

The Effects of Digital Project-Based Learning on EFL Students' Pronunciation

ผลของการจัดการเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัล
ที่มีต่อการออกเสียงภาษาอังกฤษของนักเรียนที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ

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Abstract

This research study examined the impact of integrating technology into project-based learning, specifically digital project-based learning (DPBL), in an English as a Foreign Language (EFL) classroom. The primary objective was to explore the effects of DPBL on students' pronunciation, particularly focusing on final sounds. Additionally, the study sought to gather students' opinions about their experience with DPBL. The participants comprised 35 ninth-grade students from a public school, selected through a purposive sampling method. The instruments employed included lesson plans, a task, a pronunciation test, and a questionnaire. Quantitative data were analyzed using mean scores, standard deviations, and a dependent samples *t*-test, while qualitative data were assessed through content analysis. The results highlighted the promising potential of applying DPBL in the EFL classroom. Specifically, the mean score of the posttest (40.80) was significantly higher than that of the pretest (16.54) at the 0.5 level. Furthermore, all students expressed positive opinions about this teaching

method. This study suggests that project-based learning, coupled with technology, can enhance the language acquisition process for EFL students.

Keywords: digital project-based learning, pronunciation, English as a foreign language (EFL) students

บทคัดย่อ

งานวิจัยนี้มีจุดมุ่งหมายเพื่อศึกษาผลของการผสมผสานเทคโนโลยีร่วมกับการเรียนรู้โดยใช้โครงงานเป็นฐาน (Project-based Learning) เรียกว่าการเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัลในชั้นเรียนที่เรียนภาษา อังกฤษเป็นภาษาต่างประเทศ วัตถุประสงค์หลักคือศึกษาผลของการเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัลที่มีต่อการออกเสียงของนักเรียน โดยเน้นการออกเสียงท้ายคำ งานวิจัยนี้ยังศึกษาความคิดเห็นของนักเรียนที่มีต่อการเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัล กลุ่มตัวอย่างได้แก่นักเรียนชั้นมัธยมศึกษาปีที่ 3 จำนวน 35 คนจากโรงเรียนของรัฐบาลแห่งหนึ่ง โดยใช้วิธีการเลือกแบบเจาะจง เครื่องมือที่ใช้ในการวิจัย ประกอบด้วยแผนการสอน งาน แบบทดสอบการออกเสียง และแบบสอบถาม สถิติที่ใช้ในการวิเคราะห์ข้อมูลเชิงปริมาณ ได้แก่ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และสถิติ *t*-test แบบ dependent samples ข้อมูลเชิงคุณภาพวิเคราะห์โดยใช้การวิเคราะห์เนื้อหา ผลการวิจัยเน้นให้เห็นถึงความเป็นไปได้ในการประยุกต์ใช้การเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัลในชั้นเรียนที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ ผลวิจัยพบว่าค่าเฉลี่ยของคะแนนหลังเรียน (40.80) สูงกว่าค่าเฉลี่ยก่อนเรียน (16.54) อย่างมีนัยสำคัญทางสถิติที่ระดับ .05 นอกจากนี้นักเรียนทุกคนมีความคิดเห็นที่ต่อการเรียนรู้วิธีนี้ การวิจัยนี้ชี้ให้เห็นว่าการเรียนรู้โดยใช้โครงงานเป็นฐานที่มีการผสมผสานเทคโนโลยี สามารถส่งเสริมกระบวนการเรียนรู้ภาษาของนักเรียนที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ

คำสำคัญ: การเรียนรู้โดยใช้โครงงานเป็นฐานผ่านสื่อดิจิทัล การออกเสียง นักเรียนที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ

Introduction

English plays a vital role in contemporary life, serving as a global language of communication. It is the official language in 53 countries and is spoken by approximately 400 million people (Ilyosovna, 2020). Moreover, English serves as a key medium for business, information exchange, and education (Plaileka & Essien, 2021). As the predominant language in the business world, proficiency in English has become nearly essential for individuals seeking

to enter a global workforce (Nishanthi, 2018). A substantial portion of websites on the internet are also in English (Nishanthi, 2018). Therefore, effective communication in English is crucial.

