single direction by choosing own ideas of solutions without any hesitation. (Daun et al., 2016). The teachers should have some liberality for obscurity. This research article gives an overview about the different PBL models used in Vishwaniketan Campus and expected role of teachers in all PBL models.

1.1 PBL Models in Vishwaniketan Campus

Over and above the 'University of Mumbai' curriculum; Vishwaniketan employs Project-Based Learning approach to transform students into design engineers, industry-ready professionals and entrepreneurs for successful career. Vishwaniketan uses four different PBL models i.e. VA-PBL, CLPBL, i-PBL, UG Fellowship in their campus (refer fig. 1). The major outcomes of this PBL models being start-ups, scholarship for MS program and international mentorship for the students.

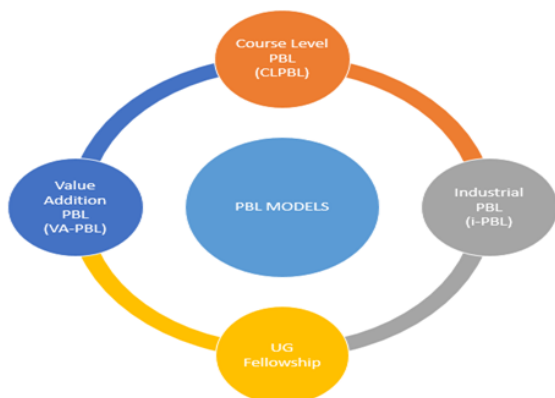


Fig. 1: PBL Models in Vishwaniketan Campus

1.1.1 Course Level PBL (CLPBL)

Course Level PBL (CLPBL) models are implemented at the course level and focuses on student's deeper content learning and skill development. Every semester, each department practices CLPBL.

1.1.2 Value Addition PBL (VA-PBL)

Value Addition Project Based Learning (VA-PBL) starts in the second semester, and focuses on students technical skill development in which students are trained by the industry on the future technologies of his/her choice. Every semester students work on one project till sixth semester. This way he learns five technologies and completes five projects.

1.1.3 Industrial PBL (i-PBL)

Industrial Problem Based Learning (i-PBL), is aligned to design new products as per the customer

requirements and technology useful for industry. In this model, students work on industrial problems. Vishwaniketan have four industrial labs sponsored by the industries in automobile, wireless robotics, automation and product design. Aim is to get acquainted with industrial, tools, techniques and practices. Goal is to produce future products.

1.1.4 Undergraduate (UG) Fellowship

Vishwaniketan firmly believe that education has no boundaries. The best possible global exposure and learning through Vishwaniketan's UG-Fellowship programme, helps students to transform themselves into ideal global professionals. Project Based International Research Summer Internship gives students international exposure. Vishwaniketan have networked with CTIF and 16 international universities, which offer fellowships in which students work with university professors on research projects. Typically, students spend six weeks in that university and takes university support to complete the project.

1.2 PBL Teacher's Qualities and Skills

By changing traditional "teacher and students" model, PBL can be made effective and successful. In PBL environment teachers have to possess different skills and roles. Teachers must:

- Be able to provide encouragement, empathy and motivation.
- Enable and accelerate brain storming, development and involvement through group activities.
- Generate classroom activities based on understanding of students.
- Should be innovative for performing experiments and flexible to be available after working hours in case of need.

PBL should include advancement is in traditional teaching pattern and adaptable for opting learner's choices and views. Currently system encourages compliance and demonstration-based learning and bell schedules. In a PBL scenario the instructor's orthodox role changes and it may need some time to change. The instructor should act as a guide or coach in the classroom (Du et al., 2013). The instructor should not assume skilled problem solving attitude from the students. To learn rational issue solving technique is the main aim of PBL, students might need guidance and assistance during this process (Dym et al., 2015). To create and solve questionnaire along with the students, the instructor can put a good teaching model in front of the students. The teacher may change his/her involvement as per improvement of the students in problem solving. However, the teacher should be able to distinguish between guidance and extra engagement (Edström and Kolmos, 2014). The teacher should use multidirectional techniques of finding the solution for a problem to enhance the good thinking skill of the students. Also, if the teacher always give complete solution for the problem then students will not take ownership for finding out the solution (Fernandes et al., 2012). The teacher should develop the skill of observing the things and ask questions for it in various manner.

1.3 Factors Affecting PBL Implementation

1.3.1 Factor 1: Organizational

In order to implement PBL successfully the engineering institute's internal dynamics should be flexible and agile. Otherwise, implementation of PBL is almost impossible or risky.

