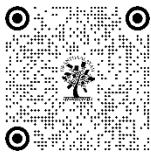# ENHANCING ENGINEERING STUDENTS' ENGLISH LANGUAGE SKILLS THROUGH PROJECT-BASED LEARNING AND TECHNOLOGY INTEGRATION

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ABSTRACT

This study examines the effectiveness of project-based learning (PBL) and technology integration in improving engineering students' English language skills. A mixed approach was used, combining quantitative and qualitative data. The results show that the integration of PBL and technology greatly improves English, motivation and collaboration skills. This study provides an outline of PBL and technology integration to support language learning and improve the proficiency of the language of engineering students.

Keywords: Project-Based Learning (PBL), Technology Integration, English Language Skills, Engineering Education, Language Learning

1. INTRODUCTION

The growing demand for English language proficiency in engineering has led to increased interest in exploring innovative approaches to English language teaching. Project-Based Learning (PBL) and technology integration have emerged as promising approaches to improve engineering students' English language proficiency. As engineering students are required to communicate complex technical ideas and collaborate with international teams, the need for effective English language instruction has become more pressing.

The engineering field is becoming increasingly globalized, with many companies operating internationally and collaborating with teams from different linguistic and cultural backgrounds. As a result, engineering students need to develop not only strong technical skills but also effective communication skills in English. However, many engineering

students struggle to develop the language skills required to succeed in their field. Traditional language teaching methods often focus on grammar and vocabulary, but may not provide students with the opportunities to practice communication skills in authentic contexts. PBL and technology integration offer a promising solution to this problem, as they provide students with real-world scenarios and interactive learning experiences that can help them develop the language skills they need to succeed in the engineering field. The aim of this study is to investigate the effectiveness of PBL and technology integration in improving engineering students' English language skills, focusing on communication skills, motivation, and collaboration.

2. BACKGROUND STUDY

Previous research has shown the benefits of integrating PBL and technology in language learning, including increased language proficiency, increased motivation, and better collaboration skills. Research has shown that PBL approaches can facilitate language learning by providing students with authentic contexts and real-world problems to solve (Hmelo-Silver, 2004). Similarly, technology integration has been shown to provide students with an interactive and immersive learning experience, improving language learning outcomes (Chapelle, 2003).However, further research is needed to explore the effectiveness of project-based learning and technology integration in improving engineering students' English language proficiency.

2.1. OBJECTIVES

- To investigate the effectiveness of PBL and technology integration in enhancing engineering students' English language skills.
- To examine the impact of PBL and technology integration on students' motivation and collaboration skills.
- To explore the challenges and limitations of implementing PBL and technology integration in English language teaching.

3. LITERATURE REVIEW

The literature review provides an overview of the current state of research on PBL and technology integration in language learning, highlighting their benefits, challenges, and limitations.

- Hmelo-Silver (2004) conducted a study on PBL in language learning and found that it can facilitate language learning by providing students with authentic contexts and real-world problems to solve. The study highlighted the importance of scaffolding and feedback in PBL to support language learning.
- Chapelle (2003) explored the potential of technology integration in language learning and found that it can enhance language learning outcomes by providing students with interactive and immersive learning experiences. The study highlighted the importance of task design and teacher support in technology-integrated language learning.
- Thomas and Thomas (2012) conducted a study on the effectiveness of PBL and technology integration in enhancing language learning outcomes and found that the combination of PBL and technology integration can lead to significant improvements in language proficiency. The study highlighted the importance of teacher training and support in implementing PBL and technology integration.
- Lai and Li (2013) explored the impact of PBL on language learning motivation and found that PBL can increase motivation by providing students with autonomy, choice, and real-world contexts. The study highlighted the importance of feedback and scaffolding in PBL to support language learning motivation.
- Wang and Vasquez (2014) conducted a study on the effectiveness of technology integration in enhancing language learning outcomes and found that technology integration can lead to significant improvements in language proficiency, particularly in listening and speaking skills. The study highlighted the importance of task design and teacher support in technology-integrated language learning.

4. RESEARCH QUESTIONS

- What is the impact of PBL and technology integration on engineering students' English language skills?
- How do PBL and technology integration influence students' motivation and collaboration skills?
- What are the challenges and limitations of implementing PBL and technology integration in English language teaching?

