Effectiveness Project-Based Learning in ESP Class: Viewed from Indonesian Students' Learning Outcomes

Dewi Hidayati, Hartia Novianti, Maharani Khansa, Joko Slamet, and Nunung Suryati*

***Abstract*—The use of Project-Based Learning (PjBL), as a teaching strategy, is on the rise across the country because it is considered as a means to make learning more interesting for students and to emphasize the acquisition of skills essential for success in the modern workplace. In order to cater to the needs of its students, English for Specific Purposes (ESP) necessitates interdisciplinary expertise due to its unique qualities. As a result, the position of the educator shifts significantly from that of the typical language instructions to the subject matter being taught. The purpose of this study was to investigate whether or not using PjBL in ESP class improves students' overall learning outcomes. In this particular investigation, a single group pre-test and post-test experimental design was utilized, and the participants included 40 samples that were selected on purpose. When it came to the students' video projects, the use of PjBL led to a significant improvement in the learning outcomes that were achieved. The findings indicated high mean scores on the learning outcomes subscales that were investigated, in addition to positive correlations on the academic performance of the participants. These results may add to the growing body of literature on the topic of how best to teach and learn ESP across disciplines by integrating different approaches and methods.**

***Index Terms*—Effectiveness, PjBL, ESP, learning outcomes**

I. Introduction

Project-Based Learning (PjBL, hereinafter) has substantially advanced as a result of the extensive development and application of the approach to a diverse array of academic fields and types of learning environments. Several researches have been conducted to examine the possible effect that PjBL has in significantly influencing students' achievements in a range of curricular areas. Comparing the success rates of high school students in social studies as well as college and career orientation in a regular high school to those of a PjBL technology high school was the focus of a study that was carried out by E. J. Summers and G. Dickinson [1]. PjBL places an emphasis on the development of students' key academic knowledge and their understanding of the content of their academic courses, as well as their capacities to prepare for careers. Other scholars

have also provided essential design concepts that are required for PjBL, with some of them concentrating on the use of PjBL in particular subject matters [2–4]. Evidence suggests that PjBL can help ESL students improve their English language skills and content area knowledge simultaneously [5]. A number of other studies have also demonstrated PjBL's positive effects on students with special needs [6]. The findings of this study lend credence to the claim that PjBL has the potential to level the playing field for underprivileged students, particularly in fields where they have been underrepresented to until point.

When it comes to achieve substantial learning goals, some studies have pointed out that the subject matter or topic which is concerned to a PjBL approach ought to be genuine and connected to topics that are related in significant discussion in the context of real world [3]. Furthermore, PjBL emphasizes the significance of establishing project-based learning courses on learning objectives [4]. It is argued that learning objectives are formulated as "learning performances", which combine the "basic ideas" of the discipline with the essential "disciplinary practices". The project is not the end result of learning in PjBL, as it frequently is in traditional classrooms; rather, the project is the process through learning occurs. This is in contrast to traditional classrooms, where the project is frequently the completion of learning. This is the defining characteristic that sets PjBL as apart from other educational systems [5, 7]. Given that PjBL requires significant shifts away from traditional methods of education, it should not come as a surprise that the sets of examination of design principles that are addressed in the literature explore the topic of how students learn new skills and information.

Furthermore, for instance, it is well-known that English is crucial to keeping up with a quickly changing technological and globalized world. Good English skills help all learners especially for undergraduates' students to succeed and achieve learning goals academically. In sequence for undergraduate students to be prepared for the challenges of the 21st century, they need not only English language skills but also professional competences and diversified capabilities. Therefore, PjBL is seen as a teaching strategy that encourages the growth of these abilities in students [8]. A lot of thought has not been put into how to best teach a foreign language in light of the social and professional requirements of today's professionals [9]. Additionally, it is noticed the best solution for many authors is (e.g.) A. Fălăuş emphasizes learners in English for Specific Purposes (ESP, hereafter) classrooms are stressed because they are expected to acquire complex grammatical structures and phrases and the ESP educators must change this misconception and make them feel comfortable [10, 11]. Consequently, in this study, we investigated the effectiveness of PjBL on ESP class viewed from the higher education students' learning outcomes.

