Problem and Project Based Learning:

Practice, Share and Adapt

Institutional Reports

1st IUCEE Online/Virtual Mini Symposium

9th and 10th October 2021

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Deputy Chief Editor: Dr. Deepak Waikar

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Message from the Chief and Deputy Chief Editors

Prof. Krishna Vedula and Dr. Deepak Waikar

For empowering teachers and learners and for strengthening communication, and teamwork, the **Problem & Project-Based Learning** (**P^{2}BL**) has been highly recommended by educators, researchers, and practitioners. The National Education Policy (NEP) 2020 of the Government of India and All India Council for Technical Education have incorporated P^{2}BL as one of the preferred pedagogies for higher education. As such the IUCEE Foundation has been promoting the P^{2}BL through the PBL Cluster for sharing initiatives and practices among the members. Therefore, for encouraging and accelerating the implementation, the IUCEE organised an online/virtual Mini-Symposium on P^{2}BL during 9-10 October 2021.

This e-book on "The Problem and Project-Based Learning – IUCEE Institutional Reports" is an expression of approaches practiced in 15 Institutions. It was challenging for the organising committee and the editorial board to review and piece together these reports. As such, each institution has shared experience which can be useful for those who wish to consider the P^{2}BL as one of the teaching methods

It is envisaged that the experiences of the participants through the Mini Symposium will encourage many more teachers and faculty members to consider the P2BL as one of the preferred teaching methodologies in the near future.

The e-book will also appeal to the progressive minds of the senior management of the education institutions, policymakers, administrators, and researchers who may have been assessing and evaluating the P^{2}BL.

As Chief and Deputy Editors of this e-book, we feel honoured to share it with readers. The e-Book is expected to provide reference e-journal on the P^{2}BL in the hearts and minds of the readers.

We, the members of the Editorial Board, invite your comments, views, and suggestions.

Thank you,
With best wishes,

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Table of Content

Mini-Symposium on Problem/Project-based Learning (IUCEE MS-P²BL)

The IUCEE Foundation has taken up the campaign for encouraging and accelerating the implementation of Problem and Project-based Learning (P²BL) as envisioned in the National Education Policy (NEP) 2020. The IUCEE has been promoting the P²BL through the PBL Cluster for sharing initiatives and practices among the members. The IUCEE, in collaboration with Consortium Members and interested institutions, organised Mini-Symposium on the P²BL during 9-10 October 2021.

The main objective of the Mini-Symposium was to identify good practices, share the challenges and lessons learned, and prepare an actionable Problem and Project-based Learning ((P²BL) roadmap unique to the Indian context.

The special feature of the first Mini-Symposium was for the Consortium Members and is dedicated to Consortium Members. Another very important component of the Mini-Symposium is most of the speakers and panel members were chosen with the support and advice of the Consortium Members and interested Institutions.

The IUCEE Foundation played a catalytic role in bringing together Consortium Members and interested institutions to share good practices, challenges, and prepare actionable blueprint, roadmap, and framework as applicable through the Mini-Symposium on the P²BL.

The theme of the Mini Symposium was chosen as "Practice, Share, and Adapt". A google site was specially designed for providing information to the prospective authors and participants.

https://sites.google.com/iucee.org/iuceemsp2bl/home

Over 150 authors, co-authors, and delegates registered for the Mini Symposium. There were 4 keynote/plenary sessions, 2 institutional panel sessions, and 6 parallel sessions. Prof. Krishna Vedula, General Chair of Mini Symposium, highlighted importance of P²BL during his opening address and Dr. Deepak Waikar, General Co-Chair of the Mini Symposium, outlined regarding the proceedings of the P²BL Mini Symposium on 9th October 2021. Er. Deepak Gadhia, Social Entrepreneur, delivered a valedictory address on 10th October 2021.

The participants gave 9.434 out of 10 rating for the contents and 9.554 out of 10 for administrative support for the Mini Symposium on P²BL as depicted in Figures 1 and 2.

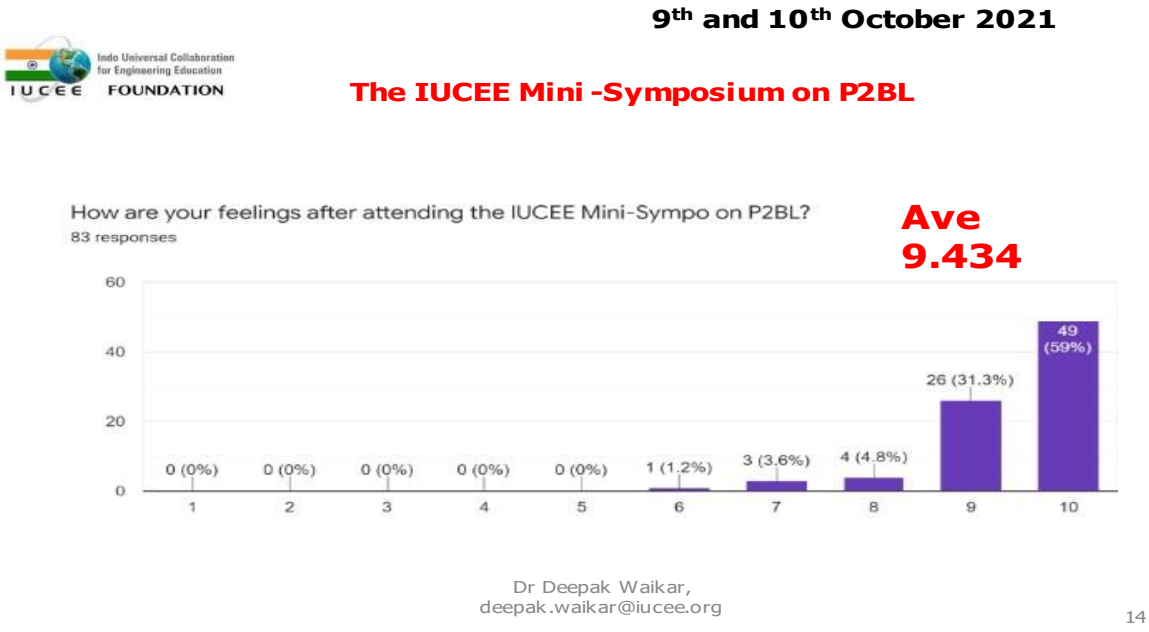

Figure 1: Participants response after attending the Mini Symposium.

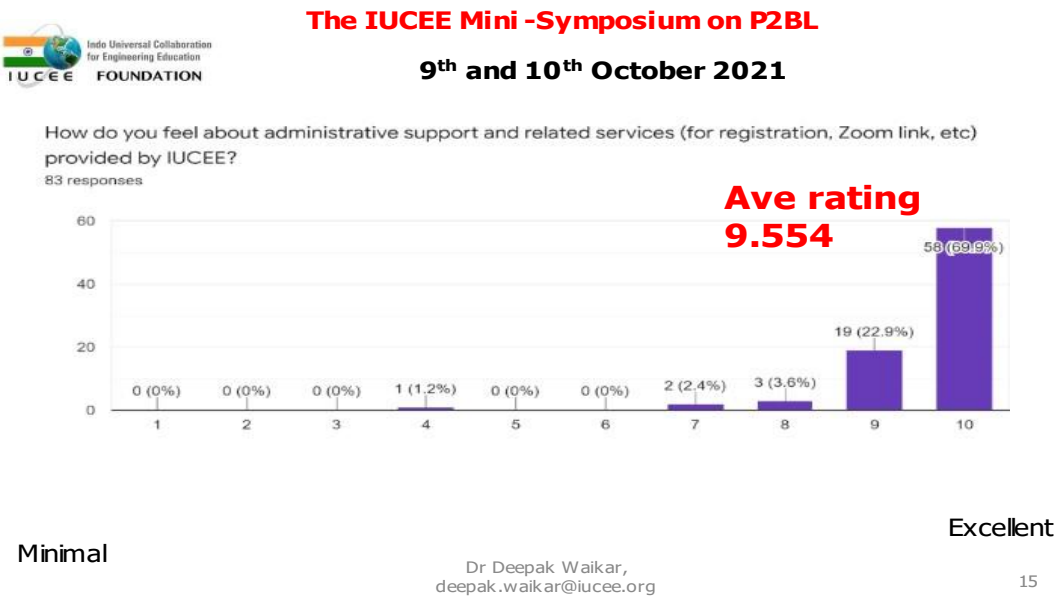

Figure 2: Participants response for the administrative support for the Mini Symposium.

B.H. Gardi College of Engineering & Technology
Report on Problem-Based Learning

Prepared by

Prof. Parag Paija, Assistant Professor, Department of Mechanical Engineering

Abstract:

Problem-Based Learning (PBL) is a method during which complicated real-world issues are used to enhance ideas and principles for student learning as hostile direct presentation of facts and concepts. Additionally, to course content, PBL can promote the event of critical thinking skills, problem-solving abilities, and communication skills. In our study, we have majorly focused on the enhancement and development of students with the introduction of Problem-Based Learning in the curriculum. In this study we have made known implementation of PBL at our institute with challenges faced & how can we overcome them.

1. Introduction

Problem-based learning was firstly introduced in various subjects for 1st Year Students of every department & later in few periods we implemented the same in vivid subjects of our engineering curriculum. The aim of starting this approach was to develop critical thinking and analysis, self-directed learning, developing and executing projects and holding leadership roles, etc. In the beginning, it was a bit difficult for the students to adopt this methodology in spite of the traditional teaching-learning process. As PBL requires more time in understanding the subject thoroughly after some time the students seem more eager to learn the subjects. Through the implementation of PBL, we got to know that the students were more focussed and eager to learn those subjects through diverse engaging activities.

The challenges faced by faculties are mentioned herewith:

- Time Consumption
- Concern about the performance & knowledge gain of students
- Reviewing performances of students
- Assessments of students
- Lack of required resources for implementing PBL in various courses

The challenges faced by students are mentioned herewith:

- Adapting to Problem-Based Learning Methodology
- At the initial stage eagerness to learn the subjects
- Lack of Teamwork

The following strategies were implemented for eradicating the challenges faced:

- Expert training/FDPs

- Interactive & Engaging sessions
- Workshops & Courses for students' enhancement & development

2. Current Status

Currently, the PBL is introduced in various subjects of all the courses with more than 500 students actively involved in PBL related activities. Mini projects have been implemented in several subjects with 35 trained faculties for development & enhancement of students. The statistical data for the same regard have been mentioned herewith.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
6	6	50	500+	35	25	1	35	Started in 2014

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
8	4	1	00	

2.1 Sample PBL Lesson plan

We have implemented PBL learning in traditional-teaching learning methodology with the below-mentioned lesson plan merged with the curriculum.

- Problem interaction with students to solve real life problems
- Student organization
- Individual and group teaching
- Formation of work and presentation
- Analysis and evaluation of problem-solving processes
- Hands On Session on various topics of curriculum

2.2 Sample Student PBL Assessment

In the PBL teaching-learning method the students are assessed through their efforts, critical & creative thinking for the assigned domain/project, teamwork, dedication, and contribution for the allocated task.

3. Current Challenges (as of August 2021)

The challenges we faced in the implementation of PBL in our institutions are :

- On grounds/class interactions with students
- Lockdown due to pandemic
- Workloads on faculties
- Lack of offline resources
- Students lack focus on identified learning outcomes

4. Proposed Plans for 2022/23

Proposed plans for accelerating and enhancing the infusion of PBL in various subjects to overcome the above-listed challenges are mentioned herewith. We will be organizing events like hackathon, virtual project fair, ideathon, various eminent experts' sessions, etc.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts Colleges	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
6	6	80	650+	35-40	25	2-3	35-40	

5. Potential Role for the IUCEE

IUCEE plays a significant role in the development & implementation of PBL learning in the traditional teaching-learning curriculum. We have a collaboration with IUCEE for various courses like Student Leadership Course, Clean & Green Campus Course, etc. & Faculty Development Programs through expert faculties for enhancement & development of student & faculties. IUCEE can support & help us in efficiently implementing PBL in every course through the below mentioned.

- Forming & Enhancing collaborations with various institutions for sharing aspects & insights for the development of both the institutions.
- Generation of scopes for fruitful & potential collaborations for the upliftment of students
- Faculty Development Programs for enrichments of faculty knowledge
- Organizing workshops & courses for students incorporating the implementation of PBL knowledge.

6. Recommendations

Here are few recommendations for efficiently executing PBL learning for the betterment of students.

- Organizing workshops & courses
- Faculty Development Programs
- Focus on student-driven learning

7. Conclusions

In this era PBL plays a significant role in all round development of the students. In our study we have made known implementation of PBL at our institute with challenges faced & how can we overcome them. We are implementing PBL in our curriculum & with the multifarious support of the IUCEE we can & will be implementing the same in every subject with engaging activities & projects for developing & enhancing skills & knowledge of the students which can be used in their career.

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Hyderabad Institute of Technology and Management
Report on Project-Based Learning

Prepared by

Santosh Naik, Surendra Bandi, Hema Mahajan, Dr. K Siva Prasad

Abstract:

Engineering Education is not delimited between its curriculums [1]. However, it also needs several alternative skills to grab opportunities and help students to face any situation in the world. Our Institute has always encouraged having smart projects on the campus for bringing transformation in engineering education. It is collaborated with the IUCEE (Indo Universal collaboration for Engineering Education) and began several initiatives that prove students ability, enhancing students skills for their carrier .

1. Introduction

Leadership is one of the skills that are very much important for students to achieve their goals in life. This case study has four initiatives EPICS (Engineering Project in Community Service), UBA (Unnat Bharat Abhiyan), EWB (Engineers Without Border), GCSP (Grand Challenges Scholar Program), its impact, and emerging skills of the students to make them better in the future. This study emphasized more on the leadership skills and its importance that each student ought to have. HITAM built an ecosystem in the form of HITAM-XPLORE (Experiential Platform for Learning Outreach and Real Time Engineering), a center which combines EPICS at HITAM, EWB (Engineers Without Borders) Student Chapter, UBA (Unnat Bharat Abhiyan, A Government of India's initiative to involve students in societal development) and GCSP (Grand Challenges Scholar Program) Projects [2].

Institutional PBL Journey –

- HITAM has been a member of Purdue's EPICS for the past four years and follows the Design Thinking Model to introduce community projects at first year level. We have stared implementing PBL in 2016 by solving community related problem.
- XPLORE students gain long-term define-design-build-test-deploy-support experience, communication skills, experience on multidisciplinary teams, and leadership and project management skills. They gain an awareness of professional ethics, the role of the customer in engineering design, and the role that engineering can play in the community. Community organizations gain access to technology and expertise that would normally be prohibitively expensive, giving them the potential to improve their quality of service or to provide new services
- Challenges – Motivating students to work in Multidisciplinary team, finding of real community partner

Following are the team experiences from PBL approach

- Acquiring experience
- Understanding the value of each activity
- Develops the ability and skills of thinking and doing the activities
- Acquiring the skills and qualities of Group activity

- User involvement
- Clear Statement of Requirements
- Proper Planning [3]

Every project needs roadmap to follow for being on the desired path and gets fruitful outcomes and hence in this study design thinking process was introduced in the course during PBL which helped students to understand the real-time problems which can be solved by applying the knowledge gained theoretically from the courses. Through design thinking process, students got to know the real-time problems and improved their skills to deal with the same by applying their knowledge. The EPICS lab was established for students to work on projects. Students will work on projects every week 3 hours and all materials and equipment are provided in the lab. Timetable of EPICS lab for all students shown in Table 1 below [4].

Table 1. EPICS Lab time table

Hyderabad Institute of Technology And Management							
EPICS TIME TABLE BTech I Sem 2019-20							
DAY/HOUR	9.50-10.40	10.40-11.30	11.30-12.30	12.30-1.20	1.20-2.10	2.10-3.00	3.00-3.50
MON	EPICS-(ECE-A)- 1st Year			LUNCH			
TUE	EPICS-(CSE-A) - 1st Year						
WED	EPICS-EEE - 1st Year				EPICS-(CSE-B) - 1st Year		
THU					EPICS-(ECE-B) - 1st Year		
FRI	EPICS -MECH - 1st Year				EPICS - 3rd Year CSE		
SAT	EPICS -2nd Year EEE AND MECH				EPICS -4th Year Students		

The challenges faced by faculties are listed below. Sample

- Time Management
- Project funding

The challenges faced by students are listed below. Sample

- Team Problem
- Motivation

The following strategies were used for addressing the challenges faced.

- Brainstorming activity
- Design thinking course training
- Funding resources planning

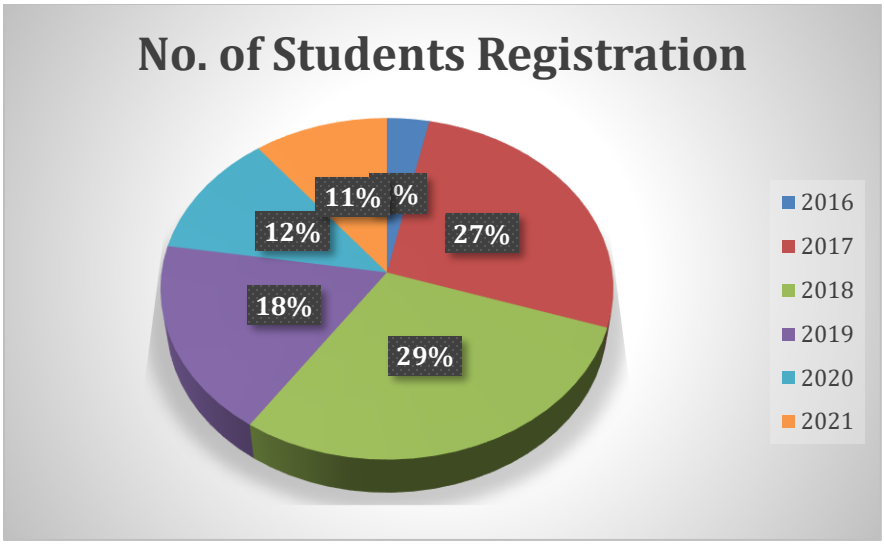

Fig.2 PBL Students registration

The following crucial lessons were learned from the first run of the PBL. Sample

- Real time problems
  Through design thinking process, students got to know the real-time problems and improved their skills to deal with the same by applying their knowledge. Students have improved their understanding to handle real-time problems and at the same time they interacted with community partner that helped them to go in the depth to work on it. This study has shown the importance of design thinking process and its impact on Student's learning.
- Project-Product conversion
  After doing product survey students have come up with multiple ideas to solve the problem. To fill the gap of existing products in the market with the required product as a team they have decided to provide a solution for the community partner by which he can do his work easily and efficiently.

