Graduate Research in Engineering and Technology (GRET)

Volume 1
Issue 8 *Pedagogies for Higher Education.*

Article 2

September 2022

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Recommended Citation

Thengade, Anita and Aher, Jayshree Ghorpade Prof. (2022) "Online Teaching and Assessment Practices using Project Based Approach (Effective Learning with Peers)," *Graduate Research in Engineering and Technology (GRET)*: Vol. 1: Iss. 8, Article 2.
DOI: 10.47893/GRET.2022.1141
Available at: https://www.interscience.in/gret/vol1/iss8/2

Online Teaching and Assessment Practices using Project Based Approach *(Effective Learning with Peers)*

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***Abstract*—**Literate population is an important asset for any nation & plays a crucial role while representing the country at internationals. Education makes the backbone of the society, which reveals the skills, knowledge and behaviour transferred from one generation to the next generation. During COVID 19 pandemic, major changes can be seen in the education system. Class room teaching is replaced by an online teaching model to facilitate the students to continue their education. Online teaching methods were adopted by the teachers to maintain the students' learning at all levels. The pandemic has resulted in a change of teaching patterns from traditional classrooms to digital pedagogies. The teaching has become more student oriented rather than on-way teaching methods. These new innovative and active learning practices for teaching pedagogy have enabled the smart teachings for the Education era. The main actor for the Project-based learning is a student, where he/she explores the real-world difficulties for a problem and thus acquires a deeper knowledge by having active learning. The lockdown has actually unlocked multiple prospects to study various online tools for the ultimate stakeholders and facilitators.

The purpose of this paper is to present the Online Teaching Learning Model considering Project Based Learning (PrjBL)/ Problem-Based Learning (PBL) for the course "Business Intelligence" as an example to discuss the design of teaching process and problems with engineering students. The proposed teaching pedagogy has evolved with experimental, flexible, peer-learning, learner-centred, discussion-based, knowledge sharing with fun. Thus, the Outcome Based Education (OBE) has effectively improved the teaching and learning skills of students as well as facilitators in this advanced Education Era.

***Keywords*—** Project based Learning (PrjBL)/ Problem-Based Learning (PBL), Higher Education, pedagogy, student-centric *JEET Category*— Practice

I. INTRODUCTION

The pandemic started during Dec'2019 across the world, which posed various challenges in every field of life. India reported COVID 19 confirmed cases in the month of March 2020 and coronavirus cases were increasing significantly. The Indian Government has announced nationwide lockdown in the country to prevent the virus infection by avoiding the mass gathering and encouraging social distance [1]. This crisis enforced to find an alternative to face-to-face teaching. As a result, the education system moved to online mode to continue the learning of students. In this covid situations all the schools/colleges were closed and the education system [2] fully transformed into an online mode of teaching. Every school, college has started to conduct online classes by mobile or laptops. Here, teacher challenges are started. The major issue of online mode is that teachers are unable to provide informal social interaction with students. Education is an important part of human life but social interactions are missing in online mode of teaching techniques.

Suddenly shifting the mode of the education system i.e., offline to online was also a big challenge for teachers as well as students. There is a need for proper infrastructures like cameras, internet connectivity and many more for conducting and attending the classes in online mode.

The rest of the paper is organized as follows: Section-II starts with a general overview of Online Learning Framework and it introduces the main components required to be handled in online mode. Next in Section-III, implementation of PrjBL/ PBL approach for a Business Intelligence course and conclusion in Section-IV.

II. GENERAL OVERVIEW OF ONLINE LEARNING FRAMEWORK

Pandemic laid various challenges for the shift of teaching learning from offline traditional classes to the online mode. Different challenges posed were the perceptions for the online courses to be conducted, delivery methods, teaching pedagogy to adapt with technical adaptability, students' interest and mindset to adapt to online engagement, etc.in the engineering studies.

Fig. 1 depicts the online learning framework adopted by the education sector across the world. Education is one of the potentials that should be developed in an appropriate way to promote national development across the world and benefit the society. The National Education Policy (NEP) 2020 [2] for higher education includes [3] multidisciplinary insights that smoothen the educational transformations. It is observed that peer learning is having more positive effects with increasing understanding. Students' participation and class attendance is increasing while learning with their friends and solving the problems [4] together.

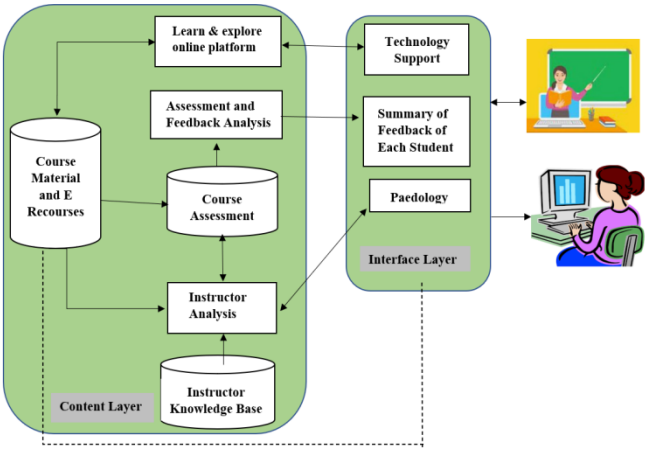

Fig. 1: Online Learning Framework

The active participation of the students while learning has made Learning a Fun!