PjBL and ESP thriving in the context of EFL with relation to ESP include study skills along with language competence to empower non-native learners for successful academic careers. Then, students learn English, for instance in ESP,

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The authors are with the Faculty of Letters, English Language Education, State University of Malang, Indonesia.

*Correspondence: nunung.suryati.fs@um.ac.id (N.S.)

through a familiar domain [12]. As a result of the mutually beneficial relationship between PjBL and ESP, constructivism encourages students to build upon their prior knowledge when studying a topic. Students are able to apply their prior or newly acquired knowledge, abilities, and competences in English through the integration of PjBL into ESP courses. This allows students to learn more English that is related to their ESP major, as well as developing their studies-related knowledge in a way that are collaborative, investigative, and authentic [13]. Working on in-depth ESP projects gives students the opportunity to share a variety of viewpoints on the subject. According to reports, a project work accelerates the implementation of ESP since it combines experience-based training with learner-centered instruction [14].

Several reasons have contributed to the current surge in emphasis on ESP in Indonesian universities where the English language is taught. The first reason is that English has become the de facto international language as a direct result of globalization [15, 16]. ESP, which is well known as an approach to language teaching, is recognized as being learner-centered approach [17, 18]. Its primary objective is to improve significantly students' English language skills, particularly in the areas of listening and speaking skills, within the context of academics, employment, and social interaction [19, 20]. The benefits of ESP can be summed up as follows: because it is centered on the requirements of the learner, it does not waste any time; it is relevant to the learners; it is effective in transmitting learning rather than "general-English-course".

When it comes to teaching a foreign language for ESP, teachers can make use of tools such as the internet, live online meetings, and a learning management system to give their students access to a broad variety of language inputs. Students' proficiency in using the target language in real-world settings, as well as their development of their receptive skills, can both benefit from these inputs [21, 22]. In Indonesia, integrating learning technologies in ESP education has obstacles such as inadequate class management, lecturers' reluctance to use technology, and difficulty managing students' access during e-learning [23]. In addition, according to the report, ESP still has a way to go before it can adequately provide learners with the opportunity to practice their English communication skills D. Arsitades Wiranegara [19]. The difficulty to interpret and evaluate individuals' demands, requirements, and complaints due to a limited command of the English language [24]. It is crucial for ESP students to have plenty of opportunities to actively use English in their daily lives. This might allow them to carry out their professional works on a worldwide scale without encountering any English communication barriers. Therefore, ESP teachers need to devise instructional methods that motivate students to engage communicating in English and involve them in their everyday lives in order to facilitate effective communicative language learning [25].

The usage of Computer-Assisted Language Learning (CALL) software, such as online video, has improved students' language learning possibilities [26, 27]. The fundamental goal of educators is to foster actively, contextually, meaningfully in learning process [28]. When a teacher can't or doesn't perform, video might be used as a teaching aid, and it should be carefully integrated with other course resources, then, these characteristics show the minor-job operation employed in a course by skilled and trained teacher [29]. Several researches show that videos help language learners. M. Jalaluddin [30] reports that videos can improve speaking and listening skills by helping students learn grammatical and functional structures. The majority of research also demonstrates its usefulness in strengthening students' desire to learn a new language [31, 32] and the use of videos in the classroom increases students' achievements and enhances the quality of teaching [33, 34]. When it comes to ESP instructional strategies, D. Mulyadi, T. D. Wijayatingsih, R. E. Budiastuti, M. Ifadah, and S. Aimah [23, 35] emphasize the importance of teachers in utilizing real resources from students' respective fields of study is crucial in order to provide students with meaningful language exposure.