Current Status

Currently, the PBL is introduced in Freshman Engineering course, 172 students are currently working on 43 community related projects.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	1	1	172	6	1	43	6	Started in 2016

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
7	48	16	3	

Solar Fertilizer Sprayer
Grass cutter
Leaf blower
Walking Frame
Paddy Cutter

2.1 Sample PBL Lesson plan

Fort night Model	Modules
1st week	ICE Breaking
2nd Week	Creo Session
3rd Week	Creo Session
4th week	Phase 2 Problem identification
5th week	Phase 3 Specification development
6th week	Phase 4 Conceptual design
7th week	Phase 4 Conceptual design
8th week	Phase5 Detailed design
9th week	Phase5 Detailed design
10th ,11th and 12th week	Phase5 Detailed design
13th week	Phase 6 Testing and delivery

2.2 Sample Student PBL Assessment [5]

Problem identification	Interaction with the Community (10 Pts)	10 pts. = Clear Documentation of Community interaction with visual proofs	8 pts. = Clear Interaction with community with an appropriate document	4 pt. = Oral representation of community interaction (no proof)
	Problem identified (5 Pts)	5 pts. = Clearly addressing the problem by statistical representation of either human, educational, health or environmental community	3 pts. = Mentioned without statistical representation.	1 pt. = Does not mentioned the clear need of the community
	Stakeholder Identification (5 pts)	5 pts. = Clearly identifies a specific and real user or organization, by name, which can provide feedback/suggestion for the team and receive the project once completed.	3 pts. = Mentioned the community but not a specific user who can provide suggestions or feedback over the project	1pt. = No clear details of community or specific user
Specification development	Measurable requirements (10 pts)	10 pts. = Clearly describes at least 5 measurable requirements depending on the project	8 pt. = Less than 4 described specifications or the ones described are not measurable	4 pt. = At least 2 specifications listed
	Identification of existing solutions (10 pts)	10 pts. = Identification of existing solutions addressing the similar problems with appropriate documentation	8 pt. = Identification of existing solutions addressing the similar problems with no appropriate documentation.	4 pt. = No clear identification of existing solutions.
	Gaps in existing solutions (5 pts)	5 pts = A clear explanation/ analysis of gaps with the documentation by using the appropriate case studies.	3 pts = A marginal explanation/ analysis of gaps by using the appropriate case studies.	1 pt = No appropriate case studies for justification of gaps.
	Poster Presentation (Mandatorily) (5 pts)	5 pts = Creative poster presentation	3 pts = Good oral presentation	1 pt = Either Creative poster or good oral presentation

2.3 List of external collaborators for PBL as applicable

- Unnat Bharat Abhiyan [6]
  The Mission of Unnat Bharat Abhiyan is to enable higher educational institutions to work with the people of rural India in identifying development challenges and evolving appropriate solutions for accelerating sustainable growth.
- Engineers Without Border [7]
  To become global leaders by taking up society-based engineering projects and work for sustainable solutions.

3. Current Challenges (as of August 2021)

- Conversion of more working model into product
  Due to time constrain & technical depth knowledge on the problem conversion project into product is taking longer period of time.

Proposed Plans for 2022/23

Adding Engineering Project in Community Service in the Autonomous syllabus as a mandatory course for Freshman Engineering.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	1	1	250	6	1	50	6	

4. Potential Role for the IUCEE

- By conducting IUCEE Student Leadership course for students
- Organizing PBL Symposium

5. Recommendations

Engineering Project in Community Service (EPICS) has allowed us to interact with the people and understand them. EPICS programs help to build long lasting relationship between engineering student and the local community. Both students and community partners can have mutual benefit as students get a platform to broaden their professional knowledge and community partners might be benefitted from alternative solutions to their problems at a low budget [4].

6. Conclusions

The initiative resulted in making students aware of social problems and solves those problems by providing engineering solutions. By incorporating the programs that we assess, students have been benefited in very specific ways. The institute understands long-term incorporation of the ideas for the following reasons. Primarily, different programs serve with different structures and help in feeding diverse interests of students. Secondly, it helps in validating the skills of students reward them with certifications that will benefit them in their future. EPICS stands as a great example of how minute innovations can help students with both skills and newer technologies. Students today have the opportunity to write research papers and contribute to the fields of their interest without any setbacks. It is because of these programs that students could look beyond their academics and

institutes to grow individually and benefit their communities. The demographics back all these outcomes that students of HITAM had. As an institute that seeks for excellence for students as a two-way parameter, it is very necessary that the students are provided with the right resources so that they can build their career block-by-block [3].

Learning of students through Engineering Project in Community Service

- Teamwork
- Handling challenges
- Collaborative learning
- Hands on experience
- Time management
- Decision making
- Improvement of user engagement

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Saveetha Engineering College
Report on Problem/Project-Based Learning

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Synopsis/Abstract:

Our Institution, Saveetha Engineering College is known for its motto 'Be the best'. The rejuvenation of the teaching learning process happens as a continuous process in our Institution. It is believed that every learner is a professional who needs to meet the requirements of the society as well as industries. A learner is always the fulcrum of this learning process and that would lead to a highly self-reliant and technology-oriented education system which our Institution strives to achieve. The travel towards problem-based learning (PBL) made us realize the need to emphasize collaborative learning, solving realistic problems through innovative solutions and being technically and ethically sound in implementation of solutions. The Department of Artificial Intelligence were successful in the previous academic year (2020-21) towards the PBL mission. In addition to this success story, the extensive training provided by Indo US collaboration for Engineering Education (IUCEE) resulted in the implementation of PBL for five major courses across varied branches of study in the current academic year (2021-22). Initial analysis on the acceptance of this revolutionary teaching learning process among the stake holders (management members, staff members, learners, and parents) revealed that all of them were highly motivated and accommodative to the process. The challenges faced at certain points of this process are being recorded and it is believed to be solved through the expertise of IUCEE.

1. Introduction

The Origin

Right from the initial days, the management of Saveetha Engineering College stood by the idea of preparing our students for INDUSTRY 4.0 by imparting 21st Century Skills. To attain this industry ready curriculum, our Institution employed several learner friendly teaching methods. Similar to the history of PBL which originated from the medical studies, PBL in Saveetha Engineering College also has a successful history. A new technique 'Multiple Interactive Learning Algorithm' (MILA) was introduced for the teaching process, where the entire session of a class was partitioned to accommodate teaching and activity content. Several learning activities were conducted to enable the learners practice and implemented the learned concepts in the classroom itself. This programme created the awareness to adopt related methods like Inquiry Based Learning (IBL) that always made the learners to be inquisitive and intellectual to attain the outcomes of a course.

The collaboration with IUCEE in the year of 2018, streamlined the process of teaching learning and it led to several accolades for Saveetha Engineering College in the domain of academics. The certification programmes on International Engineering Educator Certification Program (IEECP) offered by IUCEE were actively taken up by our faculty members who were duly motivated by the management to get trained for the bright future of the learner community. Throughout this three-phase programme, teaching community was enlightened on the concepts of course design, dynamic classroom, incorporation of technology, collaborative learning and effective assessment.

The teaching methods were gradually and steadily paced based on these inputs and a clear strategy for teaching-learning evolved. The emergence of Saveetha Teaching Learning Center (STLC) further facilitated the process of imparting the current trends in teaching among the learners.

Challenges

Our Institution, by herself has made immense experiments in the process of teaching-learning. Every challenge that we undertook while transcending from the mode of conventional teaching led us to a new avenue of opportunity and success. The lessons learnt by breaking the shackles of challenging environments led us to take the courageous decision of taking up project/problem based learning for our courses.

Strategies

Every challenge led us to the definition of effective strategy. The inputs of IUCEE through the certification programmes and incessant mentoring sessions led us to identify innovative strategies.

1. **Industry-Institute Collaboration:** The Memorandum of Understanding (MoU) with several leading industries and establishments from Government and private sectors have led to training of student members at a simultaneous mode along with learning. In the case of PBL, the problem or the project is taken up with an internal (Institution) and external (Industry) mentor or teacher. PBL have also led to the process where consultancies are effectively taken up by students and mentors for other organizations.
2. **Use of Technology:** Even before the pandemic situation, our Institution ensured that the role players of teaching-learning need to be an expert with technology. Several online tools and platforms were utilized for exercising the defined teaching methodologies at initial stages. Flipped classrooms (precursor of present online teaching), online quizzes (Kahoot, Quiz Maker, Quiz Stud and related platform) and activities like Student teams-achievement divisions (STAD) were carried out to make the process more effective and fruitful. **At every step, the teacher ensured the use of technology to prepare, mentor and assess the learners. In this juncture, it is pertinent to mention about** Conceive, Design, innovate and Operate (CDIO) workshop handled by Kristina Edstrom (Associate Professor, KTH Royal Institute of Technology) at RRSPBL. The session made the learners realized the effectiveness of Mentimeter (mentor tool) that rearranged the members into small groups for brainstorming.
3. **State of art Laboratories:** Our Institution is known for its state-of-art facilities and well-equipped laboratories that would provide learners, a suitable platform to solve the problems and implement projects. Modern equipment, Artificial Intelligence (AI) backed tools, robotic machineries, virtual laboratories (for online sessions) are supporting the teachers in a great way to make the learners take up the problems.

Insights from the past experience

Even though several experiences can be counted for the adaptation to new method of teaching, a standard example from the past is that of the implementation of problem-based learning (PBL) for the course 19AI401-Fundamentals of Web Technology. Mr. Obed Otto (Professor and Head of Artificial Intelligence and Data Sciences) department implemented PBL for this course and achieved tremendous success. The course was offered during the academic year (2020-21) and was imparted online through Moodle platform. A glimpse of the resources revealed that learners

were presented with a set of problem statements. The entire course is divided into four problem statements and each module listed only the basic requirements and tools for attaining the solutions. For example, 19AI401-Fundamentals of Web Technology courses listed the following experiments:

Exp1: Development of web server to display multiplication table
Exp 2: Development of website for manufacturing company
Exp 3: Development of website for prediction of house price
Exp 4: Development of website for event registration

The Figure 1.1 depicts the levels of learners' participation in these experiments that motivated us to follow the PBL way of teaching-learning for forthcoming semester.

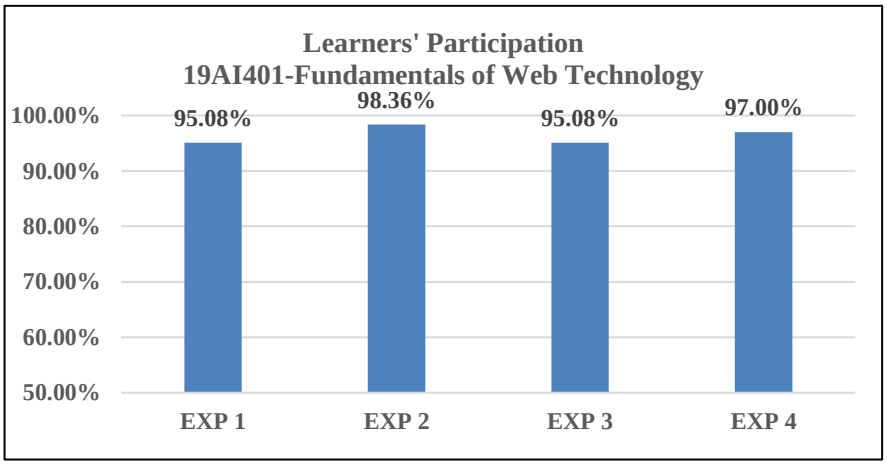

Figure 1.1 Representation of Learners' participation in problem-based learning (PBL) for 19AI401-Fundamentals of Web Technology course

2. Current Status (Academic Year 2021-22)

At present, the PBL is introduced for five courses across varied domains. About 300 students are involved in the PBL related activities. The process has been initiated by August 2021 and the implementation is in full swing and is heading towards an initial level of assessment.

2.1 PBL Lesson plan

The curriculum design and associated lesson plan are individually prepared by the course faculties. The teacher (faculty) here is given all independence to design their framework of implementation. The lesson plan provides the insight into break-down of course into elements, timeline and mode of implementation. In addition, revised Bloom's taxonomy propounded by Anderson and Krathwohl (2001) is assimilated in the process of mapping the outcomes of each step with an appropriate learning level. In the case of PBL, each project is mapped to the highest order of the taxonomy – 'Create' which lead the learners to design, develop, plan and implement.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts	No. of Courses	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
1	1	61	1	1	5	3	Completed (2020-21)
4	5	300	6	Department specific Laboratories	5 (Course specific)	6	In Progress (2021-22)

The details of the courses and faculty implementing PBL are listed here:

Dr. C. Sheeba Joice and Dr. M. Selvi – 19EC303 – Digital Principles and Systems Design
Dr. T. Sripriya – 19EC520 – Introduction to MEMS and NEMS
Mr. Joyal Isaac – EE8703 – Renewable Energy Systems
Mr. F. Felix Prabhu – 19ME403 – Kinematics of Machinery
Ms. S. Padma – 19CE402 – Surveying

2.2 PBL Assessment

In the past experience, PBL assessment for the course 19AI401- Fundamentals of Web Technology are carried out through Active quizzes, time-bound submission of projects, live interactive viva session and so on. Though these are formative assessments, summative mode of evaluation is done through internals and final semester examination. Our Institution's present autonomous curriculum (R2019) provides the learners with immense options to take up mini-projects, online courses, in-plant training, industry internship, consultancy, paper publication and much more that could facilitate his involvement in PBL. Each of these self-reliant way of learning with appropriate guidance and mentoring from teachers are provided credits for successful completion of the courses. In the current academic year, the PBL based courses will witness the varied kind of additional choices made by learners to implement their projects. In addition, every such choice will be followed by an in-house assessment and evaluation.

2.3 External Collaborators (MoUs)

The successful collaboration happens through tie-ups with

1. Service based Industries (Information Technology)
2. Product based Industries (Manufacturing)
3. Entrepreneurships – Individual Start-ups
4. Professional Societies
5. Foreign and Indian Universities
6. Learning Platforms (like NPTEL)
7. Software (MATLAB, AutoCAD)

3. Current Challenges (as of August 2021)

Each course taken up for PBL in this academic year (2021-22) is from varied domains. Hence specific challenges faced by the course faculties are believed to be solved with the help of input from experts of IUCEE. Since the students are in both offline (contact classes) and online sessions (in cyclic mode) for the classes at present due to pandemic reasons, drafting of detailed lesson plan and methodology of implementation that brings the learner to the proper perspective of the problem becomes a compulsory challenge.

4. Proposed Plans for 2022/23

The enlightenment on National Education Policy (NEP-2020) provided by IUCEE through RRSPBL was a driving force that made us decide to take up PBL for current academic year. For the forthcoming academic year (2022-23), we are in the plan of improvising our performance and implementation strategies for the same set of courses. However, in future, a course committee organized by STLC would decide the addition of new course for PBL for 2022-23.

5. Potential Role for the IUCEE

Saveetha Teaching Learning Center (STLC) and the teaching members owe their knowledge on PBL to IUCEE. The certification programmes and associated activities have widened our thoughts and enhanced our skills to take up PBL in our teaching life.

6. Recommendations

We as an Institution are looking forward for several thought-provoking and collaborative experiences from IUCEE, that could provide us a golden platform to showcase our outcomes.

7. Conclusions

The inputs from the initial assessments for the PBL based five courses have been positive both in qualitative and quantitative aspects. The IUCEE based teaching strategies and resources have highly been instrumental in guiding the teaching community of Saveetha Engineering College to implement PBL. The mini-projects and outcomes are encouraging for elevating them to research aspects. We are hopeful to make a mark in terms of good publications that could relate to the Millennium Sustainable Development Goals (SDGs) through our projects and problems.

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B.M.S. College of Engineering, Bengaluru, KN

Report on Problem/Project-Based Learning

Prepared by

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Synopsis/Abstract:

Since inception in 1946, B.M.S. College of Engineering (BMSCE) has distinguished itself in the field of education in general and in the field of engineering education in particular. Graduates of B.M.S. College of Engineering have gone on to occupy high offices in various government and private institutions and have served the society well. However, the methodology in the imparting of education since then till now hasn't changed much from the usual classroom-based teaching using blackboard/projector and a written examination-based evaluation which was introduced by the British in India. With rapid enhancements in technology, with growing awareness of the highpoints of Indian cultural and intellectual heritage and with an increased understanding of the process of teaching-learning; it is being increasingly felt that it is high time we adapt our education system to the changing times and make it relevant in the face of future challenges and uncertainties.

There is an old Sanskrit quote saying

आचार्यात् पादमादत्ते पादं शिष्यः स्वमेधया। पादं सब्रह्मचारिभ्यः पादं कालक्रमेण च॥

(A student gets one quarter of his understanding from his teacher, one quarter by his self-effort and intelligence, one quarter by discussions with classmates and the final quarter through experience over time.) But the existing system just focused on having professor deliver lectures to a class of about a strength of 60 and checking the understanding of students through written periodical exams. The lowest point of this system came about in the previous year when the students were forced to be glued to their laptop/smartphone screens for close to six hours per day due to the classes being online. It was quite a challenge to engage the students during the class and to keep them motivated to turn up for the classes on a daily basis. Many students communicated that they were unable to focus by being such 'passive' learners. It is at this crucial juncture that the National Education Policy (NEP) 2020 has come out, aiming for holistic learning by means of experiential and active learning.

1. Introduction

Recognizing the shortcoming of regular classroom teaching, BMSCE decided to establish R&D centre and several labs under its supervision. One such lab called "Robotics and Embedded Systems Lab" (Propel Lab-1) was established in 2014 with support from the eYantra initiative of IIT Bombay. Other 'Propel' labs were also established to cater to the emerging needs of 3D printing, drone technology and the like. Recently in 2019, the Institute Innovation Council (IIC) was also setup to encourage startups and innovation on-campus. On 31st January 2021, IUCEE

Student Chapter at BMSCE (ISCB) was setup with the vision of enhancing engineering skills among students through fostering of problem-based learning (PBL). Robotics Club, a students' body has been established under the aegis of Propel Lab-1 to foster engineering skills in the areas

related to Robotics encompassing the streams of Mechanical, Electronics, Electrical and Computer Science and Information Science & Engineering departments.

The BMSCE Satellite program 'Upagraha' is providing opportunities for students to engineer and build various sub-systems of a satellite. 'Phase-Shift' is a annual Techno-Cultural fest organized by BMSCE every year typically on 14-15th September to commemorate Engineers' day, where some of the technical events employ competitions which put to test the engineering skills of the participants.

eYantra initiative of IIT Bombay runs competitions called eYantra Robotics Competition (eYRC) and eYantra Innovation Challenge (eYIC) every year, in which students of BMSCE take active part. During the academic year 2020-21, 200 teams of (nearly 800) students took part in the said competitions. ISCB conducted a 36-hour learn-a-thon "Python Bootcamp" for students who are not exposed to Python through 23 graded problems which are solved by the participants in sequence.

Some of the challenges faced by faculty in the PBL journey include:

- Inadequate training to mold important courses into the PBL methodology
- Limited compatibility between grading a PBL based course and the framework set by the affiliated university
- For programming courses, codes will be available online for most standard programming questions. Faculty will have to come up with unique questions even for teaching basic stuff.

Some of the challenges faced by students include:

- Lack of initiative
- Lack of teamwork, especially in pandemic times when movement was severely restricted

Some of the lessons learnt include:

- Students who undertook the extra effort to persevere and participate in eYantra competitions and the said Python Bootcamp learnt the underlying subject matter quite well. They have also gained the confidence to learn a new topic mostly on their own with limited guidance.
- PBL framework is best implemented in teamwork between faculty and students as well; where one can learn from one's peers and keep progressing. Faculty are encouraged to take part in FDPs where PBL approaches are discussed.

2. Current Status

Currently, the PBL is introduced in at least 20 courses amongst different Departments of the College. More than 500 students are involved in the various courses in which PBL methodology is implemented. Mini project is introduced as a separate course in many departments in the 3rd, 5th and 7th semesters. Project for Community Service is specially introduced as the theme for 7th semester mini projects in some departments. Certain courses like 'Machine Learning', 'Internet of Things (IoT)', 'Advanced Logic Design' etc. have been offered with support from industry. Details

of involvement of courses, subjects, students, faculty members, lab resources, etc in PBL are tabulated in the Table 2.1 till 2020/21:

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts in the College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
14	20	20	500	20	5	1	20	Started in 2020

2.1 Sample PBL Lesson plan

In my assessment, PBL methodology can be implemented most easily for those courses having an element of programming. For such courses, the minimum theory required to solve the simplest problem in that domain is to be discussed first. Then the students are asked to solve the said simplest problem. The theory portion for the subsequent part must address the various approaches that the students took to solve the problem previously given. Additional information as to the line of thinking of students must be addressed.

Another approach in active learning is the concept of 'think-pair-share'. Here, the instructor poses a question to the class, gives a minute for each student to reflect upon the question, another minute for a pair of neighbours to share and discuss each other's thoughts. Then, the next couple of minutes are spent in sharing all the thoughts with the rest of the class.