Pronunciation is key in English communication. Proper pronunciation is essential to make the speech clear and understandable. On the contrary, incorrect pronunciation affects speech clarity, leading to misunderstanding (Derwing & Munro, 2015; Saito & Plonsky, 2019; Srakaew, 2021), and undermines learners' confidence and credibility when speaking English (Hue & Lan 2024). However, learning the pronunciation of a foreign language is a complex and challenging task. Various factors contribute to EFL learners' pronunciation challenges. According to Mueller (2019), many EFL learners struggle with English phonemes that do not exist in their native languages, leading to persistent pronunciation errors. Essien (2016) stated that inadequate practice time in English pronunciation can cause pronunciation problems.

English pronunciation issues among Thai learners have been studied across different student groups. Recently, the studies of Piyamat and Deekawong (2021) and Thongboonyang (2022) investigated the pronunciation difficulties of students at a university level. These two studies revealed similar results. That is, Thai students struggled with various aspects of English pronunciation, and the main causes of these issues were the differences between the Thai and English sound systems, leading students to substitute English with similar Thai sounds. Numerous studies have pointed out that teaching methods are the primary factor contributing to Thai students' pronunciation difficulties. Research conducted by Plaileka and Essien (2021), Kalapakdee (2021), Piyamat and Deekawong (2021), and Sa-e-dee (2020) revealed that Thai teachers often relied on textbooks to teach English pronunciation. Consequently, students lacked both interest and opportunities to practice speaking.

Project-based learning (PBL) can be an effective method for improving students' pronunciation skills in response to mispronunciation challenges. PBL is an active learning method that places projects at the heart of classroom activities. It provides students with opportunities to apply their language skills practically. In addition, students are engaged in meaningful communication, which directly supports pronunciation enhancement. As stated by Thomas and Mergendoller (2019), PBL fosters a deeper understanding of content and motivates students to use language in communicative tasks that align to improve

pronunciation. By working on their projects in which they have to do presentations and group discussions, students use and practice correct pronunciation in meaningful contexts.

Nowadays, technology is developing rapidly. It has been utilized for many aspects, including educational purposes. Therefore, integrating technology into PBL can amplify its benefits. Digital tools, such as mobile applications and online resources, can offer students more interactive and engaging opportunities to practice pronunciation. Liu et al. (2019) emphasized the importance of these tools in addressing pronunciation issues, noting that digital tools can expose students to native pronunciation models, improve phonetic accuracy, and build students' confidence in speaking.

Research studies have investigated the application of PBL in English classrooms. For instance, the work of Ruengkul and Wasanasomsithi (2021), along with Ruengkul's study, demonstrated positive effects of PBL on students' writing skills. Additionally, some research has examined the impact of PBL on speaking skills, as seen in the studies by Sirisrimangkorn (2021) and Soranastaporn and Posai (2018). However, there is a notable scarcity of research studies utilizing PBL to enhance pronunciation skills. Moreover, existing research on the integration of technology into PBL for the improvement of pronunciation remains limited. Consequently, this study aims to enhance the pronunciation skills of Thai EFL students by incorporating technology into PBL, referred to as digital project-based learning (DPBL). By addressing the common issue of mispronunciation of English final sounds, this research study can offer a practical solution to the pronunciation problems of Thai students through the implementation of digital project-based learning (DPBL). Additionally, the study highlights the potential of digital learning tools to support language acquisition in a modern classroom, paving the way for further research on the intersection of technology and language learning.

Objectives

1. To investigate the effects of DPBL on EFL students' pronunciation of English final sounds.
2. To investigate EFL students' opinions about participating in DPBL.

Review of Literature

Project-Based Learning (PBL)

Project-based learning is rooted in constructivist theories. Many scholars define PBL in many ways. According to Condliffe et al. (2017), PBL is a teaching method centered around a principal project that serves as the primary means of learning. This approach engages students in an extended inquiry process in response to a complex question, problem, or challenge, fostering active participation in the construction of knowledge. PBL is a collaborative, inquiry-based teaching strategy where students integrate, apply, and build their knowledge while working together to solve a problem (Guo et al., 2020). In the realm of science education, Lavado et al. (2024) highlight that PBL offers students valuable opportunities to develop practical, real-world skills by tackling multidisciplinary challenges. In summary, PBL is a student-centered instructional approach that places projects at the core of classroom activities.