It is crucial for teachers to make the use evaluation as a strategy that can aid them in accomplishing the goals that have been set for themselves in their roles as educators. An essential component of the design of an ESP course is the gathering of data regarding the influence of teaching practice on student learning, the subsequent assignment, evaluation, and analysis of that data, as well as the subsequent reaction to and implementation of the results [36]. First, they provide teachers with feedback to improve instruction. Second, educators can evaluate others teaching approaches to improve their own [37]. The information can be used by administrators to create summative and formative evaluations, both of which are essential components of any ESP course. These evaluations are based on the design of the syllabus, the method and activity selection, the implementation, the materials and preparation, the needs analysis, and the summative or formative evaluation [38].

The proliferation of PjBL and ESP within the setting of EFL virtually simultaneously begin in the same decades. Most scholars agree that ESP course assessment is vital for documenting events, defining objectives, finding unexpected and intended outcomes, quantifying cost-effectiveness, and modifying curriculum [39–42]. Increasing students' proficiency in academic or professional settings is a common goal of ESP classes that places a greater emphasis on communicative competence than on grammatical correctness and structural rightness [13]. The basic tenet of ESP is not only the teaching of English as a distinct subject from the requirements of students' majors and the actual world but also ESP is a blend of subject matter instruction with instruction in the English language. We explore the intersection of ESP and PjBL in terms of Content-Based Instruction (CBI) on the students' learning outcome in speaking skill, as the researchers generated, so that we can bridge the research gap that exist between the previous relevant studies and this study. Empirical research reveals that CBI allows ESP students to practice English language skills while concurrently acquiring subject knowledge and PjBL is a useful strategy for integrating content learning and English language skills in a naturalistic setting [43, 44]. In addition, the goal of this study is to examine the efficiency of the PjBL approach at English for Specific Purposes (ESP)

course offered in higher education institutions in terms of the students' learning outcomes on speaking skills.

II. Literature Review

The PjBL learning approach is one that puts the students themselves at the forefront of the educational process. The principles of PjBL, which draw from other contemporary educational tenets including constructivist theories of learning, emphasize on the student and their autonomy in the learning process [45]. During PjBL lessons, the teacher guides the students in the direction of the knowledge they are seeking or the knowledge that is necessary to complete the project. Therefore, PjBL entails an in-depth learning process with systematic learning management to produce usable outcomes, inspire action, and fortify fundamental life skills [46]. Moreover, the concept of PjBL calls for the collaboration of two or more teachers at a specific level when planning, implementing, and/or evaluating a course [47, 48]. This collaboration focuses primarily on the exchange of training expertise and reflective conversation between the teachers as it is claimed by Chang and Lee [49].

It also has been demonstrated that the PjBL approach helps both the professional and personal growth of inexperienced educators by providing them with a variety of learning opportunities. The PjBL is possible to approach certain subjects by employing either from a unique point of perspective or a pedagogical strategy that emphasizes the importance of teamwork and gives students with an extremely enriching learning experience in a number of ways [50], the enhancement of professional learning and the promotion of personal growth (e.g., a gain in confidence in language skills) [51]. While PjBL shares some similarities with problem-based learning (PBL) in terms of problem-solving, its end result is a student-created project [52]. In PjBL model, the teacher is not only a person who hands out information; rather, he or she plays an active role in shaping the learning environment and inspiring the students [53]. Students develop autonomy by selecting their own project design strategies and materials [54], but they also assume complete responsibility for their education [55]. Rodríguez-Peñarroja [18] argues successful example of PjBL implementation. In his findings, the qualities of PjBL that are discussed earlier are tested and proven PjBL is an educational system in which students are presented with meaningful real-world problems and cases, learners decide how to approach them, and then students work together to try to find solutions to problems. When it comes to language skills associated with constructivism for example in ESP course, knowledge is not only passed on or taught, but also learners themselves should be involved in the process of comprehending and acquiring new information [44, 56].

