

Pillai HOC College of Engineering and Technology, Rasayani

Best Practices

1. Title of the Practice: Project Based Learning (PBL)

2. Objective of the Practice

The objective of Project Based Learning (PBL) is to enable the students to apply the concepts and theories they have learnt in the previous semesters and in the on-going semester. Developing projects that incorporate the learning from various courses makes the students understand inter-connectedness of the courses. A project environment fosters group work, cordiality and minimally even collective bargaining. PHCET has found PBL a subtle way of introducing in the young students desirable social behaviour that would help them in their professional lives. PBL has the potential to enhance employability and productivity and prepare them for the world of work.

3. The Context

The Engineering curriculum in most Indian Universities include a six months to twelve months of project work. The students may opt to carry out the project in the Industry, R&D institutions, etc. However, due to the poor preparation, many students are not able to take advantage of this opportunity. This affects placement and employability and becomes an institutional challenge. Hence, it was decided to introduce PBL in PHCET. This has been a great turning point and the enthusiasm of students is palpable. PBL was started as a pilot in the Computer engineering department and has now become an institution wide practice in each semester.

4. The Practice

PBL has become integral part of all programs at PHCET and is included in the academic calendar. The method adopted is practical and implementable. It has evolved in such a way that students have published their work in conferences, participated at government approved national competitions like Hackathon, Vishwakarma awards, etc. Testimonials of each program are available on phcet.ac.in. Rubrics are framed for evaluation of PBL projects. The evaluation is conducted in two stages. Stage 1: students perform literature review and design calculations and in stage 2: students develop complete solution of the given problem.

The following example illustrates the practice.

A. The Problem:

Design and build a flat plate solar water heater, FPSWH, for a temperature rise of about 7 to 10°C/m length of tube/pipe at 1000 W/m² solar radiation intensity.

Students follow the engineering design process to: (a) build a FPSWH (b) test to see if it can raise the temperature of water to the desired level, and (c) use their testing results to improve the design and get as big a temperature change as possible.

They apply their understanding of the three forms of heat transfer viz., conduction, convection and radiation, and how they are related to energy efficiency. They calculate the efficiency of the solar water heaters during initial and final

tests. Students need to take temperature measurements of outlet water from the tube after every filling of 100 ml in the container, and plot graph of outlet water temperature versus time.

Stage I - Students are instructed to brainstorm for the FPSWH designs (come up with at least three ideas, write or draw all the ideas, can be as weird as possible – don't get too critical at this stage), select the best design (most promising one) based on various parameters, prepare an initial budget sheet with the cost and quantity of materials needed for starting construction. Prepare a detailed drawing that includes labeled materials and dimensions, prepare a CAD model of the SWH, materials budget worksheet (include quantity of each item), build the first iteration of design, check for leaks (if any) before sealing the devices.

Stage II - Students are advised to take time to make design modifications - focus on improving the efficiency of the devices, include any additional material in the budget, need to furnish measurements and calculations leading to temperature graphs (over time), efficiencies, total costs, cost/degree change, and cost percentage efficiency.

5. Evidence of Success:

The experience of PHCET with PBL as a teaching learning process has been very positive. PBL engages the students. The survey conducted by PHCET of the students and the guides show that it is an effective and enjoyable way to learn - and develop deeper learning competencies required for success in college, career, and civic life. Activities like projects engage the hearts and minds, and provide relevance for learning. A project improves learning and by completing a project, students understand content better; remember what they learn and retain it longer than with traditional teaching. Hence, students who gain content knowledge along with PBL are better equipped to apply what they know in new situations. The 21st century workplace needs people with knowledge and skills, dynamism, initiative and confidence to take responsibility, ability to solve problems, and work in teams, communicate ideas, critically analyse ideas and situations, and manage themselves effectively. PBL type of environment can inculcate many of these attributes in young students and the PBL in each semester gives adequate time for students to imbibe them.

6. Problems Encountered and Resources Required

Prior learning experiences and theoretical understanding of the curriculum do not prepare students well for PBL. It requires a different kind of thinking and certainly has a learning curve. Many times students who are not very academically inclined or proficient seem to pick up PBL very fast and work productively and their attitude and approach to learning changes. Some students need more time to immerse themselves into PBL. Differences of opinion and personal conflicts, though naturally expected, the feedback of the guides indicate that the prevalence of these traits was nil or negligible. There was hardly any resistance or lack of enthusiasm among the students. PBL affects other academic activities and therefore, the students and the guides have to work extended hours and even on holidays. However, it was well-received. The required resources were available in the Component Library of the research Lab or the students procured them.

7. Notes

The enthusiasm and the participation of the students gave the impetus to include PBL as an institution wide practice. Students organize themselves, share responsibilities, and negotiate among themselves. They come to the Institute on holidays also to work on their projects. Observations of the guides are that the PBL has significantly impacted the behaviour of students and a degree of earnestness and enthusiasm has been instilled. With the entire Institute adopting PBL and having it as a semester wise activity twice a year will change the learning culture of PHCET and proved the quality of the final year projects that the students undertake.

