

Enhancing Engineering Undergrads' Communication Skills with Problem-Based Learning for Professional Proficiency.

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Abstract

Problem Based Learning is a Teaching-Learning Methodology that has been used successfully to improve learning in a variety of contexts and at various levels all over the world. Some studies have shown that it is valuable as an effective learning strategy in a variety of courses, including effective language skills in English. PBL can improve learners' competency in effective professional communication skills and reduce communication problems. The goal of this study is to see if Problem Based Learning may be used to improve professional communication abilities in English while also developing Content Knowledge, Problem-Solving, Critical Thinking, Collaboration, and Self-Directed Learning skills.

It was a descriptive study for third-year Electronics and Communication Engineering (ECE) students at Vidya Jyothi Institute of Technology college.

Key words: Problem Based Learning, Professional Communication Skills, Improved Content Knowledge

1. ANALYSIS OF RELATED LITERATURE

Problem Based Learning is an all-inclusive teaching style in which pupils are kept in a stimulating environment and assigned to certain unassertive and free tasks (Barrows, 2000; Silver, 2004 & Radanovich, 2008). The criterion is that they must work in teams to solve the challenge assigned to their group (each team has four pupils) [1]. The lecturer's role is limited to that of a guide and facilitator. Both the curriculum and the method of learning improve students' acquisition of Critical Knowledge, Self-directed Learning Strategies, Problem Solving Proficiency, and Team Participation Skill (Radanovich 2008) [2]. The Classical Approach defines PBL as small and permanent groups of students working with a teacher on a new case, with input given every three class sessions. On the first day, the group receives a case study and begins analysing the primary data with the help of the teacher. The group agrees on the problems to be solved and divides the research assignment among the team members [3]. In the following class, the students present their findings, acquire further information, and restart their quest. In the third class session, the students bring the team closure on the case; this is when the groups pool their information and produce the final report [4].

2. PROCESS OF LEARNING BASED ON PROBLEMS

As previously said, Problem Based Learning (PBL) is most commonly used by dividing the class into minor groups, with the lecturer serving as the facilitator, assigning a few somewhat relevant issues to students and piloting them on how to tackle the difficulties with minimal input. As students acquire confidence in PBL, the amount of assistance they get decreases [5]. This process can be managed by providing students with a few worked samples at the start of their journey. In the later phases, students

might be pushed with less complex challenges until they have demonstrated sufficient ability in dealing with more actual problems [6].

Silver suggests utilising white boards to assist students scaffold their issue solving, which is displayed in four columns: the Facts Columns, the Ideas Columns, the Learning Issues Columns, and the Action Plan Columns [7]. Students are urged to keep track of their progress. During the process, students should discuss the difficulties, delineate them in light of their prior knowledge, then construct a hypothesis, and last determine their learning objectives and establish additional learning [8]. After identifying the solutions, the students should be able to reflect on what they have learned. They should then explain their results to the entire class [9].

PBL offers advantages because it is a step towards professional training; it prepares students for the real world by exposing them to the following difficulties and abilities (Tan, 2003):

- Teamwork
- Self-directed learning
- Proficiency in Professional Communication
- Problem-solving Capabilities
- Interdisciplinary Education
- Higher-order Thinking Capabilities

Because research on PBL in language courses is few, this study intends to fill the vacuum in research on PBL in English language teaching-learning and content-based language teaching-learning [10]. To summarise, various benefits of PBL research have been identified, which include: (1) Language Skills, (2) Professional Communicative Skills, especially among individuals who may not have many opportunities to speak up in a teacher-centered classroom [11]; (3) Reading Skills, (4) Critical Thinking Skills, (5) Collaborative Learning, and (6) Collaboration Skills.

THE STUDY'S OBJECTIVES

The study's goals are to look at the effects of PBL on:

1. Increased student competency in Professional Communication; and
2. Improved student retention of course material

The primary goal is to help students in the PBL group develop and improve their language abilities for Professional Communication [12]. It was made easier by the quantity of reading done for each job. Students will be introduced to challenges related to the course material and will read, gather, and sort data to answer the difficulties [13]. If PBL is to be viewed as an alternative to the traditional lecture technique in students' development of competent professional communication skills and course material, the learning environment must be conducive [14].

The following research questions were developed to address the study's objectives:

1. How much does the PBL method improve students' professional language proficiency?
2. Is there a difference between the PBL and non-PBL groups in terms of the amount of content learned?

5. METHODOLOGY

a. SUBTITLES

The study's subjects were 128 third-year engineering undergraduate students participating in two PDBS curriculum sections, including a Professional Communication Skills component. Classes were held twice a week for 55 minutes each [15]. Discussions, class activities, and group presentations were held in traditional classrooms with the use of a board, computer, and LCD projector [16].

b. Methodology

The course was divided into four portions, two of which were chosen for the experiment. One of the classrooms, which had 64 students, used the PBL technique, while the other, which also had 64 students, used the standard lecture and guided approach. The first was the experimental group, while the second was the control group [17]. The PBL class was divided into four-student teams. Everyone had the same

professor, the same notes, the same curriculum, and the same course structure [18]. The instructor was constantly present in class to observe students' interactions and behaviour. On the first day of each new task, the PBL groups were assigned a problem to solve and were required to submit their results to the class the following week.