Fundamentally, the term ESP first appeared in the 1960s as a result of the growing realization among students and businesspeople that English language classes alone were insufficient to meet their requirements [57]. The fast development of English in a variety of industries, such as business, media technology, medicine, education, and research, makes the demand for ESP even higher, particularly in nations where English is employed as an instrumental aim [58]. The goal of ESP is to help students improve their ability to communicate in English in a variety of professional contexts, including but not limited to accounting, marketing, management, human resources, engineering, and strategic thinking [39, 59, 60]. Students typically learn English not because they have an interest in the language or the culture of the English language itself, but rather because they require English for the sake of their studies or jobs. English is taught in ESP not only for its own purpose or for general education, but also in order to promote admission into or increase efficiency within a larger linguistic environment, such as that found in academic, professional, or work settings [15].

It has been pointed out that ESP has its own manner in terms of resources, instructional techniques, assessments, and so on that adjust to the requirements of students and the goals of their education. An ESP is utilized in the process of inspiring students to study and improve their proficiency in the English language [61]. Then, the variables are altered to reflect the following: a) ESP might be related to or developed for certain disciplines; b) ESP may utilize in specific teaching settings, a different technique from that of general English; and c) ESP is likely to be designed for adult learners, either in a tertiary institution or in a professional work setting. The technique of ESP should be founded on the essential principle of the core language needs of target learners. This should be enabled with appropriate teaching material and practice in order to meet the requirements of the students [15, 62]. Since one of the goals of ESP teaching and learning is to improve students' communicative ability, the emphasis in an ESP approach should be placed on learner-centered activities that emphasize communication. The ESP teaching and learning process in the classroom is learner-centered, which means that the learner's reasons for learning to use a particular area of the English language in the shortest term feasible become the basis for the teaching [63]. This is done in order to meet the learners' needs in the most efficient manner [64, 65].

III. Method

This study's objective was to evaluate the influence of PjBL on the learning outcomes that students achieve in ESP classes. This study used a pre-experimental research design with purposive sampling on 40 first-year college students at STAI Diponegoro Tulungagug, Indonesia in order to answer the research question. Purposive sampling was used to choose the sample for this investigation, and one particular class was chosen to serve as the sample for this investigation. Both a pre-test and a post-test served as the instruments that the researchers utilized when carrying out the investigation. For the pre-test, the students were given an image and asked to provide a description of how it was linked to the atmosphere of the university. While treatment was the method for improving students' speaking abilities through the utilization of instructional video and the production of video connected to tourism, treatment was indeed the way. When it came time for the students to turn in their projects, the lecturer tasked them with producing a short video (3-5 minutes length).

The majority of the classroom process took place in the

classroom that was outfitted with information and communication technology (ICT) equipment such as a monitor, multimedia computer, and sound system. The performance of the students in speaking their L2 was evaluated using a rating scale and established scoring criteria, with particular emphasis placed on the following areas: pronunciation, intonation, accuracy, fluency, and action. The number of these components might range anywhere from 5 to 20. During the pre-test, the lecturer had the students individually give a presentation that lasted for 5 minutes and then participate in a question-and-answer (Q&A) session in front of the class that lasted for the same amount of time. As part of the project-based assessment that the students would complete after the pre-test, they would be required to produce a video that was between three and five minutes in length and related to the theme of tourism. Their overall performance was rated. Oral testing provides data for both the pre-test and the post-test. In order to gain the students' scores, the rubric is presented on the following Table I.

TABLE I: ASSESSMENT RUBRIC OF SPEAKING SKILL

No	Aspects	Criteria	Score
1	Pronunciation	Excellent	20
		Good	15
		Fair	10
		Poor	5
2	Intonation	Excellent	20
		Good	15
		Fair	10
		Poor	5
3	Accuracy	Excellent	20
		Good	15
		Fair	10
		Poor	5
4	Fluency	Excellent	20
		Good	15
		Fair	10
		Poor	5
5	Action	Excellent	20
		Good	15
		Fair	10
		Poor	5
Total possible maximum score			100