1.3.2 Factor 2: Quality of Teachers

Engineering institutes are facing problems because existing faculties are not accepting PBL willingly. Faculties feel insecure about their jobs and responsibilities. This barrier could be outshined if the management educates their faculties for PBL. It has been found that PBL requires students to work in a group therefore number of teachers working in an institute also matters. Otherwise, teachers need to guide multiple projects. From fig. 2 it has been found that successful implementation of PBL in engineering education depends upon two factors i.e. organizational and man power. Therefore, this research article is devoted to understand the different roles of teachers in PBL.

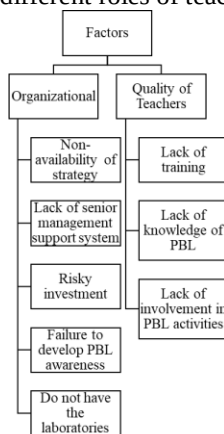


Fig.2: Factors Affecting PBL Implementation
(Source: Authors own research)

2. Methodology and Methods

Fig. 3 shows the research methodology flow diagram for research work. The literature review is completed by searching some keywords along with their combinations such as – Challenges and difficulties in PBL; Project Based Learning in Engineering; Course Level Project Based Learning in Engineering; Role of Supervisor in PBL; PBL Implementation; Role of Supervisor in PBL and Challenges. For searching these Scopus, keywords and Google Scholar were explored.

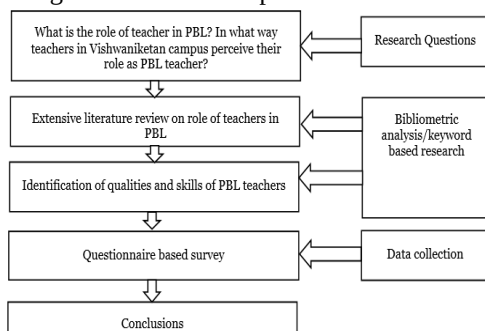


Fig. 3: Research Methodology Flow Diagram

The articles related to these keywords were examined. In addition to this, collected articles are evaluated using some criteria, given as - (i) the articles written in English only were considered; (ii) the articles belong to peer-reviewed publications and published reports were only considered; (iii) the articles published in between year 2012 to 2019. In this way, the literature review was performed in this research.

From literature survey it has been found that teachers should possess various qualities (such as leadership skill, time management skill, creative thinking skill, and must be passionate to do mentorship) while implementing PBL. Also, teachers must use different approach to deal with students of different skill set and must have capability to experiment with different ideas. Fig. 4 shows different roles of teachers in PBL.

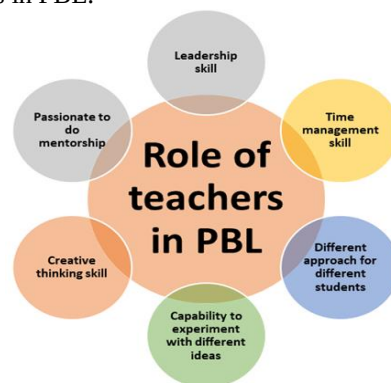


Fig. 4: Role of Teachers in PBL

2.1 Questionnaire based Survey

Questionnaire based survey among Vishwaniketan's iMEET (ViMEET) faculties are carried out to understand their experiences during PBL implementation. The questionnaire was sent to 16 faculties of ViMEET by an e-mail and received response of all participants i.e. response rate was 100%. In this research article, questionnaires were prepared for CLPBL model with the aim to understand faculty's perception towards their role in CLPBL. Assessment of questionnaire were carried out on 5 point scale. Questions are as follows:

- CLPBL implementer should have "leadership" skill. (code: Q1)
- CLPBL implementer should be "passionate" to do mentorship. (code: Q2)
- CLPBL implementer should "use different approach to deal with students of different skill set"? (code: Q3)
- CLPBL implementer make students compulsory "to do any project"? (code: Q4)
- CLPBL implementer should have "time management" skill? (code: Q5)
- CLPBL implementer should be "free to experiment"? (code: Q6)
- CLPBL implementer should "provide empathy and inspiration to students"? (code: Q7)
- CLPBL implementer should have "creative thinking" skill? (code: Q8)

3. Results and Discussions

From fig. 5, it has been found that about 54% participants agreed that CLPBL supervisor should have leadership skill. 45% participants believes that CLPBL implementer should have passion to do mentorship, whereas 50% participants felt that CLPBL implementer should use different approach to deal with students of different skill set. 48% of participants believes that CLPBL implementer should make students compulsory to do any project. 75% participants agreed that CLPBL implementer should have time management skill. 87.5% participants believes that CLPBL implementer should be free to do experimentation with innovative ideas, whereas 56.25% participants felt that CLPBL implementer should provide empathy and inspiration to students. 50% participants agreed that CLPBL implementer should have creative thinking skill.