Distribution of topics per 2-week period for the course

Weeks 1 & 2	Introduction, Division of Groups and Pre-Tests
Weeks 3 & 4	English Professional Communication Skills
Weeks 5 & 6	Words and Lexical Structure
Weeks 7 & 8	On Meaning
Weeks 9 & 10	Phrase, Clause and Sentence structure
Weeks 11 & 12	Language in Context (Communication)
Weeks 13 & 14	Post-tests and Conclusion

The non-PBL group received lectures on each topic on the course outline and had only one group assignment to present and submit at the end of the semester. However, group work was assigned after the semester-long topic that had been delivered and discussed. Students in non-PBL classrooms were given sample literary pieces in addition to those in the Course lecture notes, which the teacher addressed in class based on the theme of the week. The format for the presentation and task was the same as for the PBL group. However, at the conclusion of the semester, the PBL group was required to make comments and assessments of the class, focusing on the technique used to learn and what they had learnt.

Evaluation of Research Objectives

To address Research Question 1, i.e., to evaluate the subjects' language growth in both reading and writing, the following tests were administered to pupils using both PBL and non-PBL approaches:

1. An English Proficiency Test consisting of carefully crafted cloze tests tailored to the students' level (advanced) at the beginning and conclusion of the semester. The cloze exam was selected to assess students' reading skills, which may have improved as a result of the PBL projects.
2. Essay writing of 400 to 600 words at the beginning of the semester (pre-test) and at the conclusion of the semester (post-test). The essays were scored in terms of language and substance, and the outcomes of the two groups were then analysed, compared, and contrasted.

To answer Research Question 2, which is course content acquisition, the final examination scores for both groups were analysed for similarities and differences, keeping in mind that the PBL group followed a self-learning structure through solving meaningful tasks, whereas the non-PBL group had traditional lectures

FINDINGS AND DISCUSSIONS

Although the PBL groups were evaluated in a variety of ways (peer and teacher evaluations, interviews, observations, pre-tests and post-tests), the discussion of the findings will only focus on the results of the pre-tests and post-tests for the cloze and essay, as well as the final examination scores. Pre- and post-tests were used to measure students' language gains, and the final examination results were analysed to see if there were any changes in performance between the PBL and non-PBL groups in terms of course content, i.e., with and without conventional instructions. Because the language exams were given before the final exam, the results in this section are also presented in this sequence.

6.1 Cloze Test Pre- and Post-Test Scores of PBL and Non-PBL Groups

This section displays and discusses the findings of the PBL and non-PBL groups' pre-and post-test scores, which are displayed in Table 1. At the start of the semester, the mean scores of both groups' cloze outcomes were 9.36 and 9.25 for the non-PBL and PBL groups, respectively. The difference is not very significant (0.11), indicating that the two groups were on par in terms of linguistic ability from the start. The t-test demonstrated significance for each group at $p < 0.005$.

The Cloze Test Performance of the Experimental and Control Groups

	Experimental Group		Control Group	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Mean (/20)	9.36	13.35	9.25	10.70
n	64	64	64	64
Std. dev.	4.224	4.363	4.425	4.316
Std. error	.623	.643	.700	.682

r	.848		.890	
t	-9.393		-2.931	
df	45		39	
Sig.	.000*		.006*	

The results of the cloze test reveal that both groups improved. The PBL technique, in particular, has had the post-test, with the PBL group's mean score of 13.35, a difference of 3.99 from the pre-test. In contrast, the non-PBL group had a mean score of 10.30 and a difference of 1.45 from the pre-test. The greater difference in mean score in the PBL group may be ascribed to the lengthy and critical reading students were required to complete on a range of reading material in order to acquire data for the PBL activities. The non-PBL group, which got standard classroom training, did not accomplish this.

6.3 Course Grades Overall

This section provides information on the course grades for courses in both the PBL and non-PBL groups, as well as the final grade distribution for the two groups. This part is relevant in order to see the effect of the PBL strategy, which, as previously stated, had no explicit classroom instruction on the topics and required students to "acquire" the syllabus on their own through problem solving. The question is whether the students understood the main themes of the course using the interactive self-learning, problem-based method. To restate, the PBL groups got no explicit teaching on the course subjects, whereas the control group used the conventional method, which included entire lectures on each topic. Both the PBL and non-PBL groups took the identical final test paper at the conclusion of the semester. Table 6.0 summarises the outcomes of both groups.

Distribution of Course Marks / Grades of PBL and non-PBL group.

Scores	PBL		Non PBL	
	No of Students	%.	No of Students	%
90 – 100	0	0	2	3.2
80–89	4	6.3	5	7.8

70–79	10	15.6	6	9.5
60–69	19	29.7	16	25
50–59	26	40.6	22	34.5
0–49	5	7.8	13	20

The findings are reported in terms of grade distribution to show how the students fared overall, as well as whether or not they missed anything in the course content, and are compared to those of the control group. According to the grades, the non-PBL group performed somewhat better than the PBL group, with two kids achieving 90 to 100. No one in the PBL group received a score of 90-100%. However, the PBL group had 31 pupils in the 0-49 and 50-59 groups, compared to 35 in the non-PBL group. This suggests that the PBL method benefitted the weaker students more than the stronger students, since only 5 students had lower grades in the course compared to 13 in the control group.

The concept of self-learning is not new. Lev Semenovich Vygotsky's seminal work on the concept of Zone of Proximal Development (ZPD) was developed in the late 1920s, and ZPD is still being quoted frequently in current research, as seen in this example, which is: "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peer" (Cole et al., 1 Individuals learn best when they collaborate with others, which is also the foundation of the PBL approach.

7. CONCLUSION

The overall results of the exams (cloze and written) reveal that the study's PBL group was able to handle learning without explicit teaching and fared just as well as those in the regular class. Students in the PBL group were also able to convey their ideas in a more critical manner in the post-test essays and offered appropriate supporting material to explain their points in terms of language, especially writing.

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