According to Krajcik and Shin (2014), the essential characteristics of project-based learning (PBL) include the following:

- 1) A driving question: This approach encourages students to engage with problems that align with their interests.
- 2) Student autonomy: PBL emphasizes the importance of student autonomy, allowing learners the freedom to make decisions about their project goals, methodologies, and outcomes. This empowers students to take ownership of their learning while fostering self-directed learning skills.
- 3) Collaborative learning: This method promotes collaboration among students as they work together on projects, enhancing their communication and teamwork abilities.
- 4) Artifact creation: A key component of the PBL process involves producing an artifact that addresses the driving question, serving as a tangible representation of the learning experience.

Many scholars support PBL because of its many benefits. First, PBL enhances students' critical thinking skills. PBL fosters an environment where students are required to engage in complex problem-solving and critical analysis, which are fundamental components of higher-order thinking (Thomas & Mergendoller, 2019; Wang & Hannafin, 2017). This form of active learning encourages students to explore real-world challenges, prompting them to formulate hypotheses, design experiments, and critically evaluate outcomes. By synthesizing information and reflecting on their processes, students develop essential critical thinking abilities that extend beyond the classroom.

Second, engagement and motivation are other pivotal benefits of PBL. This approach captivates students by making education relevant to their lives and future aspirations. Its hands-on approach fosters active participation and collaboration among peers, which is essential for maintaining engagement (Sedubun & Nurhayati, 2024). When students recognize a direct connection between their projects and real-world applications, they are more likely to invest effort and energy into their learning. This increased level of engagement and motivation ultimately leads to academic success.

Thirdly, PBL fosters meaningful learning experiences. According to Ang and Kwe (2014), PBL requires students to apply theoretical knowledge in varied contexts, thereby enhancing their overall understanding of the material. Students perceive that the relevant skills and knowledge acquired can be utilized in their everyday lives. This type of meaningful learning marks a transition from rote memorization to the practical application of knowledge, allowing students to retain information more effectively and utilize it across different scenarios.

While PBL offers numerous advantages, it also has limitations, which can be categorized into three primary areas. As noted by Sedubun and Nurhayati (2024), these challenges include being time-consuming, difficulties with assessment, and the necessity for extensive teacher preparation. PBL requires students to engage in thorough exploration, collaboration, and problem-solving. As such, they face time constraints. In addition, traditional assessment methods, such as standardized tests, may not adequately reflect student learning in a PBL context, where skills like critical thinking, collaboration, and creativity are paramount.

Furthermore, successfully implementing PBL demands that instructors invest significant effort in designing projects, guiding students, and providing ongoing support.

To apply project-based learning in a classroom, Stoller and Myers (2020) have proposed five main cycles, including preparation, information gathering, information processing, information display, and reflection cycles. In the preparation stage, educators develop a project relevant to and engaging for students. The project should be designed around a central problem or question that aligns with the learning objectives. Stoller and Myers (2020) emphasize the importance of ensuring that the project is connected to real-world issues and is meaningful to students' language learning goals. This stage involves selecting topics, setting clear objectives, and outlining the project's scope and requirements. The design phase is crucial as it sets the foundation for the entire project and ensures that it will be engaging and educational.

The next step, information gathering, is detailed planning. This stage involves creating a roadmap for implementing the project, including timelines, resources, and assessment methods. Stoller and Myers (2020) highlight the need for careful planning to ensure that all necessary resources are available and that students understand their roles and responsibilities. This stage also includes preparing instructional materials and designing assessments to measure the process and the final product.

The Information processing cycle is where students actively engage in the project. During this phase, students work on their assigned tasks, collaborate with peers, and apply their language skills in a practical context. This stage allows students to explore and apply their knowledge in a dynamic and interactive environment. Stoller and Myers (2020) stress the importance of providing ongoing support and guidance to students as they work through the project. Teachers facilitate learning by monitoring progress, addressing challenges, and providing feedback.

The information display cycle provides students with the opportunities to demonstrate their learning and receive feedback from others. Stoller and Myers (2020) note that presenting the project allows students to reflect on their work, articulate their learning process, and gain

confidence in their language skills. Effective presentation also involves preparing students to communicate their ideas clearly and professionally.

The final stage involves reflection, where students and teachers assess the project's outcomes and processes. Stoller and Myers (2020) emphasize the importance of reflection for deepening learning and improving future projects. Students reflect on their experiences, what they learned, and how they can apply their knowledge in the future. Teachers also evaluate the project's effectiveness, considering what worked well and what could be improved. This reflective process helps both students and educators to learn from the experience and make necessary adjustments for future projects.