It is observed that teachers are not aware of their roles while implementing PBL. If teachers are not aware of their role then effective and useful outcome of PBL cannot be achieved. To implement PBL effectively faculties must attend PBL trainings. PBL training is conducted in three different levels. Level one of PBL training deals with why PBL is important? How teachers can implement PBL? Level two deals with teacher's role in PBL and research in PBL. Level three deals with the outcome of PBL.

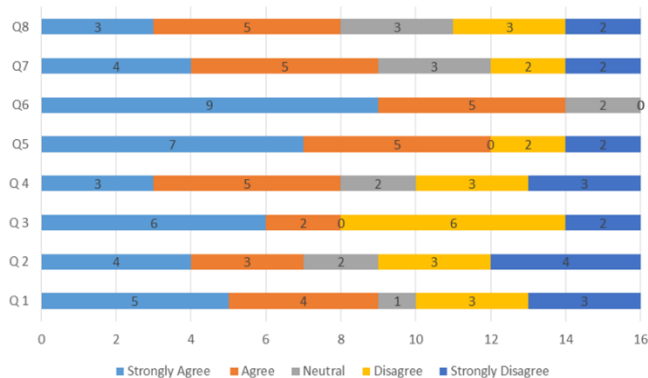


Fig. 5: Questionnaire based survey results

4. Conclusions

It is concluded that PBL teachers must have higher level skills such as leadership skills, ability to think differently, time management skills, and passion towards attaining goal.

From the survey it is observed that majority teachers are unaware about their roles in CLPBL. Almost 50% participants in the present study indicated that the main purpose of CLPBL was to make students compulsory to do any project, which is contradicting with the definition of PBL. It is concluded that more training is required to teachers to understand their roles clearly while implementing CLPBL. In future work this research work can be extended to evaluate sustainability of PBL models.

References

- Akao, Y. (2012). Quality function deployment: integrating customer requirements into product design. Cambridge: Productivity Press.
- Alves, A. C., Sousa, R. M., Fernandes, S., Cardoso, E., Carvalho, M. A., Figueiredo, J., & Pereira, R. M. S. (2016). Lecturer's experiences in PBL: implications for practice. *European Journal of Engineering Education*, 41(2), 123-141.
- Bacarin, G., Faria, G., Rinaldi, G., Silva, L. T., & Abreu, Y. G. (2014). Low cost rain gauge: product and process development final report.
- Baytiyeh, H., & Naja, M. K. (2016). Students' perceptions of the flipped classroom model in an engineering course: a case study. *European Journal of Engineering Education*. In press.
- Carpenter, M. S., Yakymyshyn, C., Micher, L. E., & Locke, A. (2016). Improved student engagement through project-based learning in freshman engineering design. In *Proceedings of the 123rd ASEE Annual Conference and Exposition*, New Orleans.
- Chau, K. W. (2015). Problem-based learning approach in accomplishing innovation and entrepreneurship of civil engineering undergraduates. *International Journal of Engineering Education*, 21(2), 228-232. Retrieved in 10 October 2016.
- Chua, K. J. (2014). A comparative study on first-time and experienced project-based learning students in an engineering design module. *European Journal of Engineering Education*, 39(5), 556-572.
- Chua, K. J., Yang, W. M., & Leo, H. L. (2014). Enhanced and conventional project-based learning in an engineering design module. *International Journal of Technology and Design Education*, 24(4), 437-458.
- Cooper, R. (2013). *Winning at new products: accelerating the process from idea to launch*. Cambridge: Perseus Books.
- Daun, M., Salmon, A., Weyer, T., Pohl, K., & Tenbergen, B. (2016). Project-based learning with examples from industry in university courses: an experience report from an undergraduate requirements engineering course. In *Proceedings of the 29th IEEE Conference on Software Engineering Education and Training (CSEET)*, Dallas, TX. Retrieved in 10 October 2016.
- Du, X., Su, L., & Liu, J. (2013). Developing sustainability curricula using the PBL method in a Chinese context. *Journal of Cleaner Production*, 61, 80-88.
- Dym, C. L., Agogino, A. M., Eris, O., Frey, D., & Leifer, L. J. (2015). Engineering design thinking, teaching, and learning. *Journal of Engineering Education*, 94(1), 103-120.
- Edström, K., & Kolmos, A. (2014). PBL and CDIO: complementary models for engineering education development. *European Journal of Engineering Education*, 39(5), 539-555.
- Fernandes, S., Flores, M. A., & Lima, R. M. (2012). Students' views of assessment in project-led engineering education: findings from a case study in Portugal. *Assessment & Evaluation in Higher Education*, 37(2), 163-178.