2.2 Sample Student PBL Assessment

Assessment, in my opinion, is the most difficult part of a course with the PBL methodology. If the course is a stand-alone mini-project or part of an alternate assessment, the problem is lesser. Rubrics can be defined with respect to choose of the problem and the approach taken towards the solution and percentage of solution implemented. Whereas if the course is such that a written semester end examination has to be conducted, it is not clear how to bring in the innovation with PBL framework.

2.3 List of external collaborators for PBL as applicable

- eYantra initiative, IIT Bombay
- Nokia Networks Limited
- Samsung

3. Current Challenges (as of August 2021)

- Lockdown due to pandemic
- Lack of time to mold existing syllabuses of courses into PBL framework

4. Proposed Plans for 2022/23

- PBL based Mini courses are introduced in the first year of engineering itself as a pilot project
- PBL based short-time learn-a-thons will be conducted through various student bodies in emerging areas

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts in the College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
14	30	30	600	30	10	1	40	

5. Potential Role for the IUCEE

Specify how the IUCEE can help in your current and future plans,

- Conduction of FDPs from time to time on PBL related topics
- Creation of a community of faculty who actively implement PBL and share their learnings
- Guidance in molding certain important courses into the PBL framework

6. Recommendations

We take this opportunity to urge IUCEE to facilitate the formation of a core committee of active faculty who are deeply passionate about implementing PBL so that each one can learn from others' experiences and grow together in making the implementation of PBL successful.

7. Conclusions

In conclusion, we are at a stage when the implementation of PBL is inevitable at least in the case of important courses central to the discipline of one's specialization. Also, the awareness and implementation of PBL in most educational institutes are in its infancy at the moment. We will ensure to take all steps that are humanely possible to make implementation of PBL a reality and are passionately looking forward to seeing the real change on the ground.

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Kalasalingam Academy of Research and Education
Implementation of Course Level Project-Based Learning

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Abstract:
PBL is introduced at KARE to be offered at course levels. The implementation challenges, particularly time management, are addressed through an innovative strategy to provide additional hours per course which is offered as PBL. Experiences from the previous batch are discussed and it is concluded that appropriate strategies for motivating students and inculcating team spirit should be promoted for the successful conductance of PBL.

1. Introduction
Project based learning (PBL) was first introduced during AY 2019-2020 for all the engineering departments. The initiative was proposed by the then Director (IQAC) after attending IUCEE conference at SRM (A.P) wherein an emphasis was placed on giving autonomy to the faculty members to teach and evaluate a course. After an internal brainstorming session amongst the department heads, the proposal was approved by the Vice Chancellor and the Management. This was formally approved by the Academic Council during 2019. The purpose of this initiative was to gradually eliminate the rote memory type of teaching-learning to acquiring of practical knowledge and skills. The autonomy allows the faculty member to freely adopt PBL as a part of teaching-learning and evaluation. During the first year of its implementation, only 5 faculty members offered mini projects in their courses. There were some important concerns from both the faculty and the students. These concerns were aggravated when whole teaching learning shifted to online mode. After many audits and other internal discussions, the concern was addressed to a considerable degree during the AY 2020-21.

The challenges faced by faculties are listed below.
- Lack of sufficient time to guide and evaluate the course level projects
- Shortages of resources needed for the project

The challenges faced by students are listed below.
- Lack of sufficient time to work on the project to the satisfaction of the faculty
- Lack of team spirit

The following strategies were used for addressing the challenges faced.
- Faculty conclave on PBL was organized to discuss implementations issues and suggestions to improve.
- Since time management was a concern from both faculty and students' side, an innovative strategy was adopted to create 3 hours per week in the regular timetable itself for facilitating PBL. This additional hour is termed as 'X - Component" where X is a variable in the sense that the 3 hour per week can be utilized for implementing project, giving seminars/presentations, hands on training on the required tools/machine etc.

After the completion of the first batch using the PBL teaching methodology, a survey of students was conducted. Results of the pre and post-survey are depicted in Table 1.1. Some of the observations were noticed during the group interactions are:

a) Some slow learners have performed better than fast learners.
b) In some courses, students have acknowledged the teaching competence of the teacher has improved by offering PBL.

Table 1.1: Student perceptions about the PBL course and its evaluations

Percentage of students			
felt satisfied with PBL for current semester	aware of the evaluation scheme	preferred PBL for next semester	course are adequate for testing practical skills
92.27 %	98.38 %	97.32	98.13

The performance of the students was compared with the previous semester results in terms of pass percentage and class average, and they are shown in Table 1.2

Table 1.2: Student performance before and after the introduction of PBL courses

S. No	Course Name	Previous semester in Traditional teaching		After PBL implementation	
		Pass percentage	Class Average	Pass percentage	Class Average
1	Environmental Engineering	88%	56	97%	63
2	Earthquake Resistant Design of Structures	91%	61	100%	69
3	Java Programming	86%	53	95%	64
4	Watershed Hydrology	85%	54	100%	66
5	Solar and Wind Energy Conversion	82%	52	96%	61

The following crucial lessons were learned from the first run of the PBL.

- For enhancing the involvement of students in PBL, higher weightage had to be given in the assessment for the project (about 40% on an average).
- The project completion timeline should be at least 3 weeks to 4 weeks before the last working day in the semester. Accordingly, the project scope has to be defined by the faculty.

2. Current Status

Currently, the PBL is introduced in 16 courses spanning across almost 8 engineering departments. About 934 students are involved in the course level mini projects in smaller groups

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	16	934	16	21	10-12	16	Started in 2019

of a maximum of 3 or 4 students per batch (Around 293 batches). Some of the projects are interdisciplinary in nature. Industry/community-related projects have been undertaken related to specific subjects/courses. Details of involvement of courses, subjects, students, faculty members, lab resources, etc in PBL are tabulated in the Table till 2020/21:

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
293	10	12	4	

Sample list of title of 5 Mini projects using PBL

1. Relational modelling on multi-dimensioning aspects
2. Zero energy low-cost refrigerators for the farmers
3. Low-cost bio-fertilizers and bio-control agent for the farmers
4. Effect of soft storey on symmetrical and asymmetrical RCC buildings under seismic load
5. Decision supports system for water distribution network for a small town

2.1 Sample PBL Lesson plan

Week	Activity Description
1st	• Formulating project group & Introduction about PBL • Assigning individual problem statement to each group
2nd	• Describing objectives of the project • Arriving methodology to complete the project
3rd – 6th	• Completing each objective of the project • Monitor the project progress with suitable reviews (includes technical content, project management, team spirit)
7th	• Orientation on technical report writing
8th	• Preparation and submission of project report • Project presentation and viva-voce

2.2 Sample Student PBL Assessment.

Description	Good	Average	Poor
Technical content	Is fully clear to apply the design principles in analysing the given case with proper justification from relevant codes	Is able to apply the design principles and analyse the given case, though not very clear about codal recommendations.	Makes mistakes in the understanding of fundamental principles
Teamwork	All the members involve at all the level with regular meetings and discussion	All the members participate in the design process but is not planned regularly.	Not all the members participate.
Project management	Roles defined and project management done effectively	Roles are defined more or less clearly, but the implementation is not effective	Roles of individuals and timeline for project completion are not clear.
Report preparation	Is able to present a fully structured report with relevant tables and figures	Is able to bring all the details but structured approach is missing.	Is not able to clearly put the thoughts and work done
Submission of Report	Submitted before deadline	Submitted after deadline	Not submitted

2.3 List of external collaborators for PBL as applicable

- Nanochip Solutions Private Limited, Bangalore
- IBM India limited, Chennai
- PMR RMC Plant Pvt Ltd, Bangalore

- Rohan Builders, Bangalore

3. Current Challenges (as of August 2021)

The major challenges currently are due to working from remote due to COVID

- Teamwork is not being done effectively.
- Experimental based works towards a project cannot be done in virtual mode. Similarly. licensed software available with the department cannot be accessed for the project work.
- Course level projects are not taken to the next level by the students/faculty. For instance, a good project can be a seed idea for more elaborate work either for the faculty to apply for sponsored project or for the students to take up as major project.

4. Proposed Plans for 2022/23

Indicate proposed plans for accelerating and enhancing infusion of PBL in various subjects to overcome the challenges listed in section 3 as well as in line with the National Education Policy 2020. Proposed plans are:

1. One of the main purposes of PBL based teaching learning is to inculcate team spirit in students. We plan to promote peer evaluation amongst students particularly in relation to PBL so as to take everyone forward in inculcating this spirit.
2. We are planning to promote interdisciplinary projects based on open-source software for this academic year. Using the X-component option in the course, we plan to promote use of relevant software in the courses to compensate for inability to access the licensed software.
3. We are creating avenues for project displays to motivate the student to take it to next level. Opportunities are also being created through the IEDC cell of the institute for possibility of start-ups at least for the most promising projects.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year

No. of Depts	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	22	1100	22	21	10-12	16	-

5. Potential Role for the IUCEE

- PBL cluster meetings of IUCEE are indeed a very welcome opportunity to learn from faculty members of other institutions, their best practices as well as the challenges faced. It will be useful if a consolidated summary of the discussions and sharing during these cluster meetings are put in IUCEE website for easy reference.
- IUCEE student summit is another wonderful opportunity for the students to get motivated to go beyond academic learning. PBL requires an open-minded approach and one of the ways this is achieved is by peer interactions on a larger level involving many other institutes. IUCEE can facilitate inter-institute interaction for students working on joint projects.
- IUCEE Student chapter has recently been very actively functioning in the campus. The possibility of organizing events wherein students present the challenges and opportunities

offered by the institution on PBL. This will help the students learn to see the importance of PBL from students' perspective

- IUCEE MRC can help the institutions to improve the strategies for better implementation of PBL.

6. Recommendations

1. PBL should be implemented at course level first wherein minor projects can be given. This will inspire the students to develop an interest for PBL approach and they will learn to see things from application to real world situations.
2. In each semester, a maximum of two courses can be based on PBL. More than that would make it difficult for the students to manage time.
3. It is necessary to ensure beforehand that enough resources are available to carry out the projects.
4. The weightage for the PBL should be relative higher when compared to the overall assessment in a given in order for the students to feel motivated to contribute.

7. Conclusions

KARE has taken an active initiative to implement PBL in the curriculum at the course level by giving autonomy to the faculty members to offer mini projects in the course they are teaching. The experience shows that time management is important - both from students as well as from faculty members perspective. One of the ways, it can be accomplished is by providing exclusive hours on a weekly basis in the timetable itself. The main challenge we face now is in inculcating deeper team spirit in students particularly working online. Peer evaluation is suggested within PBL as one of the potential solutions amongst other possibilities.

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A Comprehensive Report on Problem/Project-Based Learning at Marwadi University

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Synopsis/Abstract:

The notion of relating the theoretical knowledge with real life challenges is very well addressed by Marwadi University (MU), followed by provisions of Problem/Project-based learning (P2BL), inspiring critical thinking, prototyping, and real-life problem solutions by the students with teachers' support. The teachers at MU have enthusiastically participated in different IUCEE initiatives. As an outset, 10% of the pedagogical activities of the subjects in a program were shifted towards the P2BL components and it's a matter to take proud that MU is now all set with a plan to implement P2BL attributes with 20% contribution to the pedagogical practices and cognitive assignments for the students for a given semester of all programs.

1. Introduction

During the academic year 2016, Marwadi University joined the IUCEE as an institutional member, and introduced the subject to the first-year students wherein the project-based learning was offered. The objective was to train students for critical thinking and to start relating the theory with the real-life problems. Faculty members were also encouraged to participate in different IUCEE inspired trainings and as on date more than 75 faculties are certified by IUCEE at Marwadi University. Since then, almost every year, the faculty have continued to participate in the IUCEE activities. During 2018, the University was visited by Prof. Bill Oakes, Purdue University under the EPICS program review also. Prof. Oakes found all the projects very influencing and encouraged the students and faculties for more efforts and implementation of the critical thinking. Just to outline the activities currently offered to the students under the P2BL initiative, students are encouraged to participate in competitions like ROBOCON, SAE BAJA, Hackathon events, and IEEE, CSI, ASME symposiums. It is interesting to note that a large and small groups of students from different engineering streams work together for a common goal and that is what exactly the requirements of IUCEE's P2BL concepts. As on date, MU have 62 start-ups registered, more than.5 million Rs of fund received, 6 companies registered, 15+ patents filed and many more in process. However, no revolution comes without challenges and the MU is not an exception. The faculty and students at MU faced following major challenges while implementing the IUCEE inspired P2BL pedagogical practices;

- Time constraints for project completion.
- Immobility of students due to COIVD-19 restrictions.
- Insufficient contact hours for students with faculty members due to lockdown.
- Lack of site visits and limited access to the end users for problem identifications.

Although, the challenges were critical, the University didn't stop at the point. Following methods and steps were implemented immediately to cope up with the challenges;

- Online mentoring and group discussions by the faculty for guidance
- Use of virtual labs to meet the expectations of students for lab works
- The teams were formed, and the project works were converted into the presentation by the students at online platforms.
- Evaluation was also made effectively by rubric design in advance and was explained to the students for the best assessment practices.
- Students were given flexibility to carry on with the same project up to the next semester.

From the experience with implementation of projects at university, experiences of various universities across globe through intellectual interactions during RRSPBL and our representation through various clusters, we believe that PBL provides better learning opportunity to students. We would like to gain more experience and expertise in the field of PBL. We also have plan to extend PBL by designing a course which may take 20% of credits in semester, spanned over multiple semesters.

Our experience so far with PBL implementation.

- Improved results due to learning by doing
- Increased students' interest for virtual and simulation labs.
- Better mapping of CO-PO due to the combination of the critical thinking and Bloom's taxonomy during the assessment.
- Students have become more industry ready by doing collaborative work and projects. A clear advantage of P2BL implantation may be observed from the given example.

Table 1.1: Student perceptions before and after the introduction of PBL for subject Project based community services

Traditional teaching			With P2BL implementation		
Q1	Q2	Q3	Q1	Q2	Q3
How to relate theory to the practice?	How to convert academic content into a project?	How to reform the engineering knowledge for end users?	How to identify useful projects for community?	How to make analysis and design workable at field?	What changes are good for end users in current academics?

Table 1.2: Student performance before and after the introduction of PBL for subject Manufacturing Processes: I

Traditional teaching			With P2BL implementation		
Average	Mean	Standard Deviation	Average	Mean	Standard Deviation
78.95	79	4	81.13	81	3.8

2. Current Status

Since last 3 years, Faculty of technology, at Marwadi University has followed that 1 subject per semester per branch should be based on PBL or PBL related activities. Nearly 750 students per year are involved in PBL or PBL related activities. Mini projects have been implemented in 20 Subjects/year. Industry/community-related projects have been undertaken related to Marwadi University courses.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts / Schools / College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
7	7	9	746	11	9	20	10	2019-20
7	7	10	776	11	10	20	11	2020-21

Sample list of title of projects using PBL

- Baby monitoring system.
- Self-supporting bridge.
- Design of compressor motor for 5 TR air conditioner of Mitsubishi heavy electric.
- Smart Foundry with data analytics support.
- AR /VR modelling for better understanding of Engineering graphics
- Smart stick for blind people.

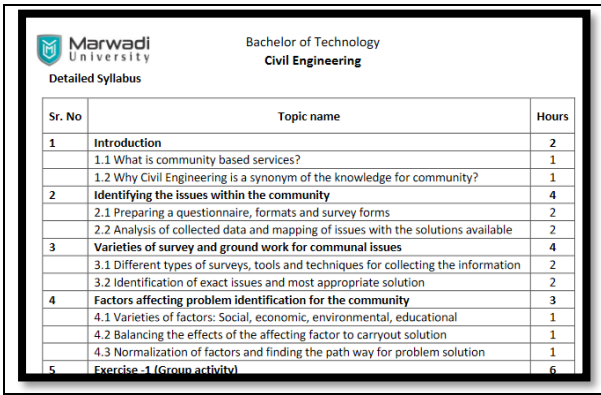
2.1 Sample PBL Lesson plan

Lesson plan is prepared in accordance with desired session outcome and is mapped to 1 hour for theory and 2 hours for practical/tutorial. Lesson plan is prepared so as to introduce the problem, desired skill set to be learned/practice and it also subdivides the task for timely conversing to solution and also to ensure the desired learning among students. Following are the glimpses of the lesson plans and credit system to meet the needs of P2BL implementation at the University.

2.2 Sample Student PBL Assessment

Assessment is a tool to inform and measure the desired outcome for the subject. Continuous evaluation is done to follow regularity, individual and team performance, and to achieve target attributes with the help of platforms like Canvas instructure. Assessment rubrics are defined based on various framework like, team formation, make it mind-set, learning from failure, team experience, code of conduct, role of team member, patent search and specification development,

selection of technology and components, ideation-empathy mapping-learning matrix, SCAMPER etc. Prototyping, presentation, interaction with end user.



Marwadi University

Bachelor of Technology
Civil Engineering

Detailed Syllabus

Sr. No	Topic name	Hours
1	**Introduction**	2
	1.1 What is community based services?	1
	1.2 Why Civil Engineering is a synonym of the knowledge for community?	1
2	**Identifying the issues within the community**	4
	2.1 Preparing a questionnaire, formats and survey forms	2
	2.2 Analysis of collected data and mapping of issues with the solutions available	2
3	**Varieties of survey and ground work for communal issues**	4
	3.1 Different types of surveys, tools and techniques for collecting the information	2
	3.2 Identification of exact issues and most appropriate solution	2
4	**Factors affecting problem identification for the community**	3
	4.1 Varieties of factors: Social, economic, environmental, educational	1
	4.2 Balancing the effects of the affecting factor to carryout solution	1
	4.3 Normalization of factors and finding the path way for problem solution	1
5	Exercise -1 (Group activity)	6

Lesson plan of 24 hours for PBCS subject

Sr. No.	Topic	Hours
1	*Introduction to design, virtual tour, cut-section demonstration.*	2
2	*Hands-on practice - spread sheets, FEA software tool.*	2
3	*Transformer Design- core design, window dimension, yoke design*	2
4	*LV winding design*	2
5	*HV winding design*	2
6	*Calculation of resistance, reactance*	2
7	*Tank design and Temperature rise.*	2
8	*Design of Induction motor-main dimension, stator winding design*	2
9	*Rotor design*	2
10	*Loss component and short circuit design*	2
11	*Loss and efficiency*	2
12	*FEA software Implementation for IM*	2

Credit assigned to the topics as per P2BL needs

2.3 List of external collaborators for P2BL as applicable

Following are the front-line collaborators at MU pertaining to the P2BL activities

- Regional Industries, NGOs, and Government agencies have actively collaborated by signing an MOU with MU for testing/validation, prototyping, mentoring etc.
- Advanced magnetics product pvt Ltd., Rajkot: An electrical motor manufacturer have shown readiness to prepare one motor as per student's design. Student's design will be compared for performance with standard motor.
- Marwadi University has collaborated with Dr. Anil Patel, Ex-scientist, USA for "Gyandan program", on creativity, problem solving and innovation, the course is offered to semester IV students for 2 credits.

3. Current Challenges (as of August 2021)

Restricted offline learning and interrupted internet connectivity for students, Limited peer learning for students, difficulties in direct conversation with the end users/Community representative, limited survey of the sites / areas due to restrictions of Covid-19 conditions.