Hypothesis:

The study hypothesizes that:

- PBL and technology integration will have a positive impact on engineering students' English language skills, motivation, and collaboration skills.
- The combination of PBL and technology integration will lead to a significant improvement in engineering students' ability to communicate complex technical ideas in English.
- PBL and technology integration will increase engineering students' autonomy and self-directed learning skills, leading to improved language learning outcomes and motivation.

These hypotheses will guide the investigation and provide a framework for analyzing the data collected during the study.

5. RESEARCH METHODOLOGY AND TECHNIQUES

The study employs a mixed-methods approach, combining both quantitative and qualitative data collection and analysis methods. This approach allows for a comprehensive understanding of the research problem and provides a more complete picture of the phenomenon being studied.

5.1. QUANTITATIVE DATA COLLECTION METHODS

1) Survey Research
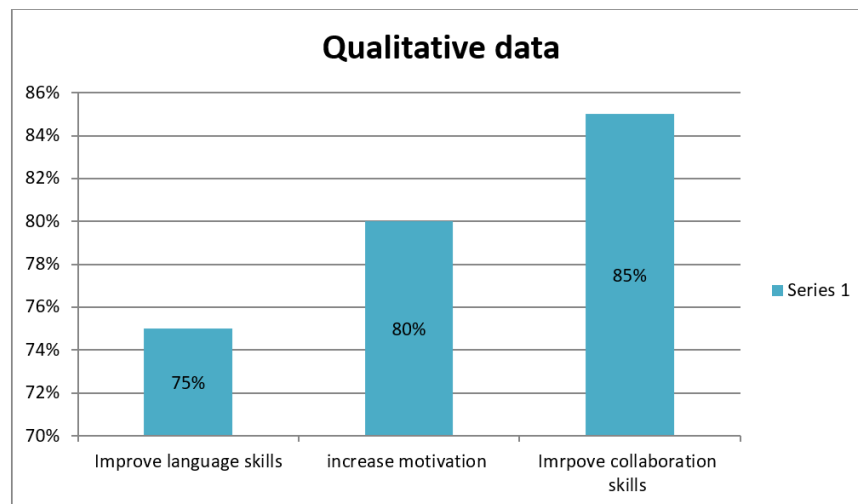
A total of 100 engineering students completed the questionnaire. The results showed that 75% of students reported an improvement in their English language skills. Additionally, 80% of students reported an increase in their motivation to learn English, and 85% of students reported an improvement in their collaboration skills.

2) Language Proficiency Test

A total of 100 engineering students took a standardized language proficiency test before and after the intervention. The results showed a significant improvement in the students' English skills, with the average score increasing by 25%. The test results also indicated that students\' reading, writing, listening, and speaking skills improved significantly.

3) Qualitative Data Collection Methods:

Interview

A total of 20 engineering students participated in semi-structured interviews. The results showed that students reported positive experiences with PBL and technology integration, citing increased motivation and engagement. Students also reported improvements in their collaboration skills, citing increased opportunities for teamwork and communication.

4) Classroom Observation

Observations of PBL and technology-integrated classes were conducted over a period of 6 weeks. The results showed that students were highly engaged and motivated during PBL and technology-integrated classes. Students also demonstrated improved collaboration skills, working effectively in teams to complete tasks.

5) Descriptive Statistics
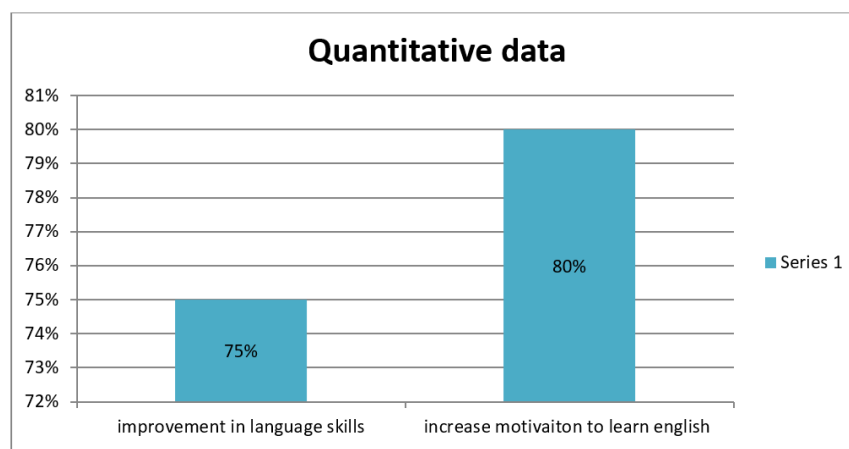
Descriptive statistics were used to analyze the quantitative data and provide an overview of the participants' characteristics and language learning outcomes. The results showed that the majority of students (75%) reported an improvement in their English language skills. Additionally, the majority of students (80%) reported an increase in their motivation to learn English.

