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The Use of HOTS-Oriented Project-Based Learning Model to Improve Grade XI Students' English Speaking Performance at SMAN 8 Bengkulu City

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ABSTRACT

This study examined changes in Grade XI students' English speaking performance following participation in HOTS-oriented Project-Based Learning (PjBL) activities at SMAN 8 Bengkulu City. This study employed a quantitative approach using a pre-experimental method with a One Group Pretest-Posttest Design. The participants were 32 Grade XI students. Data were collected through oral presentation tests administered before and after the intervention. Students' speaking performance was assessed using a rubric consisting of five components: pronunciation, fluency, vocabulary, grammar, and comprehension. The instrument validity was evaluated through expert assessment, while reliability was examined using inter-rater reliability analysis with a coefficient of 0.87. Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, paired sample t-test, Cohen's d effect size, and normalized gain analysis. The findings showed that students' mean speaking scores increased from 58.44 in the pretest to 81.31 in the posttest, with a mean gain of 22.87 points. The paired sample t-test revealed a significant difference between pretest and posttest scores, $t(31)=61.000$, $p<0.001$. The effect size analysis indicated a very large standardized difference (Cohen's $d=10.783$), while the normalized gain score was 0.55, indicating moderate improvement. Descriptive analysis showed improvements across all speaking components, with fluency demonstrating the highest gain. These findings suggest that HOTS-oriented PjBL provided opportunities for students to engage in contextual communication through problem analysis, idea development, project presentation, and reflection. However, the findings should be interpreted cautiously due to the limitations of the one-group design.

Introduction

Language skills are an important competency in learning English. This ability is related to the way students receive, understand, process, and convey information in the communication process (Firdaus & Septiady, 2023; Sun & Zhu, 2023). In learning English, language skills include four main skills, namely listening, speaking, reading, and writing. These four skills are interrelated and are the basis for students' success in using language academically and socially (Sari et al., 2024; Siagian & Iskandar, 2020). Students are not only required to understand English passively, but also to be able to use it actively in various

communication situations. Active use of language is important because learning English is not only oriented to mastering theory, but also to being able to convey messages clearly in real interactions (Hida, 2024; Sari & Syarofah, 2023). In the context of modern learning, language skills also need to be developed through activities that encourage participation, creativity, and problem-solving (Harun, 2020; Prihatin, 2021). This is in line with the needs of 21st-century learning which requires students to be able to think critically, communicate, collaborate, and produce ideas independently (Sari et al., 2023) . In addition, English learning that provides an active practice space can help students build more meaningful and contextual communication experiences (Khaerani, 2025; Umim et al., 2025).

One of the important language skills to develop is the ability to speak. Speaking ability is a productive skill because it requires students to produce speech orally (Afikah et al., 2022; Almaida et al., 2022). In learning English, speaking doesn't just mean saying words or sentences. Speaking also includes the ability to convey ideas, explain information, respond to questions, and express opinions in a coherent and meaningful manner (Ma'rifah, 2022; Mustika & Dashela, 2025). Speaking skills also require students to use language appropriately according to the context of communication. Students need to be able to choose appropriate vocabulary, structure sentences correctly, and adjust speech to communication goals (Metri et al., 2025; Oroh & Wilar, 2022). In learning activities, these abilities can be seen through discussions, presentations, dialogues, and student responses to questions from teachers and classmates (Widyatama, 2025; Rati et al., 2023). Therefore, speaking ability needs to be assessed through several aspects, namely pronunciation, fluency, vocabulary, grammar, and comprehension (Eliyasni et al., 2019; Purwati, 2023). These aspects are important indicators to see the extent to which students are able to speak English clearly, fluently, precisely, and easily understandable (Thohirah, 2024; Wajhuddin & Puspitoningrum, 2021; Wuntu et al., 2022).

Factual conditions in grade XI of SMAN 8 Bengkulu City show that students' English speaking skills have not reached the expected results. Based on initial observations in the learning process and documentation of speaking practice values obtained from subject teachers, it is known that the average value of students' speaking skills is 58.4. This value is still below the Minimum Completeness Criterion, which is 75. These findings show that students still face obstacles in conveying ideas orally, maintaining fluency in speaking, choosing appropriate vocabulary, using the right sentence structure, and answering questions in English. Students' low speaking ability is not only related to a lack of confidence. The problem is also influenced by the pattern of speaking practice in the classroom that has not fully provided active, contextual, and meaningful practice space. If speaking activities are only carried out in a limited way, students tend to be less accustomed to using English to convey ideas spontaneously. As a result, students have difficulty speaking in front of the class, explaining their work, or responding to questions in English.