4. Proposed plans for 2022/2023

Considering the success of vaccination drive, we expect students reporting in full-fledge in the campus for the upcoming year. MU has a guideline that will be followed as mentioned earlier in terms of the number of subjects involving project/problem-based learning. We would like to improve our outcomes by minimum 10% in terms of number of projects completed, start-up registration, participation in project-based competitions, design patents, etc.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts / Schools / Colleges	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
9	9	15	800	15	15	20	14	2022-23

5. Deliverables by IUCEE to MU

- **Trainings:** More faculties will be participating in the different IUCEE supported events and programs. Students will be encouraged to take lead and participate in the exhibitions and programs by the IUCEE symposium in the upcoming time.
- **Collaboration with institutions:** Enhancing the collaborations among practitioner institutions through knowledge sharing sessions
- **Collaboration with teachers and trainers:** Identifying potential collaborations among faculties.
- **Web-based space sharing:** Creating a platform (website/blog) for interaction and sharing experience and exchange the ideas amongst the teachers and students.

6. Recommendations

- Identification of problems, scope of problem, task division and rubrics should be planned minutely to get the desired outcome, frequent monitoring and updates are necessary.
- IUCEE may be a bridge between campuses, faculties and students to work on collaborative projects.

7. Conclusions

Teachers must get involved more with the students' learning via P2BL pedagogy and appropriately map the CO-PO for the desired attainment of the outcomes. Project based learning is the need of time. It helps in collaborative, peer, and self-learning. Marwadi University is offering subjects based on project and design engineering for all academic years and has observed positive outcomes. To overcome the present challenges in implementation of PBL trained faculties, solution to mind set and associated problems is required.

Dr. Vishwanath Karad MIT World Peace University Report on Problem/Project-Based Learning

Prepared by
Varsha Naik, Anand Kulkarni, Sanjay Bhagwat, Sheetal Girase, Chandrashekhar Bobade

Abstract

PBL at MIT-WPU was formally started in 2016 though it was informally being practiced earlier to that. This included various time bound student activities and competitions like ROBOCON, SAE Baja and like which involved multidisciplinary student teams along with faculty mentors. The main driver behind starting PBL was to assess the soft outcomes such as teamwork, interdisciplinary approach, communication skills and lifelong learning for the regular academics. A major challenge from the student's perspective was their reluctance to think beyond the prescribed syllabus. Through this entire PBL exercise, it was observed that the activity was beneficial to the students to correlate theory with real world problems and has potential to make them industry ready.

1. Introduction

Institutional PBL Journey

How has it started?

Dr. Vishwanath Karad MIT World Peace University (MITWPU) formed in 2017 carries on the rich legacy of what was previously known as MIT Pune. MAEER'S Maharashtra Institute of Technology, Pune was established in 1983. MIT Pune always believed in providing its students the right resources and environment so that they can successfully tackle and find solutions to the most challenging engineering problems faced by society today. The first trial of PBL was introduced on a large scale in the first semester of the third year of each engineering program during academic year 2015-16 under Savitribai Phule Pune University. It was formally introduced by Prof. Suhasini Desai and Prof. Datta Dandge in the institution. To sensitize all disciplines department heads a PBL introductory workshop was held beforehand. PBL was integrated into the existing syllabus and therefore facilitators were guided to select a topic from the syllabus of the ongoing courses while identifying the problems for PBL. In this regard a workshop (PBL@MIT Facilitators') was conducted on 22nd June 2015 for all PBL Facilitators and Coordinators. Follow up meetings were held to track the progress of PBL throughout the semester. In the next iteration, feedback forms were prepared for students and facilitators. This was not the first time that PBL was practiced at MIT. From 2005 MITWPU started with Robocon Activity which included a multidisciplinary team of students from E&TC, Computer, Mechanical, Civil, and Petroleum. One Mentor was assigned to guide them. The Team worked on a multidisciplinary problem and came out with solutions in the form of optimized robots. Also, the Mini project was not formalized as PBL but was being practiced as PBL since 2005.

What were drivers/reasons?

Outcomes-Based Education became a pillar of the accreditation process in engineering education in India in 2013. The National Board of Accreditation (NBA) released its guidelines regarding programme outcomes and attainments in the same year. Necessity to come out with new learner-

centred pedagogical methods that ensure meeting the new criteria of accreditation was strongly felt. Programme Outcomes demanded that graduates should be able to identify, formulate and solve complex engineering problems. There was no provision for assessing these outcomes in a conventional chalk and talk classroom. How to assess the soft outcomes such as teamwork, interdisciplinary approach, communication skills and lifelong learning was also a big question begging for a solution. During the quest of finding answers to this and similar questions, two of the faculty members Prof. Suhasini Desai and Prof. Datta Dandge came across and were inspired by the writings of Prof. Richard Felder, and attended first time ever conducted workshop on PBL by Prof. Anette Kolmos, UNESCO chair for PBL at Aalborg University, Denmark. This turned out to be the starting point of the formal PBL journey of MITWPU. Currently, PBL is being practiced by various faculty members in their courses. PBL is integrated into the existing syllabus and facilitators are guided to select a topic from the syllabus of the ongoing courses while identifying the problems for PBL. Apart from this, students participate in various students' technical competitions organized by different organizations BAJA, SUPRA, Smart India Hackathon, Chem-E-Car, Robocon and the like. These Student competitions can be treated as PBL as they cover practically every aspect of PBL. One such case study of Robocon was presented as competition based PBL in RRSPBL in 2019.

Rural Immersion Program, a curricular feature of MITWPU curriculum implemented across disciplines is yet another PBL case study. MITWPU arranges rural immersion programs to provide an authentic rural-life experience to our students. It includes visits to local schools, activities, social surveys of villages regarding access to water, electricity, livelihood, education and income. This inculcates the sense of responsibility towards society. Efforts are made for developing solutions to village problems with the participation of the local people through Project Based Learning (PBL). Following is the statistics for the years 2017 to 2019.

Year	Villages visited	Students	Faculty members
2017-18	23	1300	50+
2018-19	17	1300	50+
2019-20	19	1300	50+

During these visits, students worked on the issues of rainwater harvesting, water management, tree plantation, digitalization of village schools and surveys about awareness of adolescent girls about hygiene and health in their PBL.

What were the challenges?

The challenges faced by the faculty members are listed below:

- Lack of orientation about the role of facilitator as different from that of a conventional teacher
- Designing open ended problems. Teachers themselves had no clue on how open-ended problems are posed and solved and how many answers to one problem can be assessed.
- Inertia to adopt PBL as a pedagogical method. Teachers were afraid that the syllabus will not be covered through PBL.
- Time management for implementing PBL. Teachers found it challenging to complete PBL exercise meaningfully over a semester/trimester while managing other routine academic tasks.

- Assessing individual work of a student in a group. Teachers were clueless on assessing the individual contributions of team members since they found that in many cases the team was protective of its non-performing members.

The challenges faced by students are listed below:

- Time management was a challenge as they considered PBL as extra workload which was not adding to the mark-sheet in proportion to the time spent upon it.
- Resistance to adopt a new assessment pattern.
- Lack of an ability to think beyond the prescribed syllabus and the next examination.

Lessons Learned

The main objective of Problem Based Learning is to motivate students to learn actively on their own through the learning experience posed through the problem and in collaboration with each other rather than traditional teacher-driven passive learning through assimilation of facts and principles presented to them in the classroom.

Through the Problem Based Learning implemented at our university, we would like to share few observations:[5]

- Through this activity, students get to improve critical thinking and problem-solving skills.
- This activity helps students correlate theory with real world problems.
- They are encouraged to work on their own.
- In spite of having different views and perspectives, students learn to work collaboratively.
- Since the students are working in a team, it increases the sense of responsibility and understanding among them.
- It also increases the confidence and leadership quality among them.
- It enhances Faculty-Student bonding

2. Current Status

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts / Schools	No. of Courses (Programmes)	No. of Subjects (Courses)	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
9	9	18	2370	57	15	10 for 60 students	40	

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
8	2	6	5	Byproducts of completed projects are in real use

2.1 Sample PBL Lesson plan

PBL problems were designed using the standard PBL pedagogy. Every problem had its learning objectives defined. The problems were necessarily open ended with multiple solutions. Students were asked to form the groups as per their choice. Week wise schedule was given to the groups. The students would conduct meetings and record the minutes. A midterm review was taken in the form of peer review and faculty review. The students submitted a report at the end the exercise. The final assessment was conducted by the faculty members along with external experts.

2.2 Sample Student PBL Assessment

- Facilitator review with respect to
  - Interpretation of the problem statement
  - Literature and data collected
  - Week-wise working plan
- Students assessed each other through peer review

3. Current Challenges (as of August 2021)

- To motivate faculties to continue PBL activities in an online mode
- No access of laboratory facilities to students due to covid regulations
- Lack of trained faculty members and supporting technical staff (details).
- Difficulties in conversion of students group into homogeneous team
- Limitation in collecting real life data from the field, field work not possible

4. Proposed Plans

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts / Schools	No. of Courses (Programmes)	No. of Subjects (Courses)	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
20	30	30	3500	70	25	10 for 60 students	50	

5. Potential Role for the IUCEE

- IUCEE can design and deliver basic training program for wide PBL literacy amongst engineering teachers
- In building capabilities of the faculty members in their role as PBL facilitators
- Enhancing collaborations among member institutions through sharing sessions
- Identifying potential collaborations amongst member institutions

6. Recommendations

- Keeping with guidelines given by NEP 2020, mechanisms should be devised so that students will be able to connect with villages through activities such as rural immersion programmes,

in which they will understand villagers' issues and propose solutions. Students' participation in solving such real-life problems will strengthen their Problem-solving abilities, leadership, management, and teamwork skills.

- All the institutes are advised to participate in various technical competitions at national and international level such as SAE BAJA, SAE SUPRA, Robocon, Chem-E-Car, and others as it indirectly involves PBL and will help to boost the PBL movement at national level.
- Facilitators from industry should be encouraged to join PBL efforts as mentors to students.

7. Conclusions

- Problem-based learning is innovative, requiring much brainstorming, learning, and active engagement on the part of students. PBL is most effective when it is guided by best practices and evaluated on a regular basis; as a result, it needs serious effort, resources, and support to implement the PBL.
- In the adoption of PBL at the university level, there are benefits such as flexibility and freedom in developing and executing PBL, as well as challenges such as curriculum, assessment and evaluation, and time management.
- PBL has potential in bringing about a much-needed shift in teachers' role and perspective of profession. Overall, a well-prepared plan will definitely help in the implementation of PBL in the classroom and serve the purpose of effective teaching learning.

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MLR Institute of Technology
Report on Project-Based Learning
Prepared by

D.V.S.Chandrababu, Radhika Devi V, K.Srinivasa Rao

Abstract:

The world is progressing based on the thought process of human beings. Even in the educational sector many revolutions took place, and a noticeable progression is evident during different years. Though there is a technical gap between the outcome of the students and the industrial needs. In this context, teaching learning process and thought process are interconnected. Based on the observations and needs, different varieties of teaching learning pedagogies have been implemented and updated. Many effective teaching learning process or practices are in usage at present. One of the effective learning processes in our institute, MLR Institute of Technology (MLRIT), is successful implementation of micro project activity. It is an ample platform for the students to showcase what they have learned or what they know. In this framework, the procedures and process involved in micro project activity (PBL) at department level in the institute are highlighted. The testimonies and achievements of the students prove the importance of this activity.

1. Introduction

Problem-based learning (PBL) was first introduced in 2014 year for 2nd, 3rd and 4th -year students of all Engineering disciplines for only core subjects by Dean Academics of MLR Institute of Technology. The standard operating procedure (SOP) for implementing this Project based Learning at Course level was introduced.

Two professors from each department were allocated to check the progress of PBL. Faculty members are new to this implementation of the PBL during 2014 though we have succeeded for 60% now we are implementing PBL even at freshman department level too.

The challenges faced by faculties and students are listed below.

- Assessment of Project teams
- Only few students in team are active

The following strategies were used for addressing the challenges faced.

- FDPs were organized for the faculty members

2. Current Status

Currently PBL was expanded to Freshman. We have introduced project-based learning to first year engineering students at subject level like Internet of Things, 3D Printing etc.

Details are provided in Table 2.1 and 2.2.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year (Freshman Engineering)

No. of Depts	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
6	2	360	40+	2	20	15	Started to Freshman engineering in 2017

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
20	20	-	6	-

Sample list of title of 5 Mini projects using PBL

- IoT based Street light System at MLRIT
- Solar Bike
- Essentials Carrying Robot during COVID time etc..

2.1 Sample PBL Lesson plan

Various steps involved in implementing Micro projects (PBL):

i. Idea creation
ii. Team formation
iii. Project selection
iv. Mentor allocations
v. Evaluation process
vi. Rewards and Recognition

2.2 Sample Student PBL Assessment

Rubrics for Evaluation of IoT Lab Work- SEE 70 Marks

Category	Excellent	Good	Fair	Poor	Marks Scored
Problem Statement (5M)	Detailed and extensive explanation of the purpose and need of the project. (5M)	Good explanation of the purpose and need of the project (3M)	Average Explanation of the purpose and need of project (2M)	Minimal explanation of the purpose and need of the project (1M)	
Understanding of Content (5M)	Shows a sophisticated understanding of the project (5M)	Displays a somewhat limited understanding of the project. May have a few misinterpretations. (3M)	Insufficient description of technical requirements of project (2M)	Does not show an understanding of the project. Misses plot points and has quite a few misinterpretations (1M)	
Execution I – Code (15M)	Provides reasonably well structured approach; and shows technical competence (15M)	Satisfies minimum requirements - provides the minimum core functionality of the software. (12M)	Average knowledge and awareness related to the code and its functionality.(10M)	Does not satisfy brief - code not included or does not compile (1M)	
Execution II - Circuitry: (15M)	Circuit is designed with all the required specifications and components with good understanding of components and able to explain the expected output.(15M)	Circuit is designed with all the required specifications and components with good understanding of components but unable to explain the desired output (12M)	Desired objectives are achieved but hardware is not working properly (8M)	Does not satisfy brief - circuit not included or does not function as described. (1M)	
Demonstration and presentation (15M)	Content and presentations are appropriate and delivered excellently. (15M)	Content and presentations are appropriate and well delivered. (10M)	Content and presentations are appropriate but not well arranged (8M)	Content and presentations are not appropriate and not well delivered (1M)	
Documentation (5M)	Clearly communicated and sufficiently detailed to easily repeat the outcome; well and appropriately illustrated with media, diagrams and code. (5M)	Satisfies minimum requirements - it contains the required components; but reasonably poor quality.(4M)	Satisfies minimum requirements but missing some component explanation. (2M)	Documentation is missing or doesn't provide any illustration. (1M)	
Overall Effectiveness and Completion (10M)	Project is engagingly organized and presents material that is captivating for the viewer.(10M)	Project is organized properly with minimum materials and holds the attention of the viewer (7M)	Project is somewhat organized, complete and holds the attention of the viewer (4M)	Project is incomplete and not easy to follow (1M)	

2.3 List of external collaborators for PBL as applicable

- Institute of Aeronautical Engineering
- Madblocks Technologies
- Virtusa Polaris etc.

3. Current Challenges (as of August 2021)

- During Pandemic we just extended the schedule because of non-availability of resources related to their prototype/ project.
- Even physical mentoring is missed in these pandemic times.

4. Proposed Plans for 2022/23

We are further planning to implement PBL to few more subjects and even wanted to train more faculties towards PBL. We wanted to train another 10 faculty members in PBL this year.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
6	3	360	40+	2	20	25	

5. Potential Role for the IUCEE

- Enhancing collaborations among member institutions through sharing sessions
- Identifying potential collaborations

6. Recommendations

- FDPs on Assessment of PBL Activity

7. Conclusions

We are implementing this PBL at program level as well as course level this implementation definitely helped us in achieving program outcomes, even placements.

8. References

- MLRIT files

Rajarambapu Institute of Technology, Rajaramnagar
Shivaji University
Report on Problem/Project-Based Learning

Prepared by
Dr Samir B Kumbhar, Yogesh S. Patil

Abstract:
Problem based learning process is a group activity and it requires closed loop system to get desired outputs. In current report PBL implementation in Rajarambapu Institute of Technology is discussed. RIT implemented active learning process in 2008-09. It was implemented with proper planning it is still giving good results. Current case study discusses about how PBL journey started in RIT and current status of PBL.

1. Introduction

Rajarambapu Institute of technology (RIT) had started implementing activity-based learning for all classes since 2008-09. In the beginning, the faculties were started using Problem/project - based learning (PBL) activities during their course delivery however there was no concrete plan as such for using these activities. Faculties were not much conversant for using these activities. In due course of time, institute had conducted workshops to train the faculty under RIT-Gurukul. Also, faculties were encouraged to participate and publish papers in conferences. In 2016 special forum was formed for PBL activities. It was group of motivated faculties from different departments. These faculties were trained by the experts from various reputed Institutes. As a result of this, in academic year 2017-18, few faculties of all departments have changed their lecture delivery plan with inclusion of PBL and successfully delivered the subject content. The challenges faced by faculties during first cycle of implementation are listed below.

- Inadequate training
- Concern about the performance of students
- Concern about syllabus completion.
- Concern about student's performance in exam.
- Coming with a rich problem
- Concern about project timeline
- Mindset of students about PBL
- Implementation during online classes

The challenges faced by students are listed below.

- Lack of Teamwork
- Lack of initiative
- Lack of self-motivation
- Lack of fundamental knowledge
- Lack of experience of solving open ended problems
- Unable to communicate difficulties in proper manner
- Lack of time management

The following strategies were used for addressing the challenges faced.

- Expert training/FDPs
- Faculty members attending PBL cluster meetings
- Workshops and symposium on PBL by IUCEE

- Involvement of management for coaching the staff
- Flexibility in evaluation process based on rubrics
- Additional resource materials through moodle
- Selection of different problems from subject domain after brainstorming
- Start PBL with simple problems so that individual student will work on it
- Share PBL plan with students

Lessons Learned

The following crucial lessons were learned from the first run of the PBL. Sample

- Students' active involvement has been increased drastically
- Enough scope was found to generate innovative ideas and development of solution.
- Major syllabus content could be covered effectively through PBL with proper planning.
- Slow learners can participate actively while working in small groups.

After the completion of the first batch using the PBL teaching methodology, following improvements were found in academic performance of students.

- Student passing percentage was increased by 20%.
- Student average marks increased by 10%.
- Student involvement in activities increased and it is indicated in course end survey.
- Interaction between faculties regarding subjects was increased.

The following crucial lessons were learned from the first run of the PBL. Sample

- Students' active involvement has been increased drastically
- There is enough scope was found to generate innovative ideas and development of solution.
- Major syllabus content could be covered effectively through PBL with proper planning.
- Slow learners can participate actively while working in small groups.

After the successful completion of the first batch, sharing sessions were organised and an additional x number of subjects were identified for the implementation of the PBL.

2. Current Status

Currently, the PBL is introduced in 24 subjects. About 240 students are involved in the PBL related activities.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts / Schools / College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	24	24	240	34	5	--	15	

2.1 Sample PBL Lesson plan

The sample lesson plan is provided in the following tables.