Project-based learning has emerged as an innovative teaching method aimed at enhancing EFL students' pronunciation and speaking skills. For example, Sahatsathatsana (2014) examined the impact of using stage plays in a PBL framework to strengthen students' English pronunciation at a university. The study found that the integration of theatrical elements in language learning created a dynamic environment for students to practice pronunciation and speaking skills in a natural context. This approach encouraged authentic language use, increased student engagement, and improved pronunciation accuracy through repeated practice and feedback in a supportive environment.

Soranastaporn and Posai (2018) explored the effects of PBL on English communication strategies in hospitality studies. The research highlighted how PBL, through real-world projects and role-playing activities relevant to the hospitality industry, helped students develop practical communication skills, including pronunciation and fluency. The findings indicated that PBL effectively increased students' confidence in their speaking abilities, as they were able to apply their language skills in realistic scenarios.

A recent study conducted by Sirisrimangkorn (2021) examined the effects of PBL on the speaking skills of EFL undergraduate learners, as well as their perceptions of this teaching method. The study involved 31 second-year undergraduate students as participants. Various instruments were utilized, including speaking tests, PBL instructions, a questionnaire, and interviews. The findings indicated that PBL effectively enhances students' speaking abilities, and all participants responded positively to the teaching method.

The integration of technology into language classrooms

In the educational context, the term "integration" is often associated with the use of technology (Ahmadi, 2018). Various scholars have provided different definitions of technology integration in language classrooms. Frasseto et al. (2022) describe it as the incorporation of technology into classroom practices. Furthermore, Gilakjani (2017) emphasizes that technology integration involves using technology to conduct classroom activities more efficiently, actively transforming the learning process.

Scholars have extensively discussed the advantages of using technology in language education. It assists teachers in conducting more efficient and engaging lessons. It enables teachers to access various educational resources, such as instructional materials, authentic texts, and multimedia, to enrich the learning experience (González-Lloret, 2015). Additionally, the use of platforms and online tools allows teachers to create more interesting and innovative lessons, which can enhance the overall quality of language teaching (Ahmadi, 2018).

Integrating technology in language classrooms equips teachers with tools that promote active learning. For example, teachers can provide students with online textbooks, e-learning platforms, and virtual reality tools, allowing them to interact with a wide range of resources (Sailer, Schultz-Pernice, & Fischer, 2021). These resources help students engage more deeply with the content, whether through searching for information, taking digital notes, or completing online assignments. Furthermore, technology fosters a positive learning environment by offering interactive tools, which promote student participation and foster active learning (Rahayu, 2023).

Technology also offers numerous advantages for students in language learning. It provides access to a vast array of resources, from authentic materials like online articles and videos to audio resources, which enhance their language learning experience (Ahmadi, 2018). By using technology, students can easily find information relevant to their studies, thereby personalizing their learning process and deepening their understanding of the subject matter (Gilakjani, 2017).

Methodology

Research Design

The current study employed a triangulation approach, which entailed integrating various research methods to gather a diverse range of perspectives. Specifically, this research combined both quantitative and qualitative data collection methods. The quantitative aspect involved analyzing students' pretest and posttest scores from a pronunciation assessment. To validate the conclusions drawn from the quantitative findings, qualitative data were collected through a questionnaire to explore EFL students' DPBL experiences.

Population and Participants

The study involved a population of 314 ninth-grade students enrolling in the first semester of the 2024 academic year at a public high school in Bangkok. A purposive sampling procedure was used to select 35 ninth-grade students as participants. The selection was based on three key reasons: first, ninth-grade students represent an ideal academic level to prepare for further English proficiency tests, such as the Ordinary National Education Test (O-NET); second, from the survey at the beginning of the semester, they did not like learning English; finally, observations indicated that they faced pronunciation difficulties during instruction. Thus, they were deemed suitable participants for this study.

Research Instruments

The research instruments utilized in this study included lesson plans, a task, an English pronunciation test, and a questionnaire. Six lesson plans were developed with a structured approach. First, the instructional content was defined to ensure alignment with the curriculum standards and indicators outlined in the Basic Education Core Curriculum B.E. 2551 (2008) for the Foreign Language Learning Area. Subsequently, a survey was conducted in class to identify students' interests, ensuring that the lesson content matched their preferences. The lesson plans were constructed and adapted from the five stages of PBL proposed by Stoller and Myers (2020), with a focus on engaging students through technology-driven activities. The five stages are outlined as follows:

1. Preparation Stage: The instructor selected the topic and prepared guidelines for the students, which included project examples and available resources. Additionally, assessment criteria for the presentations were established. This information was presented through Canva.