Table I. Various Online Teaching platforms

Online Platform	***Features***	***Significance/Applicability of online teaching***
ZOOM	• In-meeting chat • Recording • Screen-sharing • Breakout rooms • Personal meeting ID	• Teachers were the Facilitators in new pedagogical teachings • Proactive students' participation increased their interest & enthusiasm in learning. • Student were motivated for self-learning • Attendance was seen better while learning with peers • Problem Solving skills were improved with easy learning • Team skills were enhanced • Effective learning improved the overall performance of the students with physical as well as mental health.
GOOGLE MEET	• Unlimited number of meetings • Live captioning during meetings • Compatible across devices	
WEBEX MEET	• Voice options from phone or computer audio, HD video • Annotation tools are available. • Screens can be controlled remotely. • Call Recording	

The digital learning [5] such as google classroom, Group discussion, blogs, forums, etc. has indeed raised the participation of the students making it truly 'Student-Centric' with both way active dialogues rather than one way teaching with monologues. The discussion forums help the students to proactively initiate the problem solving and have various perceptions of the same problem with different orientations. The query solving session with PBL [4] becomes easier for the students. The formative assessment with new teaching pedagogy assists the students to be the part of various phases of Project based Learning. The learning outcomes of the PBL system [10] will bring good quality education methods that will boost the confidence of the learners.

There are various platforms available to provide online teaching learning to the students. Widely used technological support / platforms are mentioned in Table I.

III. INNOVATIVE METHODOLOGY USED

PrjBL/ PBL has been implementing one of the engineering courses named Business Intelligence for the last two consecutive years. It is a completely project-based course. PrjBL/ PBL enhance student's various skills like domain knowledge, communication, presentation and teamwork. There are various phases involved while designing the project in this course [6-7, 13]. Fig 2 shows the three-step methodological process to work on the collaborative project with peer learning effect.

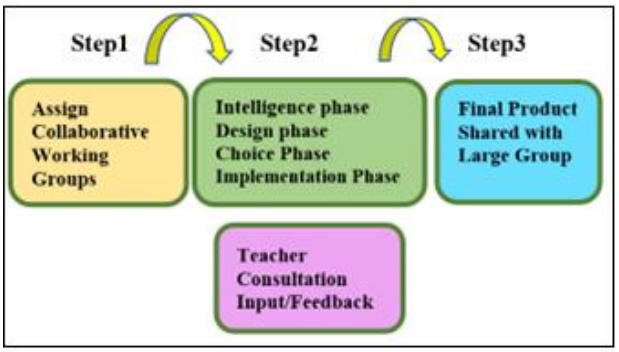

Fig 2. Methodological process to assign and share the PBL study

Problem-based Learning (PBL) [9] is a peer learning approach used in multiple disciplines. This method endows learners to imbibe different qualities such as research, integrate theory and practice, and thus apply the intelligence to develop a viable solution to a defined problem. It also explains similarities and differences between PBL [8] and other experiential approaches like Project-based Learning, Case-based Learning, etc. The "Check Solve Pass" [11] technique motivates the active contribution of every student/member of the group in collaborative learning. The PBL approach with effective, significant improvement in active participation of each group member is observed. The faculties were not only the teachers now in the new pedagogical environment, but facilitators who were motivating their students for active learning. The facilitators too were undergoing required trainings [12] delivered by NEP and educational organizations. Table II presents rubrics used for project assessment in this course.

Table II. Rubrics used for Project Assessment

Project Based Rubric					
	SCALE				
DIMENSION	***1***	***2***	***3***	***4***	***5***
Design and Implementation	No implantation of system modules	Some system modules are implemented but few are not working	Some system modules are implemented and working	All system modules are implemented but few of them are not working	All system modules are implemented and all are working perfectly
System Validations	No validations	Some validations are implemented but few are not working	Some form validations are implemented and working	All form validations are implemented but few of them are not working	All form validations are implemented and all are working perfectly
Presentation Skills and Teamwork	Not satisfactory	Poor presentation skills but no involvement in teamwork	Average presentation skills and active involvement in teamwork	Good presentation skills and active involvement in teamwork	Excellent presentation skills and teamwork
Question Answers	Answers few questions and partially correct	Answers few questions correctly but is not confident	Answers few questions correctly	Answers most of the questions correctly	Able to answer all questions perfectly with confidence

After using this assessment rubric used in Table II, we come up with the following observations

- Able to recognize the students who are good to apply the knowledge correctly in design and implementation but lack in presentation skills and team involvement.
- Able to recognize the students who fail to apply the knowledge correctly in design and implementation but good in presentation skills and team engagement.

Using this logistics, it helps instructors to imbibe required skills in the student to make them industry ready.