Innovative Project Based Learning Plan (2017-18- Even Semester)			
Faculty:-	**Course:-**	**Department:-**	
FORM	ALLOCATE	MONITOR	EVALUATION
Teams Formation	Task Type decision	Task Monitoring	Student Assessment
Students form teams based on their social affinity, professional interest-passion or personality types or various combinations of the above	Study assignments	Informal monitoring on regular basis	Students assess all team members including themselves using likert scale/ constant sum scale followed by discussion in absentia of the team member. Assessment is moderated by faculty.
Faculty forms group randomly	Multiple small projects	Formal presentations and review on regular basis	Faculty does the assessment
Faculty forms teams in a formal way to ensure diversity.	A semester long project	Checking of weekly journals	Students do self-assessment moderated by faculty
Students- TA training on team functioning	Task Choice	Team Monitoring	Course/ Faculty Assessment
A class session	Faculty allocates	Informal meeting to discuss team functioning	Students do after announcement of the course grades
A class workshop	Teams choose from a given set of tasks.	Using formal assessment tools like Ofori, et al. to assess the functioning	Students do after announcement of the course grades.
Reading articles/ watching videos	Teams come up with their own ideas and seek faculty moderation for right scoping	In class crisis clinics and active listening	Peers/ senior faculty do by talking to some students and looking at the course plan, material and evaluations
Team Contracts	Team Contracts Review	Learning Monitoring	Work Products
Students write some contracts and write them	Student study some contracts and write them	Formal examinations	Written report, presentation, poster, project deliverables like specs, design user manual.
Students write on their own	Students write on their own	Ethnographic study	Demonstration of working product, prototype
Teams discuss amongst themselves to ensure completeness of contracts	Teams discuss amongst themselves to ensure completeness of contracts	Concept inventory	*All the details about assessments and work products are announced at the start of the course

Innovative Project Based Learning Plan (2016-17- Even Semester)			
Faculty:-Prof. A. S. Thorbole	**Course:-Operations Research in Construction**	**Department:-Civil Engineering**	
FORM	ALLOCATE	MONITOR	EVALUATION
Teams Formation	Task Type decision	Task Monitoring	Student Assessment
Student were selected based on their area of interest	A semester long project	Formal presentations and review on regular basis	Students do self-assessment moderated by faculty with the help of Rubrics
Students- TA training on team functioning	Task Choice	Team Monitoring	Course/ Faculty Assessment
A class session- To demonstrate the concept of Transportation Problem	Faculty allocates	Informal meeting to discuss team functioning	Peers/ senior faculty do by talking to some students and looking at the course plan, material and evaluations
Team Contracts	Team Contracts Review	Learning Monitoring	Work Products
Faculty has formulated contract documents	Student study some contracts and write them	Formal examinations	Written report, presentation,

Supervisor

Head of Program
Construction Management

Head
Department of Civil engineering

3. Current Challenges (as of August 2021)

- Lockdown due to pandemic.
- Lack of resources.
- Lack of trained faculty members and supporting technical staff.
- Student involvement through virtual mode.
- All resources could not be available due to online mode.

3. Proposed Plans for 2022/23

RIT is planning to offer 80% course delivery through PBL and will be included in the curriculum and accordingly syllabus content will be modified. Subject identification process is started after discussion with concern faculties. It is decided to conduct sessions for faculties who are not aware of PBL. Detail plan for Year 2022-2023 is

1) Identification of courses.
2) Formation of faculty groups.
3) Training programs for faculties.
4) Submission of PBL plans by faculties.
5) Discussion on PBL plans.
6) Modification in plans.

4. Potential Role for the IUCEE

Specify how the IUCEE can help in your current and future plans,

- In building capabilities of the faculty members (specify details)
- Enhancing collaborations among member institutions through sharing sessions
- Identifying potential collaborations

5. Recommendations

- Planning is very important step in PBL
- Case studies of successful PBL help faculties to implement PBL so it is recommended to share your success stories with others.

6. Conclusions

Journey of PBL in RIT shows great progress in student performance as well as their involvement in subject. Students enjoy the way they work on problem. Because of PBL student learn how to work in team. Interaction between faculties and students increased. Faculties also get involved in identification of rich problems. Overall PBL helped to create a healthy academic environment in RIT. With proper training it is possible to involve every faculty and student of RIT in PBL

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Thiagarajar College of Engineering, Madurai
Report on Problem/Project-Based Learning

Prepared by
S.J. Thiruvengadam, S. Saravana Perumaal, C. Jeyamala

Synopsis/Abstract:
Thiagarajar College of Engineering (TCE), Madurai, India has adapted CDIO curriculum for all undergraduate Engineering programmes in the academic year 2018-19 to address the increasing gap between scientific and practical engineering demand and to meet the global requirements of professional engineer. In alignment with CDIO syllabus goals and mission of the institute, new courses addressing Problem-Based Learning, namely Engineering Exploration, Lateral Thinking, Design Thinking, Project Management, System Thinking, Engineering Design Project, Capstone Project and major project were introduced in the CDIO curriculum. The objectives of these courses are intended to improve creativity, critical thinking, collaboration, and communication among the millennial learners. The course on 'Design Thinking' offered at third semester aims to provide a conceive-design experience. The course provides an experiential learning to understand the requirements of users, to challenge assumptions, to redefine problems, to create innovative design solutions, to prototype and to test. The evaluation was carried out based on design quality and the demonstration of the prototype considering both individual cognitive development and collective team effort. Performance analysis on course implementation has confirmed significant improvement in technical, personal and interpersonal skills of learners. Inclusion of community projects in project-based learning served as an efficient pedagogical method to promote students' engagement in self-learning.

1. Introduction
Graduating Engineers should be able to appreciate the process of engineering and contribute to the development of engineering products and systems for the betterment of humanity. TCE, Madurai rendered the societal responsibilities as a programme, Technology-based Social Work in collaboration with college's National Service Scheme (NSS) since 2000. However, these efforts were sporadic and randomly carried out by interested faculty members. In the view of students' engagement in solving challenging and real-world problems, the Engineering Design course was introduced in our earlier curriculum in 2014. In order to ensure a systematized engagement in societal services, a formal programme on Engineering Projects in Community Services (EPICS) was implemented and practiced. As part of institutional capacity building, twenty faculty members have undergone a training programme on the Design Thinking course with the human-centered design approach offered by Prof. William Oakes, Director of EPICS, Purdue University in collaboration with Indo-Universal Collaboration for Engineering Education (IUCEE). Subsequently, our institute has been recognized as a member of the IUCEE-EPICS consortium in 2017. Initially, EPICS projects were executed by interdisciplinary team of students mentored by trained faculty members as one of the co-curricular activities. These projects were reviewed by the institutional review committee followed by Prof. Willam Oakes in January 2018. Based on the recommendations, it was planned to introduce human-centered design with academic credits in the new curriculum to ensure the potential cultural change among the students.

With the understanding the benefits of human-centered design process, Design Thinking course (18ES390) was introduced in recently declared Conceive-Design-Implement-Operate (CDIO) [4] institutional curricular framework in 2019 [1]-[4]. Prior to the course, Engineering Exploration and Lateral Thinking courses are offered to prepare the students to perform well in Design Thinking. In order to implement design ideas, Project Management and System Thinking courses, and engineering design projects were also introduced to all the branches of engineering and technology in practicing Problem-Based Learning (PBL) [1]-[3]. Based on the experiences gained and students' feedback from last two cycles, these courses are also offered with a common course schedule in 2021 onwards to firm up an interdisciplinary students' culture for the successful implementation of PBL at institution level.

The challenges faced by faculties are:

- Lack of experience in practicing interdisciplinary approach in offering the course
- Difficulty in managing interdisciplinary teams
- Difficulty in assessing individual and team contribution in interdisciplinary societal projects
- Lack of industrial exposure amongst faculty

The challenges faced by students are:

- Lack of dedicated available infrastructure for team discussion and prototyping
- Lack of coordination among team members
- Identification of real-world complex engineering problems for all the students in the class

The following strategies were used for addressing the challenges faced.

- Implementation of CDIO curricular framework at institute level
- Capacity building initiatives through Faculty training programmes by TCE Academic Process team [3]
- Dedicated workshop on human-centered design and product design by industrial experts
- Launch of CDIO makerspace for students' activities
- Designing solutions for the problems hosted in Smart India Hackathon, UN Sustainable Development Goals, Hackerrank, HackerEarth etc., as a part of regular academics.
- Integrating few courses in Online platforms such as edX, Coursera, NPTEL etc for the award of grades in continuous assessment

To improve the students' involvement in community-based projects and addressing technical, personal and interpersonal skills, the Engineering Design course in 2014 Regulations was modified as the Design Thinking course with three credits.

Institutional Survey

The Design Thinking course was first offered to 880 undergraduate students belong to all the branches of engineering programmes [1]. A study was conducted to analyze the students' engagement in this course and in addressing community-based projects influences their perceptions on learning experiences and professional skills of 21st century learning skills (creativity, critical thinking, collaboration, and communication) and are presented the Figure 1. Sample photographs during brainstorming sessions, exhibition of low-cost prototypes, project reviews are presented in figure 2 [2]. Many of our students have extended their projects of design

thinking and exhibited their implementations in national level contest like Smart India Hackathon and IUCEE-EPICS Design contest and received good recognition and rewards. The training programs on Design Thinking have enriched the faculty competence in mentoring the students with a human-centered approach to solve real community problems [3]. The outcome of this training resulted in faculty awards for their posters in Design Thinking training programme. The following crucial lessons were learned from the first run of the PBL.

- Students and faculty members are engaged in solving real-world problems
- Change in students' attitude in taking responsibility of their learning
- PBL provides better eco-system for integrated learning in the campus

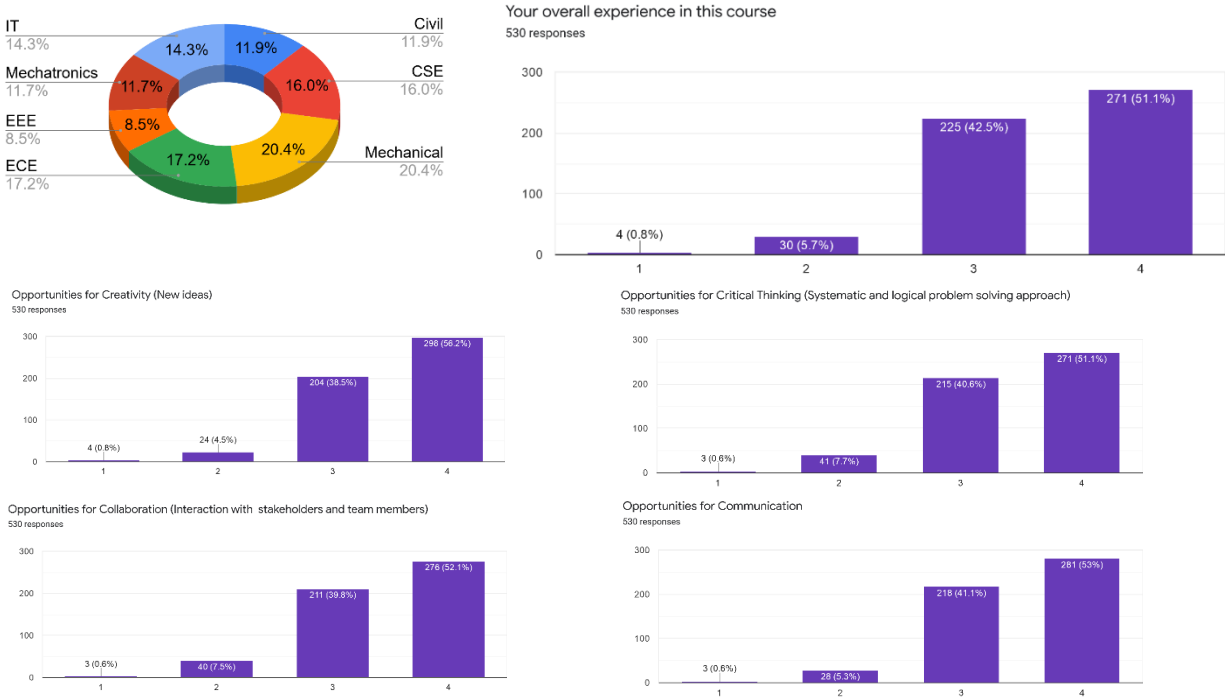

Fig.1 Students' Satisfaction Level on 21st century learning skills [1],[2]

Fig.2 Sample Photographs of Students' Activities [1],[2]

2. Current Status

Currently, the PBL is introduced in 7 courses of all undergraduate engineering programmes. About 880 students are involved in the PBL courses in every year. The details of involvement of programmes, courses, students, faculty members, and lab resources in PBL are tabulated in the Table below till 2021:

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2021 academic year

No. of Departments	No. of Programmes	No. of Courses	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per Course	No. of Trained Faculties
7	7	7	880/year	56	34	1	75

Table 2.2 Byproducts of Involvement in PBL Journey till 2020 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations
12	164	14	2

2.1 Course Design

The expectations of the course are conceived as identification of a societal problem, problem formulation, specification development through the interactions with stakeholders, identification of multiple solutions, selection of best solution with defined measurable criteria, the use of the systematic approach in evolving product architecture using a functional decomposition and development of a conceptual prototype. With these requirements, the Course Outcomes (COs) were formulated for the students' engagement in managing community-based projects. The content has been evolved from the defined course outcomes.

2.2 Assessment Plan

The previous Engineering Design course was designed as a theory-cum-practical course. Based on the feedback received from course handling faculty members and students, the assessment plan of Design Thinking has been defined as a project-based course to enhance the design-build experience to the students. The assessment plan is:

- Continuous Assessment: Three Periodic Reviews (50)
- End-Semester Exam: Demonstration and Poster Presentation (50)
- Reports are to be submitted at each review. The report and presentation will be evaluated based on customized Rubrics for periodic reviews.
- Demonstration and Poster presentation will be evaluated by two faculty members nominated by their respective Head of the Department

As per the assessment plan, rubrics are developed and implemented in reviewing the progress of students' design thinking projects. Reviews are conducted at the end of Project Identification, Specification Development and Conceptual Design Phases. Further, adherence to the project plan and communication skills are also assessed during the review process.

2.3 List of external collaborators for PBL

Efforts were made to identify community partners for maintaining continued collaboration, and in delivering and implementing appropriate solutions. Some of students' interactions with closely associated partners, Indian School for Blind and Annavayal at Thangalachery are presented in figure 5.


Fig. 5 Students' Interaction with Community Partners (IAB & Annavayal)

3. Current Challenges (as of August 2021)

- Difficulty in incorporating all necessary changes completely as curriculum design is to meet the guidelines/mandate requirements by AICTE Model curriculum, UGC, NBA, NAAC and affiliating University.
- Need of new online pedagogies for CDIO courses in pandemic situation
- Lack of faculty experience in mentoring, forming, managing, and assessing interdisciplinary teams in PBL based courses

4. Proposed Plans for 2022

Table 4.1: Involvement of programmes, courses, students, faculty members, lab resources, etc in PBL for 2022 academic year (Estimates)

No. of Departments	No. of Programmes	No. of Courses	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per course	No. of Trained Faculties
7	7	14	880/year	120	34	1	150

5. Potential Role for the IUCEE

- Training programmes for the faculty members in team formation, mentoring and managing interdisciplinary students' projects
- Enhancing collaborations among member institutions through knowledge sharing sessions on best practices and periodic panel discussion on PBL
- Pedagogical training on implementation of PBL specific to various engineering disciplines with appropriate case studies.
- Special Track on Problem Based Learning /Project Based Learning in the upcoming ICTIEE conferences.
- Facilitating problem identification in various domains with support from industries and IUCEE consortium institutions.
- Organizing Hackathons in collaboration with IUCEE consortium members.

6. Recommendations

- Need of a systematic procedure for network building among industry and academia
- Designing curriculum in addressing disciplinary knowledge, personal and professional skills, interpersonal skills in attitude equal proportion

7. Conclusions

CDIO educational framework has been practiced since 2018 at all undergraduate engineering programmes to implement the outcome-based education effectively by addressing all 12

programme outcomes specified by National Board Accreditation (NBA), India. Under this framework, curriculum was changed at the institute level, with new project-based courses namely Engineering Exploration, Lateral Thinking, Design Thinking, Project Management, System Thinking, Engineering Design Project and Capstone Project. One of the major challenges, we faced at the initial stage was the mind set of both faculty members and students. Through continuous interactions and faculty development programmes by the TCE Academic Team members, we have disseminated the importance of change and now we are at the stage to move further. As it is the perfect alignment of bottom –up and top down, we hope that we can implement integrated strategy successfully. The future strategies are the structured involvement of alumni and industry in curriculum design, content delivery and assessment and design a curriculum in addressing Disciplinary Knowledge, Personal and Professional Skills, interpersonal skills and Attitude at equal proportion.

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Vidyavardhaka College of Engineering

Report on Problem/Project-Based Learning: Introduction of "Social Innovation" and "Engineering Exploration" Courses at VVCE

Prepared by

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Synopsis/Abstract

The popularity of an institution and its sustenance in this highly competitive era demands more of problem/project-based courses to be introduced which can enhance the skill development of individuals and leverage the needs of industry as well as society at large. With this perception VVCE introduced two courses namely "Social Innovation" and "Engineering Exploration" for the very first batch of autonomous scheme in the academic year 2020-2021 for first year students. The former course is a problem-based learning which tickles the young minds towards innovation for societal problems, while the latter is a project-based learning which gives handful of current technological experiences and both of them interlink with each other.

1. Introduction

The visit to KLE Technological University, Hubballi, Karnataka by the members of college council along with members of the management of VVCE inspired them to initiate problem/project-based learning courses. Hence the two courses Social Innovation and Engineering Exploration took a shape of their existence at VVCE.

Social innovation refers to the design and implementation of new solutions that imply conceptual, process, product, or organisational change, which ultimately aim to improve the welfare and wellbeing of individuals and communities. While defining engineering we interpret "Engineering is a course, which is the amalgamation of science, mathematics and human intellect to provide something new to the society; a product or service". Or in other words engineering is to provide solution to the problems of the society in general and industry in specific. Hence engineers are called problem solvers. To solve a problem, one should identify the problem. The main aim of the social innovation course is to sensitize the students towards societal problems. It is a new social practice that aims to meet societal needs in a better way than the existing solutions. These ideas are created with the goal of extending and strengthening the civil society.

Compositely, with the insight of encouraging and motivating freshly registered students to engineering program towards integrated multidisciplinary learning environment, Engineering Exploration Laboratory was promoted. This project lab engages students providing hands on experience in latest technological projects like solar powered water pumping system, building a drone, voice-controlled car, building 3D models, aspects related to construction of bridges and houses etc., which is a combination of several engineering disciplines promoting fun in learning concepts.

A team was formed with one coordinator and one faculty member each from all the engineering disciplines for each of the two courses to work out a plan of execution with statements of objectives and outcomes as described in section 2.

2. Current Status

Along with the desire for enabling the skills of individuals through project/problem-based learning, the satisfaction of program outcomes as per NBA was taken care in framing the outlook of Social Innovation and Engineering Exploration courses giving due importance to Problem Analysis, Design, Selection, Identification, Communication, Teamwork, Lifelong Learning & Societal Considerations. Finally, the objectives, outcomes and 3 phases of operation in each course was decided which took a shape as below.

2.1 Social Innovation course objectives

- To sensitize students about social practices that aim to meet societal needs in a better way than the existing.
- To develop a creative solution for existing local societal problems.
- To communicate effectively as an individual and as a member in diverse team.