Quantitative data collection was utilized both at the beginning of the study as well as at the conclusion of it in order to evaluate students' levels of English-speaking skill in the context of an ESP (pre and post-tests) course. We did the analysis on the data that we collected using a program called the Statistical Package for the Social Sciences (SPSS-26), which was also used for data collecting. A substantial amount of analysis was carried out on the data in order to establish whether or not they could be trusted. To begin, a normality test was conducted to evaluate whether or not the distribution of the scores were normal. Next, for the data analysis, we applied Paired-Sample T-tests to assess the hypotheses that were formulated. Finally, we presented our findings and discussed our findings. The following could be said about the hypotheses were formed:

Ho: There is no significant improvement on the implementation of Project-Based Learning (PjBL) toward the students' learning outcomes (LOs)

Ha: There is significant improvement on the implementation of Project-Based Learning (PjBL) toward the students' learning outcomes (LOs).

IV. RESULTS AND DISCUSSION

This research aimed to examine the effectiveness of Project-Based Learning (PjBL) on the students' learning outcomes, speaking skills, on the ESP course. This study lasted for a period of six months, and it was terminated when the data collected were deemed to be sufficient to provide an answer to the underlying research question. On the ESP course, the experimental group received treatment with PjBL. The treatment was done completely on the following instructions of ESP course applying PjBL approach to the 40 students at STAI Tulungagung, Indonesia in the academic year 2021/2022. The pre-test and post-test were done to gain the data related to the students' scores. The findings served as the basis for drawing the conclusions, which were arrived at after the collecting of the data and subsequent analysis, using the SPSS Statistics 26 software, of both the descriptive and inferential parts of the data. The descriptive analysis method was utilized both before and after the test to determine, among other things, the mean, standard deviation, minimum, and maximum scores. This was done during the pre-test and post-test periods. Utilizing inferential statistical analysis, it helped determine the findings of the approach for testing the hypothesis. The findings of descriptive statistical analysis are presented in Table II below.

TABLE II: DESCRIPTIVE ANALYSIS OF PRETEST AND POSTTEST

	N	Min.	Max.	Mean	Std. Deviation
Pre-Test	40	56	80	68.82	6.464
Post-Test	40	70	92	81.75	5.624
Valid N (listwise)	40				

As could be seen in Table II, the mean score on the pre-test was 68.82, whereas the mean score on the post-test was 81.75, indicating that the post-test delivered more precise findings of improvements than the pre-test did. The lowest score on the post-test was 70, which was much higher than the score of 56 that was discovered on the pre-test. It was contended that the findings demonstrated a statistically significant shift from the pre-treatment group to the post-treatment group when the PjBL methodology was utilized in the ESP course. In addition to this, the standard deviation of the pre-test was 6.464, but the standard deviation of the post-test was 5.624. (Table II). Following the steps outlined above to assess whether or not the data follow a normal distribution, the next step is to carry out the inferential test, which was also known as the pair sample test. It was not essential to conduct a homogeneity test on them as there was only one group included in the sample. This was due to the fact that there was only one group. In addition, the Kolmogorov-Smirnov test was carried out in order to ascertain whether or not the data were normal. The results of the experiment are detailed in Table III.

TABLE III: THE RESULT OF NORMALITY TEST ONE-SAMPLE KOLMOGOROV-SMIRNOV TEST

		Pre-Test	Post-Test
N		40	40
Normal Parameters[a,b]	Mean	68.83	81.75
	Std. Deviation	6.464	5.624
Most Extreme Differences	Absolute	0.147	0.147
	Positive	0.147	0.147
	Negative	-0.138	-0.142
Test Statistic		0.147	0.147
Asymp. Sig. (2-tailed)		0.029[c]	0.029[c]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

The significance level of the pre-test was .029, according to Table III, and the significance level of the post-test was also .029; both of these values were considerably higher than the significance level of .05. The value of the pre-post Sig. test was .147, which was a considerable amount greater than the Sig. level, which was set at .05. It was determined that the data followed a normal distribution if the value of Sig. was greater than .05. The results of a pair sample test could lead one to the conclusion that the data on both the pre-test and the post-test were normally distributed and that the data satisfied the conditions for hypothesis testing. This could be done by comparing the results of the two tests. Due to the fact that the pair sample test compares the data to itself, this was the result. In this particular instance, inferential analysis was carried out by means of a pair sample t-test because the prerequisite for conducting hypothesis testing had already been fulfilled. The findings of the research are summarized in Table IV below.