2. Information Gathering Stage: The objectives and procedures for the final project were explained to the students. They were provided with the project guidelines, examples, and a timeline to help track their progress. Vocabulary and sentences about cooking were taught. Examples of cooking-related vocabulary items are as follows.

Table 1: Examples of cooking-related vocabulary items

Item	Vocabulary	Final sound
1	chop	/p/
2	roast	/t/
3	bake	/k/
4	glass	/s/
5	beef	/f/
6	flour	/r/
7	grill	/l/

Working in groups, students discussed their interests and proposed topics to the instructor. After that, they divided responsibilities and began planning their projects. In this stage, students were allowed to use their mobile phones or tablets while doing tasks. Padlet and Quizizz were also employed in this stage. Padlet was used to facilitate students in sharing their ideas while Quizizz was used to review vocabulary and sentences related to cooking taught in the classroom.

3. Information Processing Stage: Students collaborated with their group members on assigned tasks. They searched for pertinent information and applied their language skills to the project while regularly discussing their progress with the instructor at least once a week. Students were also required to employ technology to present their progress, such as by using Canva.

4. Information Display Stage: In this phase, students prepared to present their projects to the public, namely a TikTok video showcasing the preparation of a traditional Thai dish. They were expected to employ technology to enhance their presentations.

5. Reflection Stage: In this stage, students received feedback. Their works were evaluated based on three criteria: the content of the presentation, pronunciation, and creativity. The presentation and creativity were commented on and rated by the instructor while pronunciation was assessed by a native-speaking teacher.

As part of their assignment, students were tasked with a cooking project. They were organized into seven groups and instructed to create a TikTok video showcasing the preparation of a traditional Thai dish, presented in English. To complete the video, they needed to incorporate the cooking vocabulary they had learned in class into their demonstrations.

The English pronunciation test was designed to assess students' pronunciation of final sounds before and after the experiment. This study focused on seven sounds: /p/, /t/, /k/, /s/, /f/, /r/, and /l/, which had been identified as pronunciation challenges for the target group. The test was divided into two parts, comprising 15 vocabulary items and 7 sentences. The sentences were constructed to incorporate five target words that featured the final sounds emphasized in this study. According to Suzuki and Koizumi (2021), the limitation of employing the same test both before and after treatment is that participants' experiences during the initial test may influence their performance on the subsequent test, known as the practice effect. Participants might recall some of the test content or become accustomed to the testing environment, resulting in better performance on the posttest. To minimize this issue, Suzuki and Koizumi (2021) recommend extending the interval between the tests. Accordingly, this study established a four-week interval between the pretest and posttest. Furthermore, the vocabulary items and target words were selected to be unfamiliar to the participants.

A questionnaire was developed to explore students' opinions regarding the teaching method. It featured three open-ended questions aimed at collecting qualitative data, enabling students to express their thoughts in their own words. As highlighted by Hyman and Sierra (2016), open-ended questions allow respondents to provide a diverse array of answers, some

of which may be quite surprising. To address any language barriers and promote effective communication, students were given the option to respond in either English or Thai, their native language. The questions posed were: 1) What do you appreciate about this DPBL? 2) What do you find unappealing? 3) If you were the teacher, would you assign your students to undertake digital projects? Why?

To ensure the validity of the research instruments, all tools were reviewed by three field experts using an evaluation form based on the Item-Objective Congruence Index (IOC). Items that received a score of 0.5 or higher were selected, whereas those scoring below 0.5 were revised according to the experts' recommendations and resubmitted for final approval. To assess reliability, the instruments were tested with a separate group of ninth-grade students from the same school who were not participants in the study. The data of the test were analyzed using Cronbach's alpha as the reliability coefficient, which yielded a value of 0.75. Since this value exceeds the threshold of 0.7, all instruments were deemed sufficiently reliable for use in the study.

Data Collection

In the first week, the pretest was conducted by recording the students' utterances while they were reading 15 vocabulary items and 7 sentences. Next, they received instruction based on DPBL for six class periods. After completing the lessons, a posttest was administered using the same test as the pretest. Then, the participants were asked to complete the questionnaire.