2.2 Engineering Exploration course objectives

- To introduce students to the different engineering disciplines with hands on experience
- To infuse interdisciplinary mind-set
- To imbibe strong fundamentals in current technologies
- To promote experiential project-based learning

2.3 Few mini projects using P2BL

1.Automatic Flusher 2. Reverse vending machine 3. Motorcycle air bag Jacket 4. An app to combat 'Food Wastage and Scarcity' 5. Providing sanitary pads for low of cost: 6. The ultimate notepad 7. Foldable and movable house 8. Shopping cart with a Barcode scanner 9. water level controller using solar power 10. Blind stick 11. Automatic dust bin 12. Line tracer robot

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

Course	Cycle	No. of Students	No. of Students in Each Batch	No. of Faculty Engaging the Students	Ratio Maintained
Social Innovation	Chemistry	384	60	6	1:10
Engineering Exploration	Physics	384	60	6	1:10

2.4 Sample PBL Lesson plan

The framing of Engineering Exploration course which is introduced in semester I/II is demonstrated below for reference

Course Name	**ENGINEERING EXPLORATION**	**Course Code :**	**20AL18/28**
No. of Lecture Hours / Week	**: --**	**CIE Marks :**	**50**
No. of Tutorial / Practical Hours / Week	**: 02**	**SEE Marks :**	**50**
Total No. of Lecture + Tutorial / Practical Hours	**: 24**	**SEE Duration :**	**03**
L:T:P	**:00:00:02**	**CREDITS :**	**1**

COURSE OVERVIEW : This is a unique interdisciplinary course that expose students to the different disciplines offered by VVCE and provides opportunity for the students to explore and exhibit their capacities by working out with interdisciplinary experimental based projects

PHASE 1 : DEMONSTRATION PHASE	**TEACHING HOURS**
• Identifying the basic components pertaining to each engineering discipline and knowing its applications [Inside Engineering] • Wiring & Soldering of Simple circuits [1 hr] • 3D Printing [1 hr]	2 Lab Sessions [4hr]
PHASE 2 : EXPLORATION PHASE	**TEACHING HOURS**
• Voice Controlled Car using Google Assistance • Solar Based Water Pumping System • Build a Drone [2 Lab Sessions] • Web Page Development • Construction of Bridges • Build your Dream Home	7 Lab Sessions [14 hr]
PHASE 3: OPEN ENDED PHASE	
• Student group should come out with an experiment on their own by the end of second phase. • The experiment proposed by the student group should involve any 3 or more streams from the experiments learnt in phase 1/2 • In some special cases, if there is novelty involved in the experiment proposed by the student group and involves only one stream, then such a case is also allowed. • If any student group is unable to come out with a project proposal, then they can take the help of Faculty Advisors in defining the title of the project/experiment • Procuring of components for the open-ended phase is entirely the responsibility of the student group	3 Lab Sessions [6 hr]

NOTE:

- One entire section of 60 students will be considered as one batch
- 10 teams to be formed each consisting of 6 members
- Instructions will be given for each of the above experimental based project and demonstration wherever required by the faculty and each team should be able to complete the assigned experimental work.

COURSE OUTCOMES (COs)	
At the end of this course, students will be able to	
CO1	Identify various components/devices relating to different engineering disciplines and its functions [L4]
CO2	Select and apply appropriate resources to model the given problem [L3]
CO3	Comprehend the knowledge of different engineering disciplines with hands-on experience [L2]
CO4	Work effectively in teams to manage the assigned work and write effective reports as an individual or in team

(I) Continuous Internal Evaluation (CIE) of Engineering Exploration course

Component	Weightage	Max. Marks
Class Work (A)	100%	50
Total Marks		**50**

Class Work (A): The assessment criteria for Class Work is detailed below

Assessment Criteria	Max. Marks
Identifying the components (CO1) (A1)	10
Selecting the right resource to complete the assigned work (CO2) (A2)	15
Viva-Voce –CO3 (A3)	10
Teamwork -CO4 (A4)	05
Report Writing –CO3 & CO4 (A5)	10
Total Marks (A)	**50**

Class Work Marks (A)* = (A1) + (A2) + (A3) + (A4) + (A5)

* The Class Work Marks (A) is the average marks of all the experiments evaluated based on the above assessment criteria in each lab session.

(II) Semester End Examination (SEE) of Engineering Exploration course (B)

The assessment criteria for SEE is detailed below

Assessment Criteria	Max. Marks
Identifying the components (CO1)	10
Selecting the right resource and to complete the assigned work (CO2)	15
Viva-Voce –(CO3)	10
Teamwork –(CO4)	05
Report Writing –(CO3 & CO4)	10
Total Marks (B)	**50**

3. Challenges

As the take through of the lab was planned properly and the kind of support by the management, there was no major issues except few challenges as below,

3.1 The challenges faced by faculties are listed below.

Periodical training to faculty, Setting up of the lab & maintenance, Instructors' duties

Handling section of students together, Teamwork, Conduction of examination, well defined problem statements, change of experiments as technology changes, Trade-off between online and offline classes due to pandemic, Mentoring students for such laboratories Organization, execution and evaluation process, Manual preparation.

3.2 The challenges faced by students are listed below

- Due to pandemic, the second semester students in the academic year 2020-21 were not able to get hands on experience of the course which was a major drawback.
- Time management
- Teamwork
- Problem definition are some of the issues where students must look into.

4. Proposed Plans for 2022/23

The usual procedure carried out is that the lab coordinators suggest the framework which must be approved by the Dean Academics and Principal. It is then followed by budget approval and setting up of experiments which is then followed by training to assigned faculties. One faculty from each discipline will contribute to the design of experiments.

Course	Cycle	No. of Students	No. of Students in Each Batch	No. of Faculty Engaging the Students	Ratio Maintained
Social Innovation	Chemistry	~450	60	6	1:10
Engineering Exploration	Physics	~450	60	6	1:10

5. Potential Role for the IUCEE

- In building capabilities of the faculty members by providing trainings
- Enhancing collaborations among member institutions through sharing sessions
- Faculty and student exchange programs

6. Recommendations

To make engineering graduates employable, it is very much vital to implement problem/project-based learning curricula in all engineering institutions. IUCEE is doing wonderful job in revisiting engineering education in India.

7. Conclusions

The success of any academic idea requires right understanding amongst higher officials, good communication, selection of faculty for the role to be played, framework with timelines, proper planning and exclusive trainings, involvement of faculty members & staff, infrastructure & equipment setup. If the above said is in place, then the success of problem /project-based learning will be fruitful. This era demands quality education through problem/project-based learning which will enhance the skills of the individuals and hence plays a very important role. After the successful completion of “Social Innovation” and “Engineering Exploration” courses, our students at VVCE are more enthusiastic in learning other courses as well. They are now more confident in their approach.

AISSMS College of Engineering, Pune
Report on Problem/Project-Based Learning

Prepared by
Dr Manjusha S Deshpande

Synopsis/Abstract:

We all are aware that Engineering Graduates are not industry ready. It is not the students to be blamed. It's neither the curriculum design to be blamed. It's our teaching methodology, which needs to be revamped. It's the role of a teacher to inspire motivate and create curiosity in the young minds. To resolve this major challenge, the National Education Policy (NEP) 2020 has introduced a holistic multidisciplinary education approach. I am sure you will agree Project based / Problem based learning (PBL)will make an impact. Learning experience can be enhanced by introducing PBL. Learning will not be restricted to theoretical aspects, but more on its applications too, making learning a way of life. It will help development of skills such as collaborative learning, teamwork, communication and inculcate lifelong learning skills.

1. Introduction

The AISSMS College of Engineering is affiliated to the Savitribai Phule Pune University (SPPU) and approved by AICTE. It conducts eight UG, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Engineering, Engineering Electronics and Telecommunication Engineering, Mechanical Engineering, Mechanical Engineering (Sandwich), Production Engineering, and seven PG, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering: Power Electronics and Drives, Electronics and Telecommunication Engineering: VLSI and Embedded Systems, Mechanical Engineering: Automotive Mechanical Engineering: Design and two Research, programs in engineering.

As the AISSMS College of Engineering (COE) is affiliated to the Savitribai Phule Pune University (SPPU), it follows the Curriculum designed by the University. SPPU has introduced Problem-based learning (PBL) First Year students of Bachelor of Engineering, Semester-II(common to all courses, Choice Based Credit System) (2019 Course) (With Effect from Academic Year 2019-20) under Savitribai Phule Pune University subject (110013: Project Based Learning) and at Second Year students of Bachelor of Engineering, Semester-IV(common to all courses, Choice Based Credit System) (2019 Course) (With Effect from Academic Year 2020-21) under Savitribai Phule Pune University subject (209352: Project Based Learning)at the initiative of BOS and other supportive members.

Thus, PBL in its infant stage at AISSMS COE. It was first time implemented at First Year students (660) in 2019-20, for all branches in the second semester and Second Year Students (660) in 2020-21, in the fourth semester. The PBL is not assigned to one particular subject.

The challenges faced by faculties are listed below.

- New Concept
- Unawareness
- Lack of Induction workshops
- Assessment
- Time constrains
- Ideas constrain

- Lack Exposure
- Lack Experience
- Inadequate training
- Role of the faculty not understood
- To what depth to conduct PBL
- How to initiate

The challenges faced by students are listed below.

- Lack of Teamwork
- Lack of initiative
- No seniors to learn from
- Trained Faculty
- Time duration
- Problem Statement Selection
- Online mode

Lessons Learned from first run-

- It's a new approach.
- Create awareness amongst the faculty.
- Conduct Faculty training Programs.
- Include all faculties
- Assessment rubrics.
- Time management.
- Define the role of Faculty.
- Students start thinking on Techno – Social issues and its solution.

From the first run of the PBL were learned, support of stakeholder and training for the faculties is much needed.

2. Current Status

Currently, the PBL is introduced as term work, not related to a fixed course. About 1200 students are involved in the PBL related activities.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts.	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8	8	1	660	11	2 (Engg. Science labs)	60	0	Started in 2019-20, only FE sem-II
8	8	1	1320 + lateral entry	71	8 (Project labs)	120	5	2020-21

2.1 Sample PBL Lesson plan

Teaching Scheme:
PR: 04 Hrs/Week Credits: 02 Examination Scheme: PR: 50 Marks
Group Structure: Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups.

Selection of Project/Problem: The problem-based project-oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students designed and analyzed the problem within an articulated interdisciplinary or subject frame.

A problem can be theoretical, practical, social, technical, symbolic, cultural and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases. Activities include solving real life problem, investigation /study and writing reports of in-depth study, field work if required.

2.2 Sample Student PBL Assessment

The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness. Progress of PBL is monitored regularly on weekly basis as weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation the individual and team performance is to be measured. PBL is monitored and continuous assessment is done by supervisor /mentor and authorities. Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and engineering ethics. The institution/department supports students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students participate actively in assessment and evaluation processes. Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

- Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
- Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
- Documentation and presentation

Evaluation and Continuous Assessment: All activities are recorded, and assessment of work is done, and proper documents are maintained regularly at college end by both students as well as mentors.
Continuous Assessment Sheet (CAS) is maintained by all mentors/department. Recommended parameters for assessment, evaluation, and weightage:

- Idea Inception (5%)
- Outcomes of PBL/ Problem Solving Skills/ Solution provided/ Final product (50%) (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) (25%)

- Demonstration (Presentation, User Interface, Usability etc.) (10%)
- Contest Participation/ publication (5%)
- Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (5%) PBL workbook will serve the purpose and facilitate the job of students, mentor, and project coordinator. This workbook will reflect accountability, punctuality, technical writing ability and workflow of the work undertaken.

AISSMS COLLEGE OF ENGINEERING
ज्ञानम् सकलजनहिताय
Accredited by NAAC with "A+" Grade

Department of First Year Engineering
SEM II A Y 2020-21 Div III
Project Based Learning (110013) Final Review Evaluation Sheet YRC/PDB

							Practical Marks (PR)									
Sr. No.	Group No.	Project/Case Study Title-	Roll No.	Exam Seat No	PRN	Name of Student	Selection of Idea/concept/case study (Max-5 Marks)	Literature Review (Max-5 Marks)	Problem Statement, Objectives & Methodology (Max-5 Marks)	Analysis of Actual Workdone (Max 10 Marks)	Presentation/ Demonstration (Max-10 Marks)	Clarity about Expected Outcome (Max-5 Marks)	Question & Answers (Max-5 Marks)	Report writing (Max 5-Marks)	Total Marks (Max -50 Marks)	Remark (if any)
						CO Mapping	CO1,CO2	CO1	CO3,CO6	CO5	CO3,CO4	CO3	CO3	CO4,CO5		
1	1	Teenage suicide cases in India	20MS012	F190210218	72142511K	SHASHWAT SHIVAJIRAO JADHAV	5	5	4	9	9	5	5	5	47	
2	1	Teenage suicide cases in India	20MS030	F190210608	72142871B	UTTEKAR ARYESH DHIRAJ	4	5	5	9	9	5	5	5	47	
3	1	Teenage suicide cases in India	20MS014	F190210246	72142537C	KRISHNA BALASAHEB KADAM	4	5	5	9	8	5	5	4	45	
4	1	Teenage suicide cases in India	20MS009	F190210031	72142349D	ASAWARI DINKAR INGALE	4	5	5	9	9	5	5	4	46	
5	1	Teenage suicide cases in India	20MS031	F190210640	72142903D	WELDE PARTH	4	5	4	9	9	5	5	4	45	
6	2	EV battery production & Cost reduction	20MS007	F190210187	72142482B	GAURANG GUJARATHI	5	5	5	9	9	5	5	4	47	

2.3 List of external collaborators for PBL as applicable

- Savitribai Phule Pune University.

3. Current Challenges (as of August 2021)

List of challenges in the implementation of PBL:

- Lockdown due to pandemic
- Lack of trained faculty members.
- Depths of the PBL not clear for faculties or students.

4. Proposed Plans for 2022/23

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

Name of Depts. / Schools / College	Title of the course	Title of Subject	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
AISSMS COE Pune	BE	Project Based Learning	1320	71	10	Not Mandatory	265	-

Please note: No change in structure till 2024

5. Potential Role for the IUCEE

- In building capabilities of the faculty members
- Enhancing collaborations among member institutions through sharing sessions

6. Recommendations

- Implement a virtual Project Expo/competition for PBL
- Project /case study should end with certain outcome which will be measurable
- Selection of topic as per students wish (Disciplinary / Interdisciplinary)
- Restrict the size of team (e.g. 5-6 students/ team) with one leader among them
- Plan for at least two mid-term reviews for checking progress with use of redefined rubrics

7. Conclusions

Project based learning (PBL) requires continuous mentoring by trained faculty throughout the semester for successful completion of the tasks selected by the students per batch. While assigning the teaching workload a load of 2 Hrs/week/batch needs to be considered for the faculty involved. The Batch needs to be divided into sub-groups of 5 to 6 students. Assignments / activities / models/ projects etc. under project-based learning is carried throughout semester and Credit for PBL has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester

8. References

- Project-Based Learning, Edutopia, March 14, 2016.
- What is PBL? Buck Institute for Education.
- www.schoology.com
- www.wikipedia.org
- www.howstuffworks.com

SCTR's Pune Institute of Computer Technology
Report on Problem/Project-Based Learning

Prepared by

Dr Ravinder B Yerram, Mr Niteen P Sapkal, Mr Sachin D Shelke,
Ms Rutuja A Kulkarni, Mr Mandar N Kakade

Synopsis/Abstract:

Project based learning is a teaching methodology that inculcates psychomotor, cognitive, and affective domain skills together and supports in preparing the engineering graduates to meet the expectations of industry 4.0 and education 4.0. This report presents the journey of our institute in implementation of Project/Problem Based Learning (P2BL) that began in 2017. The PBL is implemented at various levels including a separate course on PBL at first year and second year engineering in addition to mini projects, major projects, and few individual courses. It also presents the methodology adopted, evaluation scheme, sample session plan, student and faculty survey results, future course of action, recommendations to overcome the challenges faced and the required support from IUCEE. It also provides few statistics on the status of implementation of P2BL.

2. Introduction

SCTR's Pune Institute of Computer Technology introduced Outcome Based Education (OBE) formally in 2015 as per the expectations of the accreditation agencies, following the trends in Engineering Education. The outcome statements of Program Educational Outcomes (PEO), Program Outcomes (PO) and Course Outcomes (CO) of all the courses were also defined as part of the OBE, subsequently the evaluation methods, CO-PO attainment metrics were defined and introduced at levels of the programs. It was realized that the conventional teaching methodologies being followed in the institute would not be sufficient to meet the requirements of OBE and would not be able to attain all the PEOs, POs and COs. It was also realized that the skills, knowledge, and attitudes to be inculcated amongst the students would not be fully achieved by the conventional pedagogical methods including classroom, laboratory teaching methods, mini projects, and major projects [1]. Conventional pedagogical methods would not meet the requirements of inculcating psychomotor, affective, and cognitive levels of learning amongst the students as per the Bloom's Taxonomy [2]. After rigorous brainstorming amongst all the authorities, stake holders and faculty members, it was also realized that the innovative pedagogical practices such as flipped classroom, quizzes, role play, think pair share, collaborative learning, and project-based learning are expected to be introduced in addition to conventional methods. Faculty awareness programs were conducted on OBE, implementation of OBE, and various innovative teaching methodologies including PBL at various stages and courses. Some of our heads and deans have attended IUCEE organized International Conference ICTIEE-2016. They received vital insights on innovative teaching methods especially Project Based Learning Approach.

Project Based Learning was introduced in the institution in 2017 for few courses by some of the enthusiastic faculty members. Our faculty members have also participated in Regional Research

Symposium on PBL 2021 organized by IUCEE. Some of the faculty members representing the institute at various levels of academic bodies of affiliating university also persuaded the authorities to introduce the PBL into the curriculum. Affiliating University Savitribai Phule Pune University Pune introduced PBL as a course itself in First Year Engineering in 2019-20 and Second Year Engineering in 2020-21 allocating 4 hours per week and two credits with defined guidelines in all the programs of engineering under University.

As per the University guidelines, a structured methodology was devised and adopted by the institute at every level including the planning, evaluation, and assessment methods. A coordinator was appointed in each department to coordinate the PBL to maintain the uniformity amongst all the faculty members across the department. Initially the departments and faculty members faced few challenges such as understanding of the concept of PBL, acceptance of the concept, work overload, limited domain specific expertise, lack of awareness on methodologies, and evaluation schemes to be adopted. Faculty members felt that the students would not be interested and reluctant towards active participation in PBL. But the challenges were overcome by conducting awareness programs by senior faculty members on the importance, significance of PBL, difference between the project and PBL, methodology to be adopted, targeted skills to be inculcated amongst the students through PBL, and evaluation guidelines. Students and faculty were well motivated by the awareness programs and its long term benefits.

Following methodology was adopted by the departments in implementing the PBL.

1. Each faculty member was allocated twenty to twenty-five students as a batch with a weekly workload of 4 hours.
2. Brainstorming session was conducted to orient and facilitate the student towards the PBL, its objectives, implementation methodology, evaluation methods etc. by the allocated faculty in the first session.
3. Students were encouraged to form a group of two to five students and choose a topic of their interest based on their domain expertise, courses being offered, interdisciplinary relevance, duration available, and application to the real-life problems.
4. Students were explained the requirement of driving question/problem definition and feasibility study of the same by conducting the brief literature/market/existing solutions survey to understand the present status.
5. Students submitted the synopsis including the problem definition, motivation, block diagram/circuit diagram/model diagram/algorithm/flowchart as applicable, learning outcomes expected etc.
6. A detailed schedule/timeline of implementation including various steps involved in the implementation of the project/problem was prepared and provided to the students.
7. Students were closely monitored in the progress of the project with time-to-time guidance and support.
8. A logbook was maintained by each group to document the progress and implementation based on which continuous evaluation was carried out.
9. Templates for the presentation and final report were provided to the students, students prepared the project report and presentation as per the prescribed format provided.
10. Final evaluation was carried out by asking the students to present in the presence of other students and faculty members based on the basis of criteria given section 2.2.

3. Current Status

The PBL has been implemented as course itself in First year Engineering (FE) and Second year Engineering (SE) in addition to the Mini Project at Third year Engineering (TE) and major project at Final year Engineering (BE). The status of implementation of PBL in the institute during the academic year 2020-21 is presented in Table 2.1. Major areas of the projects included Machine Learning, Artificial Intelligence, IoT, Embedded Systems, Microcontroller, DBMS, Web Development, Data Science, and Mechatronics.

Table 2.1: Project Based Learning Implementation Status – Academic Year – 2020-21

Department/ Program	No. of Students	No. Faculty Members	No. of Labs	No. of Mini Projects
First Year Engineering (FE)	806	20	2	165
Computer Engineering	332	07	03	
E&TC Engineering	303	12	3	60
IT	249	10	2	50

2.1 Faculty and Student Survey

A detailed survey has been carried out from the students and faculty members to understand the effectiveness of the PBL in learning and skills acquired by the students and summary of the results of the survey is presented in the following paragraphs and in Table 2.2 and 2.3.