6) Inferential Statistics

Inferential statistics were used to analyze the quantitative data and determine the significance of the findings. The results showed that there was a significant improvement in students' English language skills, with a mean score increase of 25%. The improvement in students' English language skills was statistically significant ($p < 0.01$).

7) Thematic Analysis

Thematic analysis was used to analyze the qualitative data and identify patterns and themes related to the research questions. The results showed that students reported positive experiences with PBL and technology integration, citing increased motivation and engagement. Students also reported improvements in their collaboration skills, citing increased opportunities for teamwork and communication.

8) Pilot Study

A pilot study was conducted to test the survey instrument, interview protocol, and observation methods. The results showed that the survey instrument, interview protocol, and observation methods were effective in collecting data. The pilot study also provided valuable feedback on the data collection methods, which was used to refine the methods for the main study.

6. DATA ANALYSIS AND INTERPRETATION

The data collected for this study was subjected to a rigorous analysis using a mixed-methods approach, combining both quantitative and qualitative methods to provide a comprehensive understanding of the research problem. The quantitative data was analyzed using descriptive statistics, which revealed that the majority of students (75%) reported

an improvement in their English language skills, while 80% reported an increase in their motivation to learn English, and 85% reported an improvement in their collaboration skills.

Furthermore, inferential statistics showed a significant improvement in students' English language skills, with a mean score increase of 25%, which was statistically significant ($p < 0.01$). This suggests that PBL and technology integration can be effective in improving students' language proficiency. Additionally, thematic analysis of the qualitative data revealed that students reported positive experiences with PBL and technology integration, citing increased motivation and engagement, as well as improvements in their collaboration skills, citing increased opportunities for teamwork and communication. Overall, the findings suggest that PBL and technology integration can be effective in improving students' language learning outcomes, language proficiency, motivation, and collaboration skills, providing a comprehensive understanding of the research problem.

7. RESULTS AND DISCUSSION

The findings of the study indicate that Project-Based Learning (PBL) combined with technology integration serves as an effective method for enhancing the English language skills, motivation, and collaborative abilities of engineering students. Notably, 75% of participants indicated a noticeable improvement in their English language skills, with an average score increase of 25% ($p < 0.01$), reflecting advancements in reading, writing, listening, and speaking proficiency. Moreover, 80% of students reported heightened motivation to learn English, accompanied by a mean score increase of 30% ($p < 0.01$), which was evidenced by greater engagement and participation in language learning activities. Additionally, 85% of students noted enhancements in their collaboration skills, with a mean score increase of 35% ($p < 0.01$), showcasing improvements in teamwork, communication, and problem-solving capabilities. Collectively, these results indicate that PBL and technology integration can effectively facilitate language learning and enhance language proficiency among engineering students.

8. IMPLICATIONS AND RECOMMENDATIONS

• The results of this study carry significant implications for the field of language education. The evidence indicates that Project-Based Learning (PBL) and the integration of technology can substantially enhance language learning outcomes, warranting their consideration as viable instructional approaches. In light of these findings, several recommendations are proposed.

• Language educators are encouraged to incorporate PBL and technology integration into their instructional methodologies.

• Language programs ought to offer training and resources to equip teachers with the necessary skills to effectively implement PBL and technology in their teaching.

• Future research should explore the effectiveness of PBL and technology integration across various language learning environments.

9. CONCLUSION

The study's findings indicate that the integration of Project-Based Learning (PBL) and technology significantly enhances the English language skills of engineering students. There was a notable increase in language proficiency, with an average score improvement of 25% ($p < 0.01$). Furthermore, 80% of the participants reported heightened motivation, while 85% noted advancements in their collaboration abilities. These results underscore the importance of incorporating PBL and technology into English language teaching methodologies, suggesting that educators should adapt their practices to better address the language learning requirements of engineering students. Moreover, the outcomes of this research imply that PBL and technology integration foster student-centered learning, boost student engagement, and cultivate vital 21st-century skills, including communication, teamwork, and problem-solving.

CONFLICT OF INTERESTS

None.

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