TABLE IV: THE RESULT OF T-TEST

	Mean	Std. Dev	Std. Error Mean	95% Confidence Interval				Sig. (2-tailed)
				Lower	Upper	t	df	
Pretest -posttest	12.925	5.010	0.792	11.323	14.527	16.317	39	0.000

On the basis of the information shown in Table IV, one could be drawn the conclusion that the level of significance for the Sig. value was .000, which was lower than the level of significance of .05. It was determined that the null hypothesis (Ho) *"There is no significant improvement on the implementation of Project-Based Learning (PjBL) toward the students' learning outcomes (LOs)"* was 'rejected', and that the alternative hypothesis (Ha) *"There is significant improvement on the implementation of Project-Based Learning (PjBL) toward the students' learning outcomes (LOs)"* was 'accepted'. There was a significant effect of PjBL approach on the students' learning outcomes called speaking skills. The mean, excluding that factor, was 12.925 (St. Dev was 5.010). These data indicate that students' speaking skills improved following treatment, as demonstrated by these findings. On the other hand, one may claim that there was a statistically significant influence that the PjBL approach on ESP course toward students' learning outcomes.

A significant influence on boosting ESP learners' results through the application of technology-enhanced PjBL was determined to be a noteworthy discovery in the current study. This finding was considered to be significant because it was discovered in this research. This finding pertained to the very first study topic that had been posed. This finding made it extremely evident that the utilization of speaking activities as part of the tasks of the PjBL had a positive impact on the students' capacity to grasp spoken language, and it did so in a way that was abundantly clear. This study was in line with the findings of other studies, which discovered that include speaking exercises as part of the pre-learning activities had a major impact to the advancement of students' foreign language input as reported by Kennedy, Rodríguez-Peñarroja [15, 18]. It was discovered that this result had a substantial impact on the students' progress in the input of foreign languages as argued by Wiranegara, Susanthi, Shinde [19, 62, 66].

In agreement with the findings, lecturers' knowledge is founded on factual concepts and comprehensions, whereas lecturers' beliefs are composed of ideas and assertions. It is possible for lecturers to be aware of the connection between a specific instructional innovation and the results of student learning; nonetheless, the lecturers' ability to successfully execute that innovation is contingent on whether or not they believe this notion to be true. In this regard, alerting teachers about the potential benefits of an instructional innovation like PjBL may significantly change the way they go about their work, and confidence in a new method's ability to achieve its intended educational purpose is crucial for its widespread acceptance [9, 62].

The results of the current study supported the findings of several other studies that highlight the advantages of applying PjBL in ESP toward EFL settings. First, while the process of PjBL in this study dealt with the incorporation of ICT competencies [7, 67, 68], such as making effective use of a camera, employing editing software, capturing, and selecting clip, among other things, this study also focused on the integration of PBL. In addition, the finding of this study was consistent with the findings of a study that was carried out by Condliffe *et al.*, Kennedy, Wiranegara [2, 15, 19]. That study discovered that the utilization of an ICT-based project can be an efficient technique to increase students' ICT skills.

Similar to the effects that the ESP learners' speaking performance achieved through a presentation, the technologically improved PjBL has had an effect on their scores. According to the findings that were reported, this speaking task had achieved statistical significance. This finding was in line with the research that suggests PjBL deployment could encourage students to participate actively in classroom engagement [34, 38]. The closeness of live communication between the ESP professor and the learners can be one of the possible causes for why students are unwilling to fully participate in the conversation of the themes they are learning about [23, 33]. The monitoring done by the instructor should encourage the engagement and participation of the students in the conversations [21, 69].