Table 2.2 Results of the Student Survey

Survey Questionnaire	% Agreed
Have you participated in Problem/Project based learning (P2BL) during your course of study FE/SE/TE/BE in any subject/laboratory other than Mini Project and BE Project?	91
If yes, did you find it interesting and motivating?	89
Have you implemented the project/problem as per the expectation?	73
Would you like to continue learning through projects and recommend to your juniors	94
Which of the following skills/knowledge you think you have improved/acquired through P2BL?	
Involved learning and improved the speed of learning	86
Promoted Self-Directed Learning	92
Collaboration	94
Technical writing, presentation, and Communication	95
Implementation and testing the solution	90
Design and planning, scheduling, meeting deadlines	88
Logical, creative, and critical thinking	90

A Questionnaire was provided to the faculty members for the survey to understand their awareness, involvement, and future plans. About 64% of respondents are aware of the PBL and implemented in one or the other courses and 90% of them expressed that PBL is interesting and motivating. Ninety-nine percentages of the faculty respondents agree that the PBL will enhance the learning and inculcate the all-round skills. Ninety-eight percentages of the faculty respondents agreed to implement the PBL in their future courses undertaken. Only 3% of them undergone formal training programs on PBL and 98% of them would like to attend the FDPs/STTPs on PBL.

Table 2.3 Major challenges faced by student and Faculty members

Major Challenges faced by Faculty	Major Challenges faced by Students
inadequate training on broad areas of domains and PBL	Limited connection with real time social problems
Hesitations amongst the students to follow the PBL as there was no weightage in university examination	Understanding and coordination amongst the students
Resource management, Lack of sufficient time for activity due to many other academic engagements	Time constraints and limited resources availability
Lack of motivation amongst the students and peers in PBL	Acquiring the domain knowledge and learning the tools to implement the complex problems in specified time
	Over expectations from PBL with so many limitations

2.2 Sample PBL Lesson plan

Details of the Session	Hours
Brainstorming Session: General Awareness, Expectations, Guidelines	2
Title Finalization and Synopsis Submission	2
Literature/Models/Market Survey	2
Comparative Study, Gaps	2
Paperwork (Circuit Diagram, Analysis, Block Diagram, Mathematics, Paper design)	2
Identification of Simulator, Implementation of the Project on Simulator	2
Acquiring components, Material, PCB/Algorithm Development	6
Implementation and Testing	6
Report Writing and Submission	3
Presentation and Evaluation	3

2.3 Sample Student PBL Assessment

Final evaluation was carried out by asking the students to present in the presence of other students and faculty members based on the following criteria.

Each criterion point has been assessed for five marks and total to be 50 marks.

a. The Idea/Problem definition	f. Testing
b. Literature/model Review	g. Report & Presentation
c. Explaining the Paperwork/Model	h. Teamwork, Collaboration
d. Design, Simulation	i. Technology Applied
e. Implementation of the Project	j. Learning Outcomes / Skills Acquired

4. Current Challenges (as of August 2021)

Despite of many efforts put in by the institute and administration, there are still few challenges are faced in PBL implementation as follows.

- Student and teachers' interactions, student team meetings were restricted to online, availability of the resources especially the hardware set up, components due to the lock down. Students were not able to demonstrate and test the working model.
- Limited number of faculty members is aware of the P2BL concept and reluctance of the faculty members in implementation of P2BL considering the time and resources involved.
- In current system, students are habituated to rout learning and scoring very good scores without participating in active learning which is leading to the demotivation towards active participation in P2BL.

5. Proposed Plans for 2021-22

Presently the P2BL is implemented as a separate course. Institute is planning to expand the same to as many courses as possible involving more number of faculty members to enhance the learning process of the students. More number of faculty members and students will be involved by rigorous training and awareness programs. All the possible efforts will be put in by the institute and administration to accelerate and enhance infusion of PBL in various subjects to overcome the challenges listed in section 3 as well as in line with the National Education Policy 2020.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc. in PBL for 2022/23 academic year (Estimates)

No. of Depts	No. of Courses	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties
4	20	2000	30	10	300	50

6. Potential Role for the IUCEE

Institute requires the continuous association, collaboration, and support from the IUCEE to help in our current and future plans.

- Faculty capacity building in the areas of pedagogy, domain expertise, life skills and research to improve the active involvement in PBL
- Strengthening the collaboration amongst the member institutions, reputed institutions and expert faculty members abroad, and industry

- Facilitation of collaborative work for some projects which are potentially connected with social context

7. Recommendations

i. Mission like drive is required to make all the stake holders realize the significance, benefits through PBL to prepare the students ready with 21st century skill set, education 4.0, industry 4.0, and NEP 2020.
ii. Faculty members must be well trained with the deep understanding of PBL concept, motivated to effectively implement the PBL, the coordination and collaboration amongst all the faculty members to maintain the uniformity in its implementation.
iii. Institutes and Universities are required to facilitate the implementation of PBL at all levels by making necessary policy changes by providing the infrastructure in examination pattern, reforming the curriculum, and flexibility required for the PBL implementation.

8. Conclusions

Realizing the importance of the PBL, institute initiated and facilitated implementation of P2BL at various possible levels. A structured methodology and evaluation system has been adopted. The PBL was implemented as a separate course itself for the first year and second year engineering students. About 1700 students and 49 faculty members actively participated in PBL. A detailed survey indicates that the large numbers of students are very pleased and excited to participate in PBL. Survey also indicates that the students and faculty members are looking forward to expanding it to all the levels of different courses.

9. References

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2. Anderson, L. W., & Krathwohl, D. R., “A taxonomy for learning, teaching, and assessing”, Abridged Edition. Boston, MA: Allyn and Bacon, 2001.

Don Bosco Institute of Technology, Kurla
Problem Solving to Problem Based Learning
- Our Journey so far

Prepared by

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Synopsis/Abstract:

This report gives some glimpses of our journey in introducing Problem Based Learning through Problem Solving Sessions. As critical thinking is so vital for future engineers to solve real life problems, we decided to begin with our First-Year students and conduct Problem Solving Sessions in some core area of Mathematics. Two Problem solving sessions were conducted for the FE students (2020-21 batch). The (online) sessions were held for a total of 4 hours over a span of two days - both Saturdays, July 3 and July 10, 2021.

One set of Problem Based Learning activity is being tried out with a group of B.E. students in this semester and we plan to use inputs and feedback obtained from this experience for improving the process in the future. Also, we plan to continue with Problem Based Learning activities with the second-year students – the batch that was introduced to the Problem-Solving Sessions. We propose to begin with some application areas in engineering which use the concepts of Mathematics and test the mathematical modelling skills. It is hoped that conceptual skills learnt in these two years will stand in good stead in their B.E. projects and to solve real life problems.

1. Introduction

Institutional PBL Journey

It all started in November 2019 when a group of faculties decided to regularly meet and discuss the skills that students of engineering needed to become good problem solvers. Problems in different areas (such as modular arithmetic, logical reasoning, permutations and combinations, probability…) were brought forward. Brainstorming sessions were held to decide on the problems, application areas and the methodologies.

Problem solving is an art as well as science. Therefore, it was decided to have sessions with increasing levels of depth and applications and design them in stages, beginning with the first year of engineering and taking through the fourth year of B.E.

Motivation:

The world is waiting for solutions of its social, economic, political, environmental, … problems. What make solutions unique are the ideas (very often simple) behind those solutions and the simpler the solution, the better! Engineers are required to give scientific solutions - that is, solutions that consider the problems from different angles, are well thought out and defines the circumstances when it is applicable. One basic component of problem solving is a mathematical

model with defined functions of unknown variables. This is not surprising as every worthwhile problem solving has a mathematical modelling aspect behind it.

So, it is essential that some basic tools and methods of Mathematics which help in solving real world problems are taken up.
So, the first sessions were involved with understanding numbers, logic and geometry.

By involving themselves in solving problems in these sessions, each participant should

- Understand the statement and identify what is asked
- Find solutions to concrete instances
- Make inferences
- Solve the general case
- Validate the results (through proofs, for example)
- Frame their own questions

Expected outcomes:
We expect these sessions would help to

- Develop a spirit of enquiry and a willingness to stretch for solutions
- Create own problems from the given problems as extensions or special cases
- Develop those skills which help you to understand and appreciate better the core engineering subjects in the higher semesters

Challenges during the sessions:
Interaction level was high but only about 30% interacting, and less than 50% participants were able to solve the problems on their own; Students preferred logic and geometry questions to questions related to numbers.

Challenges now:
Right now, only three dedicated Mathematics teachers and a handful of senior Math club members have involved themselves in these activities. Though the Institute is open and in fact, supportive of the PBL methodologies, we need to bring more engineering faculty on board and also build our competence (capacity building).

Strategies used to address the challenges:

- Three faculty attended the RRSPBL (Regional Research Symposium of PBL) held virtually on June 18, 19, 2021.
- Discussions are on to form a faculty PBL team which can look into the feasibility of doing mini projects and B.E. projects the PBL way

Report of the sessions:

The Problem-Solving Sessions were held on July 3 and July 10, 2021. Number tricks and properties of numbers were done on July 3 and the topics of Logic and Geometry were discussed on July 10. The sessions were held for a total of 4 hours.
Some observations based on the feedback:

- More than 92% of students who attended responded that they understood what was going on during the sessions
- 80% of participants said that they were able to think of an approach to solve the given problem
- About 47% of participants said that they were able to solve the problems on their own while 52% of participants said that they were able to ***somewhat*** solve the problems on their own
- More than 60% of participants said that they were able to make inferences while solving the problems
- There were varied responses regarding the difficulty level of the questions – around 80% rated them between medium to hard.
- There were about 4 to 5% of participants who were *not comfortable* in asking questions (to clear their doubts) during the sessions

Details	**Session I July 3, 2021**	**Session II July 10, 2021**
Number of students present	147 (out of 212)	137 (out of 212)
Number of Resource Persons	7	6
Topics of problem solving	Number Tricks, Famous Constants	Numbers, Logic, Geometry

2. Current Status

A set of problems has been given to Sem VII students in the subject Operations Research in the topic Game Theory. Some details:

No. of Students	No. of Teams	Average no. of students per team	Topic of PBL
70	14	5	Game theory – Nash Equilibrium
Each team has to solve a problem, in total, there are 14 different problems.			

The introductory sessions with notes and references and discussion on how the problems need to be solved have happened. The presentations and evaluations are expected to be completed by the third week of September. Feedback from the students will be considered to learn from the experience and improve.

3. Proposed Plans for 2021/22

Students from second year of engineering are always very curious about the applications of Transforms (Examples - Laplace Transform, Fourier Transform) as these concepts are completely new to them in the course. And it is usually difficult to make students understand the transforms through the normal exam-oriented teaching where they are supposed to solve only mathematical examples.

Hence the Mathematics faculty have explored and found branch-wise problems for explaining applications in the areas like signal processing, sound de-noising, compression of images, analyzing earthquake signals, etc. It is planned to select 4 to 5 students from each branch of

engineering (there are 4 branches in our Institute) and encourage them to solve such problems using mathematical modelling and programming with the help of mathematical tools like SciLab.

Here we are planning to select only some set of students for this process because it is infeasible to handle effectively many groups (around 50) by only the (three) Math faculty. Also, we need to consider the challenges because of online sessions After examining the outcome of this exercise through experience and feedback from students, it is planned to take it up in a larger scale with the involvement of the engineering faculty.

4. Potential Role for the IUCEE

The IUCEE can help in our current and future plans:

- In building capabilities of the faculty members -for conducting expert sessions and workshops on PBL
- Identifying potential collaborations as ours is an Engineering Institution

5. Recommendations and Conclusions

- Indian Universities can think of adopting/including PBL as part of pedagogy
- Institutions should involve in capacity building of faculty
- Policies of Institutions should be inclusive and encourage faculty to take up academic challenges to enhance the teaching learning experience

6. References

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3. Clark P. L. Lecture notes on mathematical induction
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MIT Academy of Engineering Report

Prepared by
Mr. Dilip Panchal

Synopsis/Abstract:

Problem-based learning (PBL) was first introduced in 2016 year for first year students of Institute in Design Thinking (ME101), Experiments Tools and Techniques (ME102), Electrical and Electronics Engineering (ET101) and many other subjects in disciplines also. Design Thinking course at the initiative of one of the professors who attended training on Design Engineering workshop organized by the B H Gardi College of Engineering, Rajkot. Three professors with specialization in mechanical engineering designed the proposal, structure, and schedule of the curriculum which was first approved by Board of Studies from Mechanical Engineering, Academic Council and Governing Council of the Institute in 2016. The first batch of 600 students studied the listed courses. Initially, there were concerns about the students learning and how they will respond to the new teaching methodology. Faculty members were also a bit worried about the implementation of the PBL.

1. Introduction

Institutional PBL Journey –

- **How it started**

One of the main reasons we started the PBL was IUCEE international certification program on Engineering Education and pedagogy. Ex. Director of IIT Kanpur was the mentoring for designing the courses which contains Problem based Learning. Our Institute Director Dr. Y. J. Bhalerao took up this challenge and started providing the training to all the faculties who are associated with the courses containing the problem-based learning. IUCEE training was our turning point, who introduces us not only the pedagogy but also the digital tools insights to use them in actual teaching and learning process. Self-analysis by writing the teaching philosophy and reflection reports gives us the guiding path to implement the activity-based learning in the class. We also learned how to implement the flipped classroom. Gradually we tried to implement the problem-based learning in the higher classes successfully.

- **What were drivers/reasons**

Experienced and motivated people for guidance and hardworking faculty members are the main drivers for the problem-based learning initiation into the institute. Support from the institute for planning and conducting the trainings time to time for upgradation of the pedagogical approaches to implement the various activities and practicing them during the actual teaching and learning process.

- **What were challenges**

Inadequate infrastructure and large class size were a bigger challenge. Conducting activity for first time took lot of time in planning and implementation was the major challenge. In first go we faced these challenges, but over the period and seeing the results management and faculties took lot of efforts to make the things possible. Now in pandemic the situation is different. We have changed the strategy to implement the problem-based learning into the curriculum. As lockdown

happened this implementation was very difficult to make the prototypes or take surveys. Due to internet partially students are able to satisfy the goals of the problem-based learning.

- **Lessons Learned**

Defining the problem. Identifying the methodology for solving the problems defined. Designing and redesigning the objectives and outcomes of the course, setting the activities. Implementing the activity-based learning for solving the problems defined.

After the completion of the first batch using the PBL teaching methodology, a survey of students was conducted. Following is the result. A questioner was designed, and some written feedbacks were taken using google forms.

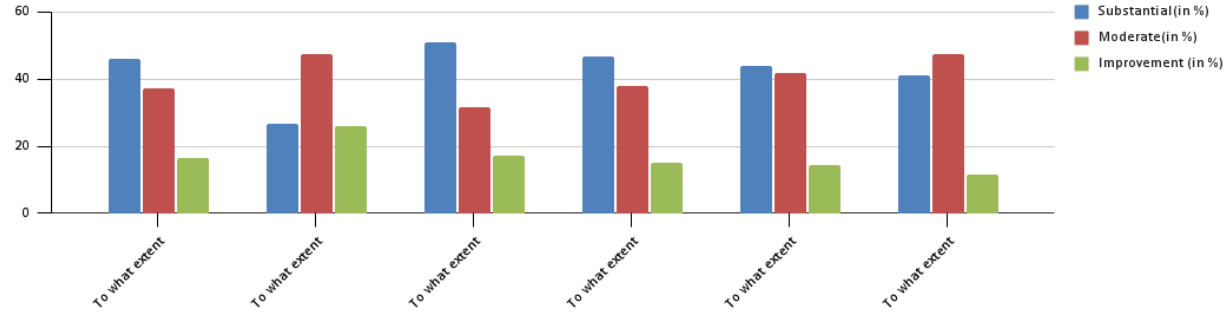

Figure 1. ABCD Divisions

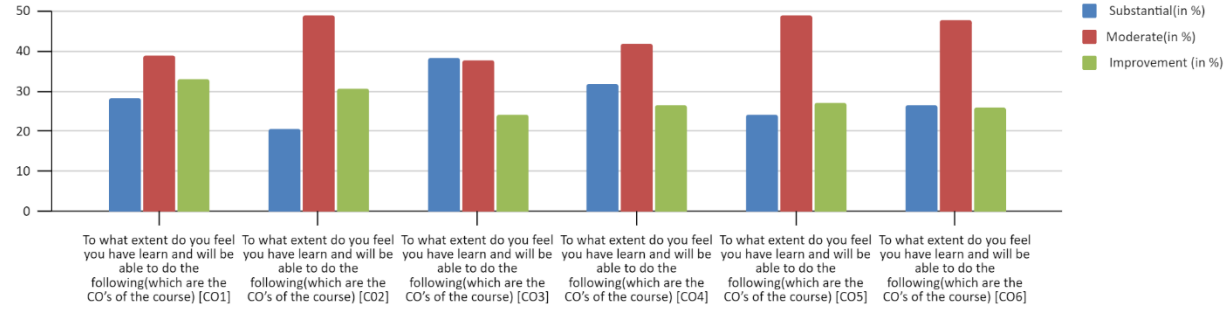

Figure 2. EFGH Divisions

Students from university pattern are able to complete the problems defined by their own or defined by faculty members. But once the timeline is over, they face the assessment. But due to autonomy continuous follow-up and activity-based learning was possible. We have not compared this concept as such case study but clearly, we could see the changes in the students' approach to solve the problems.

2. Current Status

We received very good support and feedback from students during the journey. Even we were not able to see the working Model, but simulation and ideation actually helped. The course is going to be interesting when we conduct it in the offline mode. In class activities and face to face discussion with guide will help in formalizing the concept of PBL in various subject.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL till 2020/2021 academic year

No. of Depts / Schools / College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
7 depts	7	8	600 (Sem-I 300 & Sem-II 300)	24	8	150	24	Good Experience

Table 2.2 Byproducts of Involvement in PBL Journey till 2020/21 Academic Year.

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
60	35	Nil	Nil	2 patents

Sample list of title of 5 Mini projects for the subject

1. Solar based smart street lightning System
2. Solar based water pumping system
3. Bluetooth Speaker Design using solar
4. Battery Charger using solar
5. Home automation system
6. Sanitizer Dispenser

2.1 Sample PBL Lesson plan

EXPT	Experiment Planned		CO No.	Date of Plan
A	1	Introduction to Power system, Neutral & Ground, Safety precaution, Applications & **Visit to Solar power Generation Station**	1	04/02/2021
B	2	Electricity Distribution in Campus and Interpreting the Electricity Bill	2	11/03/2021
C	3	Prototype of automation system/ simulation in Tinkercad	3	18/04/2021

2.2 Sample Student PBL Assessment

Type	Examination	Syllabus	Marks	Mode of Assessment	Weightage in Final Score	Total Marks
Practical (EX102L)	Continuous Assessment	Practical List	80 (or as per no. practical assignment)	Practical performance	20	50
	End Sem Assessment	Prototype of project	30	Demonstration/ Report/ Review Writing	30	

2.3 List of external collaborators for PBL as applicable

Fourth Partner Energy Private Limited, Hyderabad
Maharashtra State Electricity Distribution Co. Ltd.
Design Life company Pune

3. Current Challenges (as of August 2021)

Lack of practical exposure and field visits

4. Proposed Plans for 2022/23

Indicate proposed plans for accelerating and enhancing infusion of PBL in the subject to overcome the challenges listed in section 3 as well as in line with the National Education Policy 2020.

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2022/23 academic year (Estimates)

No. of Depts / Schools / Colleges	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
8 Depts	8	16	650	25	10	200	25	Expecting good outcome

5. Potential Role for the IUCEE

The IUCEE can help us in current and future plans

- Identifying electrical and electronics problems in Industry for the purpose of consultancy
- Developing right rubrics for problem-based learning
- Identifying mentors from Industry
- Provide the experienced professionals for jury.