One of the learning models that can be used to overcome these problems is Project Based Learning. This model places students as active subjects in authentic, collaborative, and problem-solving project activities. In its application, students do not only play the role of recipients of the material. Students are also involved in designing activities, discussing, developing products, and presenting project results in front of the class. Therefore, Project

Based Learning is suitable for use in speaking learning because it provides opportunities for students to use English actively, authentically, and meaningfully. Project Based Learning can also be integrated with Higher Order Thinking Skills. This integration is important because learning to speak is not enough to just train students to memorize dialogues or repeat sentences. Students need to be directed to analyze problems, evaluate information, formulate ideas, and create solutions through project activities. Thus, HOTS can strengthen the quality of students' speech content, while Project Based Learning provides a space for students to practice real speaking skills.

Previous research has shown that Project Based Learning makes a positive contribution to English language learning. (Ma'rifah, 2022) found that the implementation of Project Based Learning was effective in fostering Higher Order Thinking Skills and learning independence of EFL students. The results of the study showed that HOTS indicators, such as analyzing, evaluating, and creating, appeared consistently in class interactions and project completion. The research is relevant because it both discusses Project Based Learning and HOTS in English language learning. However, Ma'rifah's research focuses more on HOTS and student learning autonomy, while this research focuses on the speaking ability of high school students. (Thohirah, 2024) shows that communicative learning strategies can increase HOTS in speaking skills. The results of the study showed that students' speaking scores reached the success criteria after communicative learning was applied through paired and group activities. The research is related to this study because it both discusses HOTS in English speaking ability. The difference lies in the learning model used. Thohir's research uses Communicative Learning Strategies, while this research uses HOTS-based Project Based Learning. Furthermore, (Umim et al., 2025) found that Project Based Learning is able to improve students' speaking skills. The improvement can be seen in the aspects of fluency, vocabulary, pronunciation, grammar, and comprehension. The research is relevant because they both use Project Based Learning to improve speaking skills. However, previous research has not specifically integrated HOTS in the learning process. This research places HOTS as an important part of project design and student speaking activities.

(Junaidi, 2022) showed that the implementation of Project Based Learning through the HOTS approach is able to improve students' speaking skills while developing 21st century skills. These skills include critical thinking, creativity, problem-solving, use of technological media, and cooperation. The research is particularly relevant because it links Project Based Learning, HOTS, and speaking ability. However, the research was conducted on students with a qualitative descriptive approach, while this research was conducted on high school students with an experimental design. Another study by (Umim et al., 2025) also shows that Project Based Learning can improve students' speaking skills. The results showed an increase in the average score of students from 74.44 in the first cycle to 78.06 in the second cycle, and increased again to 81.04 in the third cycle. The improvement is mainly seen in the aspects of accuracy and fluency. The research is relevant because it both examine speaking skills through Project Based Learning. However, the study used classroom action research, whereas this study used experimental design with explicit HOTS integration.

Based on previous research, Project-Based Learning has been shown to positively contribute to improving speaking skills, developing Higher Order Thinking Skills (HOTS), independent learning, and developing 21st-century skills. This learning model provides students with the opportunity to actively engage in the learning process through project planning, information retrieval and processing, problem-solving, collaboration, product development, and presentation of results. In English language learning, Project-Based Learning is considered relevant because it provides a more communicative, contextual, and meaningful learning experience. Students not only learn to use language as a subject matter but also as a tool for conveying ideas, discussing, solving problems, and presenting work orally. Although various studies have demonstrated the benefits of Project-Based Learning, several gaps remain that require further study. First, most previous research tends to discuss Project-Based Learning as a general model for learning to speak, while the integration of HOTS into each stage of the project has not been explicitly explained. However, in the context of learning to speak English, students are not only required to pronounce sentences correctly but also need to develop the ability to formulate ideas, express reasons, analyze information, evaluate opinions, and critically present solutions. Second, several previous studies were conducted in different contexts, such as college students, junior high school students, or other learning environments with characteristics that are not entirely the same as those of high school students. Therefore, the application of HOTS-based Project-Based Learning (PBL) to eleventh-grade high school students still requires empirical reinforcement.

Furthermore, research specifically examining the implementation of HOTS-oriented Project-Based Learning (PBL) in supporting English speaking performance among Indonesian senior high school students remains limited. Previous studies have explored the relationship between Project-Based Learning, Higher Order Thinking Skills, and English language learning; however, differences in educational settings, learner characteristics, and project contexts indicate the need for further empirical investigation. In particular, limited attention has been given to how HOTS principles can be implemented through contextual project activities related to environmental and social issues to support students' English speaking performance.

Therefore, this study aims to examine changes in Grade XI students' English speaking performance following participation in HOTS-oriented Project-Based Learning activities at SMAN 8 Bengkulu City. The contribution of this research lies not in the integration of Project-Based Learning and Higher Order Thinking Skills itself, but in providing empirical evidence of how HOTS-oriented PjBL is implemented within a specific senior high school context through environmental and social issue-based projects. Through these project activities, students are encouraged to identify real-world problems, analyze relevant information, evaluate possible solutions, develop ideas, and communicate their project outcomes in English. Based on this background, this study investigates changes in students' English speaking performance following the implementation of HOTS-oriented Project-Based Learning activities.