Data Analysis

Voice recordings of the students were collected to evaluate their pronunciation. The pronunciations of the vocabulary items and target words were rated by the instructor and a native speaker. The data from the pretest and posttest were analyzed by comparison of mean scores, standard deviations, and the dependent samples *t*-test. The questionnaire data were analyzed using content analysis. First, each student's response was read carefully. Next, the frequency of the information was determined, and notable data were identified. Finally, the data was organized into categories.

Results and Discussion

To investigate the effects of DPBL on students' English pronunciation, mean scores, standard deviations, and the *t*-test analysis were employed to analyze the pretest and posttest data. The results are presented in Table 2 and Figure 1.

To compare the posttest mean score to the pretest mean score, the dependent samples *t*-test was utilized to analyze the data. The findings are demonstrated in Table 2.

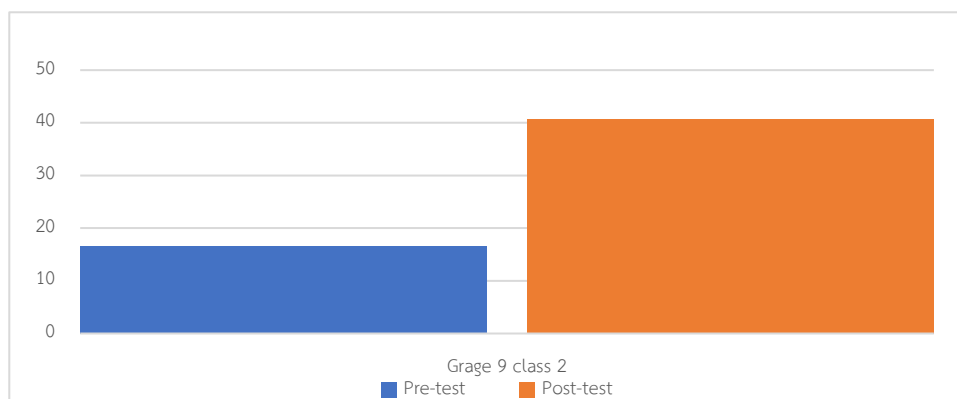
Table 2: The Comparison of the Pretest Mean Score to the Posttest Mean Score

Time	N	Mean	Max	Min	SD	<i>t</i> -value	<i>df</i>	<i>sig</i>	<i>d</i>
Pre-test	35	16.54	26	3	4.67	28.89	34	0.00*	2.80
Post-test	35	40.80	50	19	7.28				

* ($p < .05$)

Table 2 shows that there were statistically significant differences between the pretest and posttest mean scores ($t=28.89$, $p < .05$). The pretest mean score was 16.54 ($SD = 4.67$) while the posttest mean score was 40.80 ($SD = 7.28$). Therefore, the post-test mean score was significantly higher than the pretest mean score. The effect size for this analysis ($d = 2.80$) was found to exceed Cohen's (1988) convention for a large effect ($d = 0.80$), demonstrating high practical significance. The comparison of mean scores is also illustrated in Figure 1.

Figure 1: The Mean Scores of the Pretest and the Posttest



To better understand the effects of DPBL, the students were asked to complete an open-ended questionnaire. The results from the questionnaire indicate that students had positive opinions about learning through DPBL. Regarding the first question, “What do you appreciate about DPBL?,” all students expressed their favor for this teaching approach. All participants reported enjoying the classroom activities. All students appreciated that learning extended beyond the confines of traditional classrooms and occurred in more engaging environments. Furthermore, they valued the autonomy provided in choosing their projects. Additionally, all students noted that using the TikTok platform and various online tools contributed to creating more interesting and innovative lessons. Two students added the explanation to their answer that DPBL transformed a conventional classroom into a dynamic and enjoyable learning experience. Moreover, most students reported having valuable opportunities to practice their speaking skills. Many remarked that the engaging and meaningful activities encouraged them to invest effort into their projects, which in turn improved their pronunciation. Several highlighted that collaboration was another notable strength of this teaching approach. Addressing the second question, “What do you find unappealing?,” most students expressed that they had no dislikes; however, a few mentioned that time management posed a challenge. Some suggested the need for increased flexibility in choosing platforms for uploading their projects. In response to the final question, all students agreed that if they were teachers, they would implement this method, as it made learning more engaging and enjoyable.