6. Recommendations

- Problem based learning can be suggested for every subject to enhance the student's creativity.
- Also, it can improve the Industry Institute Interaction
- Increased Scope due to automation revolution in Industry

7. Conclusions

PBL journey is interesting and implementation in the right direction will boost the quality of projects.

8. References

Course conducted at MIT AOE

MIT Academy of Engineering, Alandi (D), Pune
Institutional Report on Project-Based Learning

Prepared by
Dr. MAYA M. CHARDE

Abstract:
Problem-Based Learning plays a vital role in various courses of Engineering and Technology. As an Autonomous Institute from academic year (2016-2017) we at MIT Academy of Engineering, introduced various subjects for all the branches and years of Engineering from day one for outcome-based education by implementing PBL. It helps to create an interest in students for various subjects where they need to work in a team and develops their all-round personality. The students can understand and able to implement their skills and knowledge easily and effectively due to Project-Based Learning. It also helps to bridge the gap between the assessment and the mode of delivery of the subjects. The outcome of PBL which we got tells that it is an effective way of Teaching-Learning style. It gives an opportunity to know, nourish and develop the inner qualities of the learners.

1. Introduction
In various subjects like, Design Thinking, Cryptography and System Security, Predictive Analytics, Prototyping, Microcontroller and Interfacing etc. the main reason for implementation of PBL was to nourish and nurture Learner's abilities and skills like critical thinking, communication, team building, problem identification and solving etc. enhancing employability. A practical based approach is not sufficient to understand the core concept of any of the subjects mentioned above so, if we want to develop the conceptual foundations of these courses, we need to adapt the project-based approach where project work is the main learning engagement to understand the real-world problems. For OBE we have implemented PBL and for that we have developed the team of faculties and staff by their effective engagement in various training at reputed institutes, NIT's and IIT's etc.

Challenges faced by faculty members are listed below:
- Concern about the performance of slow learners,
- Concern about the background of learners,
- Concern about the learning and understanding of learners,
- Concern about motivating the learners to work for the best outcome.

Challenges faced by students are listed below:
- Lack of Hands-on experience,
- Lack of Self-Confidence and Communication Skills,
- Lack of Self-Motivation to work in a team,
- Lack of Time – management.

The following strategies were used for addressing the challenges faced:
- Recorded videos were provided for better understanding of concepts,
- Conducted various activities like Brain Storming, Think-Share-Pare, Model making etc.,
- Assigned graded individual / group activities,

- Conducted Pre and Post Survey for every activity,
- Identifying the slow learner and adding them in different groups for their overall development,
- Explaining the case studies as an example to identify the activities/ problems.
- Assigning graded activity to an individual along with group.
- Explaining the importance of desirability, feasibility and viability through some examples / case studies so that the learners will try their level best to get best solution.
- Instructing learners to keep the evidence/ records of each and every activity they performed while doing the market survey/customer's feedback/interaction with users etc.

Lessons Learned:

We came to know,

- For improving the skill sets of learners from placement point of view PBL must be added in every course wherever is possible.
- Effective training programs provided to Faculties/Staff was really helpful to improve the skill sets of the learners.
- Due to conduction of different activities/assignments learner's confidence level was improved.

2. Current Status

Currently, the PBL and enhanced PBL is introduced in various subjects/courses as follows from 2016-17 to 2020-21.

Table 2.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2020/2021 academic year:(few examples of subjects)

Name of Depts / Schools	Title of the course	Title of Subject	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects	No. of Trained Faculties	Remarks if any
SHES	F.Y. B.Tech.	Design Thinking	600	05	03	140	05	2nd run of this course
Civil, IT, Chem, Etx, Mech, E&TC, CS	S.Y. B.Tech.	Digital Prototyping	3000	14	8	150	10	1st run of new subject
SCET	T.Y. B.Tech.	Predictive Analytics	230	6	6	57	6	1st Run in 2018-19
SCET	T.Y. B.Tech.	Cryptography and System Security	75	1	3	18-20	4	Revised Syllabus

2.1 Sample Lesson plan:

Here, Phase wise sample Lesson plan for the course Design Thinking:

Phase I: General Problem Statement & Background,
Phase II: Research Methodology,
Phase III: Design Brief,
Phase IV: Ideation,
Phase V: Concept Evaluation, Validation & Detailing,
Phase VI: Prototyping,

2.2 Student Assessment

For students' rigorous evaluation/assessment rubrics are well designed and implemented for each subjects/courses. There is separate marks for Continuous assessment and External examination with project presentation

2.3 List of external collaborators for PBL

- COEP, Pune and RIT Islampur, MS,
- B. H. Gardi Vidyapeeth; Rajkaot,
- Design LIF, Mumbai,
- MAEER'S MIT Institute of Design, Pune,
- Aalto University, Finland,
- Palo Alto Networks,
- Mahindra and Mahindra, Chakan,
- External agencies/industries like Autodesk for Fusion 360, PCB Design software,
- Bird Vision Pvt. Ltd., Pune,
- Danalytics Pvt. Ltd., Pune,
- Anand Techno Creation,
- Edutech Learning Solution Pvt. Ltd.

3. Current Challenges (as of August 2021)

- Hands on experience is missing due to pandemic,
- For guiding interdisciplinary projects needs to involve more number of faculties,
- Students are unable to connect due to their different locations for preparing good quality of working prototype model,
- Cannot go for physical market survey and users feedback,
- Difficulty in implementing hardware,
- Lack of resources (H/W & S/W tools),
- Implementation in online mode,
- Group formation because of multidisciplinary (slow learner & fast learner),
- Variation in scope and objectives of projects,

- Lockdown due to pandemic so unable to purchase various parts / accessories etc,
- Lack of Hands on learning for basic skills in institute Laboratory
- Physical product realization,
- Product Registrations etc.

4. Proposed Plans for 2021/22

Table 4.1: Involvement of courses, subjects, students, faculty members, lab resources, etc in PBL for 2021/22 academic year for FY and so on for subsequent years (Few courses are mentioned here)

Name of Schools / Dept.	Title of the course	Title of Subject	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
SHES	F.Y. B.Tech.	Design Thinking	300	05	03	72	05	For the 2nd Run
SCET	B.Tech Comp. Engg.	Cryptography and System Security	60	1	3	14	1	For the 2nd Run in 2022-23
SCET	TY.B.Tech. Comp Engg	Predictive Analytics	100	2	3	2	2	A.Y. 2021-2022
Civil Chem. Comp. Etx E&TC IT. Mech.	S.Y. B.Tech.	Digital Prototyping (ET224) [Modules: Hardware Software]	1300	18	10	160	14	2nd run of new course

Table 4.2 Byproducts of Involvement in PBL Journey for 2021/22 for F.Y.B.Tech.(Design Thinking course) (Estimated-Sample Example for the course Design Thinking)

No. of completed projects	No. of Completed Prototypes	No. of Research Publications	No. of External Collaborations	Remarks if any
72	50	02	05	Considering impact of pandemic

5. Potential Role for the IUCEE

- Guidance for industrial/ real life projects through the international network,

- Use of various tools/techniques for implementation and further enhancement of the subjects/courses,
- Internship and Sponsorship,
- Refinement in Rubrics for assessment as an individual / group,
- Self-Development for faculty,
- Identification of learning styles,
- External Collaboration etc.

6. Recommendations

- To explore the opportunities for National / International level project competitions,
- We recommend guiding the colleges/institutes for including our subject/courses in their curriculum with PBL and in collaboration with IUCEE,
- Faculty exchange programs should be executed for sharing the experiences/better practices,
- To keep the track of student's activities LMS should be provided,
- Domain expert should be appointed for the design projects,
- System is to be coped up with high configuration with technological development.

7. Conclusions

Project – Based Learning is an innovative and a systematic way of Teaching – Learning Methodology. It helps to explore the creativeness of the learners to solve the problems of different domains and to provide effective solutions for the same. It allows the learners for their overall personality development through critical thinking and hence increases their employability and participation in various technical competitions. With PBL, the progress and grades can be easily boosted up to achieve the goals of every stakeholder.

8. References

[1] IUCEE Case study report template,
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[3] "Engineering Education, Is Problem-Based or Project-Based Learning the Answer", By Julie Mills , David Treagust.
[4] "Project Based Learning in Undergraduate Engineering Education", Lutfi Al-Sharif.
[5] "Project based Learning in Engineering Design Education: Sharing Best Practices", Dr. Aruna Shekar, Massey University.
[6] Gibson, Ivan S. "Assessment criteria for undergraduate project work in engineering design." European journal of engineering education 23.3 (1998): 389-395.

Summary, Conclusions, and Recommendations

Prof. Krishna Veduta and Dr. Deepak Waikar

The first Mini Symposium on Problem and Project Based Learning (P^2BL) provided an additional unique avenue for IUCEE Consortium Members to prepare, present, show case, and share Institutional Reports on good practices and case studies.

The key drivers of the Mini Symposium were:

- To know the current status regarding P^2BL initiatives among member institutions
- To provide forum to share good practices
- To help accelerate Infusion and Implementation of P^2BL among member institutions

Special Features of the Mini-Symposium were:

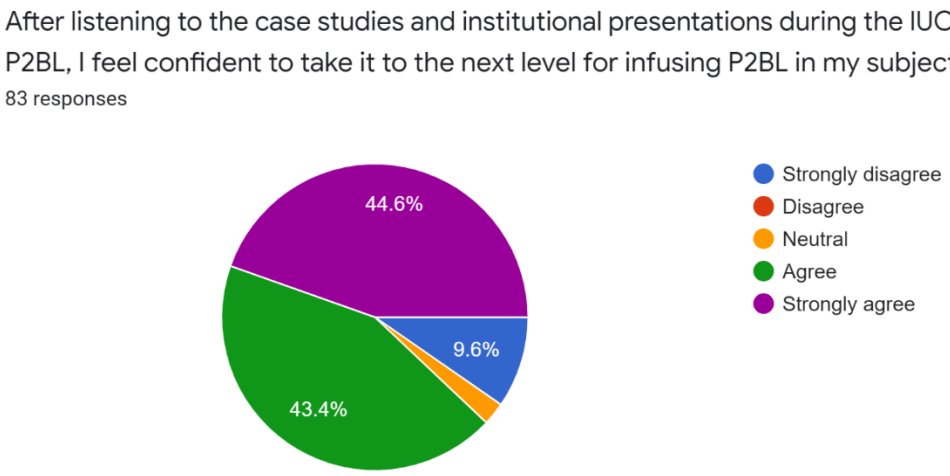
- Selection of the speakers and panelists By the Consortium Members
- The IUCEE Foundation played a catalytic role For the Consortium Members
- Share good practices, challenges, and localised solutions in Indian Context to the Consortium Members

It can be observed from the summary of the table below that over 16,000 students participated in the P^2BL activities in 15 Colleges/Institutions. About 490 faculty members were involved using P^2BL methodology in one form or other. The students and faculty members made use of over 800 mini projects during the course of study using P2BL methodology.

Table: Summary of Involvement of courses, subjects, students, faculty members, lab resources, etc in P2BL till 2020/2021 academic year

No. of Depts / Schools / College	No. of Courses	No. of Subjects	No. of Students	No. Faculty Members	No. of Labs	No. of Mini projects per subject	No. of Trained Faculties	Remarks if any
73	98	169	16,382	491	159	807	296	2014 (1) 2019 (2) 2020 (4)
4.87	6.53	11.27	1092	32.7	10.6	53.8	19.73	Average (per Institute)

As illustrated in the following figure, 88% respondents feel confident for infusing P2BL methodology in their subjects/courses. There is a need to organise appropriate level of faculty empowerment programmes for the remaining 12% of the respondents and the IUCEE can play a pivotal role.



It can be summarised with following conclusions and recommendations:

- First IUCEE Mini-Symposium on P²BL provided an additional avenue to showcase member institutions involvement in P²BL initiative.
- Participants have rated highly about the Mini-Symposium
- The moment can be continued through PBL Cluster and Range of Faculty and Student Development Programmes
- There is a scope for involving appropriate collaborators
- Consider Organising the Next Mini-Symposium on P²BL in 2022

The editorial board wishes to express sincere appreciation to the management of participating institutions, authors, co-authors, participants, and the members of the IUCEE Organising and Logistic Teams for their valuable cooperation and support for making the first Mini Symposium on P²BL successful.

Indo Universal Collaboration for Engineering Education
IUCEE FOUNDATION

2021 Mini-Symposium on Problem and Project Based Learning
"Practice Share and Adapt"

Day 1 Oct 9	10:00 am	**Opening Remarks: Dr. Krishna Vedula, Executive Director, IUCEE** **Program Overview: Dr. Deepak Waikar, Managing Partner, EduEnergy**		
	10:15 am	**Plenary Speaker: Dr. Sandeep Sancheti, Provost, Marwadi University**		
	10:45 am	**Keynote 1: Dr. Vikas Shinde, Director, Center of Excellence in Project Based Learning, Vishwanikethan University**		
	11:15 am to 1:00 pm	**PBL Best Practices: Institutional Reports Session 1** **Moderator: Dr. Deepak Waikar, EduEnergy**		
		Kalasalingam Academy of Research and Education (Dr. PL Meyappan)		
		MIT World Peace University (Prof. Anand Kulkarni)		
		Marwadi University (Dr. Sarang Pande)		
		B.H. Gardi College of Engineering & Technology (Prof. PG Paija)		
		B.M.S. College of Engineering (Dr. V Rajath)		
		Saveetha Engineering College (Dr. Sheeba Joice)		
		Hyderabad Institute of Technology and Management (Prof. Santosh Naik)		
	1:00 pm	**LUNCH BREAK**		
	2:00 pm	**Keynote 2: Dr, Anette Kolmos, Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability, Aalborg University, Denmark**		
	2:30 pm to 4:30 pm	**Case-studies (CS) Presentations: "PBL Practices": Session 1**		
		Room 1 **Chair: Prof. Santosh Naik, HITAM**	**Room 2** **Chair: Prof. C.D. Parmar, MU**	**Room 3** **Chair: Prof. Varsha Naik, MITWPU**
		Prof. S Julius Fusic (TCE) Prof. M Rekha Sundari (ANITS) Prof. Prof. Parag Paija (BHGCET) Dr. K. Panimozhi (BMSCE) Prof. Prabha S. Kasliwal (MITAOE) Dr. Jayashree S. Awati (RIT)	Prof. SV Satyanarayana (HITAM) Prof. R. Raja Subramanian (KARE) Prof. M Dholkawala (MITAOE) Prof. F. Felix Prabhu (SEC) Prof. Soumen Panda (BMSCE) Prof. Pranda P. Gupta (RIT)	Prof. Shubhangi Kale (MITAOE) Prof. Vinayak Kulkarni (MITAOE) Prof. Venugopala P. S. (NMAMIT) Dr. Seema S. Desai (RIT) Dr.T. Sripriya (SEC) Dr. Archana Sharma (MU)
DAY BREAK				
Day 2 Oct 10	10:00 am	**Keynote 3: Dr. Gopalkrishna Joshi, Executive Director, Karnataka State Higher Education Council and Professor, KLE Tech University**		
	10:30 am to 1:00 pm	**PBL Best Practices: Institutional Reports Session 2** **Moderator: Deepak Waikar, EduEnergy**		
		MIT Academy of Engineering (Dr. Maya Charde, Dilip Panchal)		
		MLR Institute of Technology (Prof. DVS Chandrababu)		
		Thiagarajar College of Engineering (Dr. S Saravana Perumaal)		
		Rajarambapu Institute of Technology (Prof. Samir Kumbhar)		
		Pune Institute of Computer Technology (Dr. Yerram Ravinder)		
		Vidyavardhaka College of Engineering (Dr. Rashmi S.)		
		Don Bosco Institute of Technology (Prof. S. Revathy)		
		AISSMS College of Engineering (Prof. Manjusha Deshpande)		
	1:00 pm	**LUNCH BREAK**		
	2:00 pm to 4:00 pm	**Case-studies (CS) Presentations: "PBL Practices": Session 2**		
		Room 1 **Chair: Prof. Anand Kulkarni MITWPU**	**Room 2** **Chair: Prof. Amit Lathigara, RKU**	**Room 3** **Chair: Prof. Keith Fernandes, SJEC**
		Prof. Yogesh S. Patil (RIT) Prof. K Badarinath (RVCE) Prof. Indira R. Umarji (SDMCET) Prof. CD Parmar (MU) Prof. Padma S. (SEC) Prof. Pranav Shriram (MITAOE)	Dr. Sheeba Joice C (SEC) Dr. Mangal Dhend (AISSMSCOE) Prof. Sheetal Girase (MITWPU) Prof. Samir Kumbhar (RIT) Prof. M. Namratha (BMSCE) Dr. Maya M. Charde (MITAOE)	Dr. GB Krishnappa (VVCE) Prof. Amol Thorbole (RIT) Prof. Sajeeda Shikalgar (MITWPU) Prof. Joyal Isac S. (SEC) Prof. VS Vijay (SJEC) Prof. Savita R Pawar (MITAOE)
	4:00 pm	**Valedictory: Er. Deepak Gadhia, Muni Seva Ashram** **WRAP UP SESSION**		
END OF MINI SYMPOSIUM				

IUCEE MINI-SYMPOSIUM ON PROBLEM/PROJECT BASED LEARNING

9TH (SATURDAY) & 10TH (SUNDAY), OCTOBER 2021 (ONLINE)
10:00 AM TO 05:00PM

PRACTICE, SHARE, AND ADAPT

The IUCEE Foundation has taken up the campaign for encouraging and accelerating the implementation of Problem/Project-based Learning (P2BL) as envisioned in the National Education Policy (NEP) 2020. The IUCEE has been promoting the P2BL through the PBL Cluster for sharing initiatives and practices among the members. The IUCEE, in collaboration with Consortium Members and interested institutions, is organising Mini-Symposium on the P2BL.

The main objective of the Mini-Symposium is to identify good practices, share the challenges and lessons learned, and prepare an actionable Problem/Project-based Learning (P2BL) roadmap unique to the Indian context.

PLENARY/KEYNOTE SPEAKERS:

PROF. (DR) SANDEEP SANCHETI
Provost, Marwadi University

DR ANETTE KOLMOS
Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability, Aalborg University, Denmark

DR GOPALKRISHNA JOSHI
Executive Director, Karnataka State Higher Education Council

DR VIKAS SHINDE
Center of Excellence in Problem Based Learning, Vishwanikethan University

Plenary/Keynotes Chaired by
PROF. KRISHNA VEDULA
Executive Director, IUCEE Foundation, India

Three Panel Sessions by PBL Practitioners from 15 Renowned Private Engineering Colleges/Universities in India.

Chaired by
DR DEEPAK WAIKAR
Managing Partner, EduEnergy, Singapore

Thirty Technical Case Studies on P2BL by Faculty members with several years of experience.

REGISTRATION FEE:

Rs 500 per participant of IUCEE Consortium Members
Rs 2,000 per participant of Non-IUCEE Consortium Members)

Link for registration
https://iucee.org/course-registration/

SCAN QR CODE
FOR REGISTRATION

REGISTRATION DEADLINE FOR PARTICIPANTS:

8th October 2021

For Technical issues regarding Registration, Contact

PROF. AMIT LATHIGARA
Dean - Faculty of Technology, RK University
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Please visit the website for further details
https://sites.google.com/iucee.org/iuceemsp2bl/home

For programme and related matters, Contact

DR DEEPAK WAIKAR
Co-Chair for IUCEE Mini-Symposium on P2BL
deepak.waikar@iucee.org

CASE STUDY SESSION CHAIRS

Prof. C.D. Parmar, Marwadi University
Prof. Amit Lathigara, RK University
A/Prof. Keith Fernandes, St. Joseph Engineering College
A/Prof. Varsha Naik, MIT-WPU
A/Prof. Santosh Naik, HITEM
A/Prof. Anand Kulkarni, MIT-WPU

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