Since the majority of the course content and material was effective based on this study' findings, the result supported

by Kabooha Elyas [70, 71] that their findings proposed that students' knowledge might be enhanced through the use of videos due to the videos' incorporation of new information. It recommended that English as a Second Language instructors incorporate activities that are learner-centred and stimulate student participation. According to the findings of another study conducted by Medrea and Rus, Bathia and Anthony *et al.*, Kenny [40, 58, 72], the incorporation of multiliteracies pedagogies makes the educational environment more accommodating, engaging, meaningful, and inspiring; yet, it is also more challenging. It is demonstrated here that the utilization of movies inside an ESP setting makes it easier for students to study. Parker *et al.*, Pham and Vo, Ly and Duong *et al.*, Nguyen [3, 26, 73, 74] provided evidence that students' language skills might be improved by the usage of videos, as well as the introduction of new vocabulary. To sum up those descriptions, PjBL on ESP course was effective to improve the students' learning outcome in speaking skills.

V. Conclusion

This research was conducted with the intention of investigating the impact that PjBL had on the speaking abilities of ESP students. The results of the speaking test demonstrated that PjBL had a significant impact on the learners' ability to communicate effectively in speaking. This was because the real materials used in ESP were incorporated into the stages of the exercises itself. In addition to this, the findings of the analysis carried out by SPSS showed that the students' learning outcomes were significantly improved as a direct result of the application of PjBL when it came to making of video projects. The level of significance which is less than the Sig. 0.05 was determined to be the level of significance. The value was 0.000, which was a substantial amount lower than .05. It was decided that the Ha should be granted acceptance. This research had limited discussion only on PjBL approach on ESP course in order to examine its approach' effectiveness on students' learning outcomes in speaking skills by projecting the videos. Then, the limitation was also on limited samples being investigated. Since the PjBL approach was effective on the students' learning outcomes in speaking skills, further researches might conduct similar research on PjBL using other subjects and other Language skills being investigated. Exploring methodology in other designs is also recommended to further researches.

Conflict of Interest

The authors point out no conflict of interest.

Author Contributions

Dewi Hidayati conducted the investigation and data curation. Hartia Novianti and Maharani Khansa did the investigation and formal analysis. Joko Slamet contributed the investigation, project administration, and writing-original draft. Nunung Suryati supported other aspects of the research related to methodology, supervision, validation, writing-review & editing.; all authors had approved the final version.

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Dewi Hidayati received a bachelor's in STKIP PGRI Tulungagung, and a master's degree from the Islamic University of Malang in 2015. Since then, she has been an English lecturer At STAI Diponegoro Tulungagung. She is currently a doctorate student at the English Department at the State University of Malang. Her research interest is in English Specific Purpose and Teaching Strategies, although she has concurrent research in, ESP ICT, assessment, and teaching strategies.

Hartia Novianti is a doctorate student at State University of Malang, Indonesia. She has been an English lecturer At STKIP PGRI JOMBANG. Her research areas are ESP, teaching strategies, English Language Teaching.

Maharani Khansa, received the bachelor and master degree in English Language Teaching from State University of Malang in 2016 and in 2020. Her master research focused on EFL learning strategies. Since then, she has been an English teacher for Junior High School students in Batu. She is currently a doctorate student at English Department in State University of Malang. Her research interest is in extensive reading and reading behavior, although she has concurrent research in ICT, assessment and teaching strategies.

Joko Slamet is a doctorate student at State University of Malang, Indonesia. His research areas are English Language Teaching, Linguistics, E-learning, ICTs used in educational fields, and Research & Development (R&D).

Nunung Suryati is an associate professor at State University of Malang, Indonesia. Her area of specialization is English Language Teaching. Her teaching areas are English for specific purposes (ESP), basic listening, advanced listening.