According to the results of this study, DPBL had positive effects on English pronunciation and opinions of EFL students, and there are many reasons to clarify these results. Firstly, DPBL fosters meaningful learning experiences. In alignment with the perspectives of Krajcik and Shin (2014), Ang and Ngu (2014), and Thomas and Mergendoller (2019), the project assigned by the instructor in this study enabled students to confront various challenges that were connected to their interests. The students were required to prepare and cook a meal. They had chances to choose their dish to present. In other words, they were in control of their projects and decided how they succeeded. This autonomy empowered students to take ownership of their learning, leading them to put effort into their projects. By allowing students to make choices rooted in their interests, the project became more meaningful, relevant, and memorable, motivating them to explore and apply the knowledge

of final sounds studied in class in communicative tasks that align to improve their pronunciation. This can be seen in the questionnaire response, in which they reported having meaningful opportunities to practice their pronunciation. As a result, like the ideas of Thomas and Mergendoller (2019), students had a deeper understanding of final sounds and performed better in the posttest.

Secondly, DPBL promotes collaborative learning among students. This study promoted teamwork by encouraging students to work together in groups. This gives students more opportunities to have English conversations. They had chances to practice their English with peers whose English level is not much different from theirs. Talking with classmates, students had more confidence than when they spoke with their teachers. Additionally, similar to the findings of Soranastaporn and Posai (2018), when students engaged in authentic communication while creating their videos, they practiced their pronunciation, receiving immediate feedback that boosted their confidence and accuracy in articulating final sounds. Like the study by Sirisrimangkorn (2021), a collaborative environment was essential and enhanced the overall learning experience. This is in line with the study of Sugianto (2022), which applied collaborative learning by using PBL in the classroom and found that this teaching method could increase students' cognitive levels and skills in literacy.

Finally, integrating technology helps create an engaging environment, which supports students' pronunciation improvement. The instructor incorporated technology at every stage of teaching — such as presenting information through Canva, reviewing the lesson through Quizzes. This created a positive learning environment that promoted students' participation and helped students engage more deeply with the content. Then, students were tasked with creating TikTok videos to practice and demonstrate their pronunciation. TikTok's short-form video format is particularly appealing to younger audiences, making it an effective medium for delivering educational content. Consequently, using this digital platform in this study made the learning process more interactive, leading to enhanced motivation and active participation, thereby improving pronunciation. The result is similar to the research study by Heidari et al. (2021), which reveals that TikTok helped increase students' engagement and participation in language classrooms. The findings from the questionnaire also supported this discussion. All students reported that they liked the use of digital platforms and confirmed that the strength

of DPBL was an engaging environment. This result aligns with numerous previous research studies (Chandana, 2023; Harvey Arce & Cuadros Valdivia, 2020; Srichote, Worathumrong, & Yimwilai, 2023) that integrated technology in English classrooms. They found that integrating technology in language classrooms positively influences student motivation and aids in the development of language skills.

Conclusions

In conclusion, this study revealed the positive impact of Digital Project-Based Learning (DPBL) on EFL students' pronunciation of final sounds and their opinions. Through real-world tasks, collaboration, and technology integration, DPBL created a positive learning environment that promotes active learning, meaningful participation, and significant improvements in language skills. The study suggests that DPBL can be an effective teaching method in language classrooms. Consequently, teachers are encouraged to incorporate project-based tasks that align with students' interests, as such relevance can further boost motivation and enhance learning outcomes. Additionally, educators can utilize DPBL to develop a more dynamic and engaging language curriculum.

While this study provides valuable insights into the effectiveness of DPBL in enhancing English final sound pronunciation, it does have some limitations. First, the research was conducted with a relatively small sample size of students, which may restrict the generalizability of the findings to other contexts. Additionally, employing the same test before and after the treatment might impact the students' performance in the latter. Finally, it focused solely on TikTok as the platform for project tasks. Although effective, this choice overlooked the potential of other digital tools. Future research could address these issues by broadening the scope of the study to include a larger and more diverse sample of students from various schools or regions, thereby enhancing the generalizability of the results. Furthermore, researchers could investigate the use of platforms beyond TikTok to determine if similar outcomes can be achieved with different technologies. Exploring the effectiveness of DPBL in other language skill areas, such as grammar or vocabulary, may also yield a more comprehensive understanding of its impact on language learning.

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