1. Title of the Practice: Institute-Industry Interaction

2. Objective of the Practice

PHCET strives to bridge the gap between Education 3.0 and Industry 4.0 by collaboration and continued Institute-Industry interaction. The students should always be trained with clear objective that they are the workforce and professionals of tomorrow. Hence exposure to and knowing in advance what is happening in the work place provides hindsight advantage and forms part of the well-prepared and future ready professionals. Towards this end, a plethora of opportunities, activities, processes and procedural modifications are explored and adopted. Expert lectures by senior industry professionals, Industry visits, industry internships, seminars on advanced technologies, etc. are some of them.

3. The Context

The location of the PHCET necessitates extra support for the students to do well in academics as they have several disadvantages such as long travel, vernacular medium up to class XII, financial insecurities, etc. Some are first generation learners. Hence, there is a dire need to proactively innovate to support the students.

PHCET is situated in the underdeveloped area of Raigad District. Majority of the students come from agrarian background. Despite many handicaps, the sparkle in their eyes tells of the longing for the good life an engineering education can provide. And they dare to study engineering. It is observed that vast majority of the graduates opt for jobs to meet financial necessities. The best that PHCET can do is to bring the students face to face with industry veterans and the realities of the work place. There are several success stories to illustrate that the practice is worth it.

4. The Practice

Over the years PHCET has developed several academic activities and student centric methods for enhancing learning and for making learning interesting. The need of the industry and the changing requirements makes it imperative to continually innovate to enhance the quality of service.

Industry-Institute interaction is one of the best practices among nearly 50 student centric methods that have been developed in the PHCET since its inception. These methods keep increasing consonant to the growth of the Institution. Lectures by industry experts, invited talks, industry visits, internship, campus placement, etc., are a few of the activities that are carried out under this practice. These are conducted in each semester. Various experts as per specialization are invited from industry to share their practical knowledge.

Better interaction between Technical institutions and industry is the need of the hour. This will strengthen engineering curriculum, exposure to industry to engineering students and subsequent placement of young graduating engineers in industries. Similarly, there is an urgent need to prepare engineering students for jobs in multinational companies, by exposing them to new technologies and engineering methodologies. These objectives can only be achieved well by bridging the gap between industry and the academic institute. .

In order to promote Institute-Industry interaction following activities conducted during AY 2018-19 at Industry and PHCET.

1. Organizing Workshops with joint participation of the faculty and the industries
2. Encouraging engineers from industry to visit Engineering Institution to deliver lectures
3. Participation of experts from industry in curriculum development
4. Arranging visits of staffmembers and students to various industry
5. Professional consultancy by the faculty to industries
6. Visits of faculty to industry for study and discussions or delivering lectures on subjects of mutual interest
7. Visits of industry executives and practising engineers to the Institute for seeing research work and laboratories, discussions and delivering lectures on industrial practices, trends and experiences
8. Memoranda of Understanding between the Institute and industries to bring the two sides emotionally and strategically closer
9. Conduct placement activities for engineering students
10. UG and PG. projects/dissertation work in industries under joint guidance of the faculty and experts from industry
11. Scholarships/fellowships instituted by industries at the Institute for students
12. Practical training of students in industries
13. Internship in core industries
14. Project evaluations by industry experts

5. Evidence of Success

PHCET conducts various activities like workshops, industry expert lectures, industry visits for students in each semester. The faculty actively guide and motivate the students to participate actively and derive benefits. It is observed that nearly all students are present for the activities and participate enthusiastically.

The success of the industry workshops and their effectiveness is assessed by the eagerness of students to attend the sessions. The success of the activities is reflected in their performance in semester internal examination. It was perceived that practice done during these workshops improved their skills significantly as indicated by better problemsolving, thinking out of box and improved analytical ability. Comparison of results with the previous result as well as subject result, indicate significant improvements. These workshops, which were carried out during the semester, helped them in their end of semester examinations as well.

In this academic year, 417 students have successfully completed internship in core industries, 5785 students actively participated in industrial visits, attended expert lectures, workshops and seminars. This shows significant improvement in number as compared to previous academic year.

6. Problems Encountered and Resources Required

It is tedious as well as time consuming job for teachers to arrange various workshops, industry visits, expert lectures, etc., due to schedule of industry and the regular academic activity. Teachers have to take continuous follow up through email and telephone to get resource person's time and accordingly fit the slot in academic schedule. To arrange industry visits teachers have to manage various aspects of logistics for the students to reach the location where the industry is situated. Students have to follow industry safety norms, and it is a great learning in itself. To apply for internship, teachers and students have to be in touch with industry and require continuous follow up. The effort is to get all students do internships every year. As the number is very large there is a considerable competition with other institutions as well. Resources both man and money are required to streamline the process.

7. Notes

A proof of Institute-Industry Interaction activities conducted for AY 2018-19 has been uploaded on website. Its effectiveness is reflected in end of semester examination results. Some of students have got university ranks during AY 2018-19. The enthusiasm and the participation of the students gave the impetus to continue Institute-Industry Interaction as an institution wide practice.

Teachers organize industry visits in and around industrial area of Rasayani and Talaja. Also they have visited industries, which are located out of Maharashtra state. Teachers and students use to utilize holidays so that regular academics is not hampered. Due to this exposure PHCET students have excelled in state level, national level and government level organized activities.

With the entire Institute adopting having it as a subject wise activity will considerably change the learning culture of PHCET. Institute-Industry Interaction has the potential to significantly improve the employability and entrepreneurship.