Even we used PrjBL/ PBL approach as part of Active Learning for the Business Intelligence course activity named as Mini Hackathon. Some real-world problems are given to the students and it is expected to provide the solution within 24 hours. And Mini Hackathon assessment is performed using rubric mentioned in table II.

We have used the Learning Management System used for Assessment (LMS) platform to facilitate the students' learning material, providing course guidelines [13, 15] and resources and also assess the skills of students [16]. Fig 3 presents a few screenshots of LMS usage done for this course.

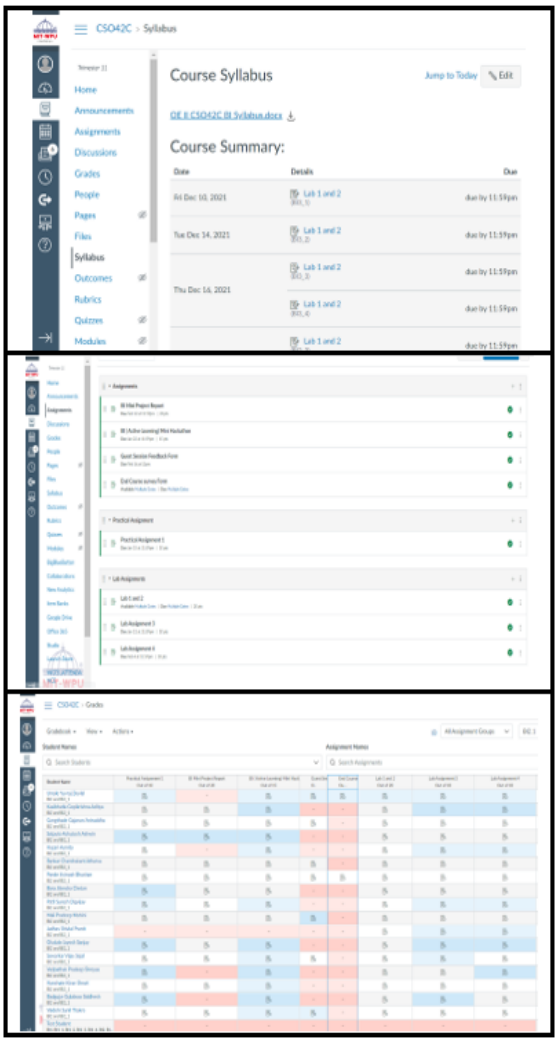

Figure 3. Screenshots of LMS usage done for this course.

Discussion:

The End of Course survey form is designed to gather the information and feedback about the course using rubrics mentioned in Table III. There are two classes for this course with 65 students in each class. Survey form is collected from all the students enrolled in the course. After the analysis of the survey, it is observed that PBL has improved the understanding of course contents.

In the student's opinion, PBL is a great tool for student learning and around 76% students are satisfied with this approach.

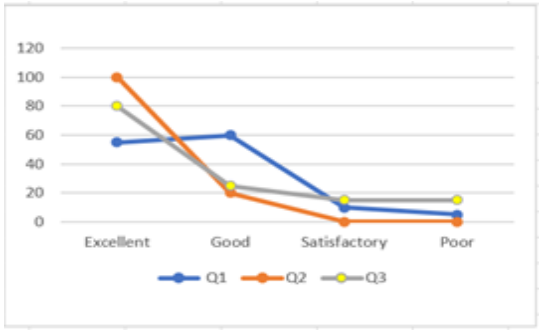

Fig 4. STUDENT'S Course End Surve

Table III. STUDENT'S Course End Survey

Item	***Excellent (4)***	***Good (3)***	***Satisfactory (2)***	***Poor (1)***
Q1 Indicate the extent to which you are able to identify Business Analytical tools and techniques for real time application?	Used everywhere	Used more often	Limited use	Not used at all
Q2 PBL has improved the understanding of course contents. In my opinion, PBL is a great tool for student learning	Fully Agree	Agree	I don't know	Disagree
Q3 To what extent do you think you are able to work together in a respectful and collaborative manner with team members to complete tasks?	Can easily and harmoniously work in teams	Can work in a team as per the project needs with minimal adjustments	Often need to make adjustments to get in a team	Unable to adjust in teamwork

IV. CONCLUSION

The world is experiencing changes in the educational era with a shift from traditional classroom teachings to new teaching learning methods. The different pedagogies have helped the students to understand and grasp the knowledge in a simpler and easier way as compared to earlier methods. It has been observed that the impact of peer learning has increased the students' attendance and interaction in studies with the Project based Learning (PrjBL)/Problem-Based Learning (PBL). Proactive students' participation increased their interest & enthusiasm in learning, which motivated them for self-learning and boosted theoretical-practical knowledge with confidence.

The proposed teaching pedagogy applied for the Business Intelligent course has evolved to results with learner-cantered, discussion-based, experimental, flexible, learning with fun. The analysis of the two-trimester study for BI course has revealed that the course outcome was improved with Program Specific Outcomes for the students of engineering.

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