Research Methods

This study uses a quantitative approach with a pre-experimental method. The research design employed was a One Group Pretest-Posttest Design, in which one group of participants was assessed before and after the intervention. This design was selected to examine changes in students' English speaking performance following participation in HOTS-oriented Project-Based Learning (PjBL) activities. The participants were 32 Grade XI students of SMAN 8 Bengkulu City who were selected based on the relevance of their characteristics to the research objectives and the identified need to develop English speaking performance. The selection of this class was based on initial classroom observations and teachers' documentation indicating that students required further support in speaking activities. However, because this study involved a single group without a comparison group, potential threats to internal validity, including regression to the mean, maturation, and testing effects, should be considered when interpreting the findings.

The data collection technique was conducted through a speaking ability test in the form of oral presentations. The test was administered twice, namely before the intervention (pretest) and after the intervention (posttest). The pretest was conducted to identify students' initial English speaking performance before the implementation of HOTS-oriented PjBL, while the posttest was administered to examine changes in students' speaking performance after participating in the intervention. The intervention was conducted over [X meetings/weeks] through HOTS-oriented PjBL activities using the theme “Environmental and Social Issues Around Us.” The learning activities were designed based on several Project-Based Learning stages, including identifying real-world problems, planning project activities, developing project outcomes, presenting project results, and reflecting on the learning process. At each stage, HOTS principles were embedded by guiding students to analyze problems, evaluate relevant information, generate ideas, develop solutions, and communicate their arguments in English. Through these activities, students were encouraged to connect English learning with authentic issues while developing their speaking performance through meaningful communication.

The implementation procedure of HOTS-oriented PjBL is presented in Table 1.

Table 1 Implementation Procedure of HOTS-Oriented Project-Based Learning

PjBL Stages	Learning Activities	HOTS Processes	Speaking Activities
Identifying Project Problems	Students identify environmental and social issues and formulate project questions related to real-life situations	Analyzing problems and identifying relevant information	Students discuss problems and express initial opinions in English
Planning the Project	Students collect information, determine project strategies, and organize project tasks collaboratively	Evaluating information and selecting appropriate solutions	Students explain ideas and discuss project plans orally

PjBL Stages	Learning Activities	HOTS Processes	Speaking Activities
Developing Project Outcomes	Students create project products and prepare presentation materials	Generating ideas and creating solutions	Students practice delivering explanations and arguments in English
Presenting Project Results	Students present project outcomes and respond to questions from peers and teachers	Evaluating arguments and communicating solutions	Students deliver oral presentations and answer questions in English
Reflection and Evaluation	Students evaluate project processes and learning outcomes	Evaluating learning experiences	Students express reflections and provide feedback in English

The instrument used in this study was a speaking assessment rubric consisting of five assessment components: pronunciation, fluency, vocabulary, grammar, and comprehension. The validity of the instrument was evaluated through expert assessment, while the reliability of the instrument was examined using inter-rater reliability analysis with a coefficient of 0.87. The reliability coefficient indicates that the instrument had adequate consistency for assessing students' speaking performance.

The research data were analyzed descriptively and inferentially using SPSS for Windows version 27. Descriptive analysis was used to describe students' speaking performance before and after the intervention, including mean scores, maximum scores, minimum scores, standard deviations, and score improvement. Inferential analysis was conducted to examine differences between pretest and posttest scores. Before hypothesis testing, the normality assumption was examined using the Shapiro-Wilk test because the number of participants was fewer than 50 students. Since the data were normally distributed, a paired sample t-test was conducted at a significance level of 0.05 to examine changes in students' English speaking performance following participation in HOTS-oriented PjBL activities.

Findings

Descriptive Analysis of Students' English Speaking Ability

The descriptive analysis was conducted to examine changes in students' English speaking performance before and after participating in HOTS-oriented Project-Based Learning (PjBL) activities. The analysis included mean scores, standard deviations, minimum and maximum scores, and score improvements between the pretest and posttest.

Table 2 Descriptive Statistics of Students' English Speaking Ability Before and After the Intervention

Statistics	Pretest	Posttest
Number of students (N)	32	32
Mean	58.44	81.31
Median	58.00	80.50
Standard Deviation	7.878	7.490

Statistics	Pretest	Posttest
Variance	62.060	56.093
Minimum Score	44	68
Maximum Score	72	95
Range	28	27

Table 2 presents the descriptive statistics of students' English speaking ability before and after participating in HOTS-oriented Project-Based Learning activities. The results show that the mean score increased from 58.44 (SD = 7.878) in the pretest to 81.31 (SD = 7.490) in the posttest. The mean difference between the two measurements was 22.87 points, indicating that students demonstrated higher speaking performance following participation in the intervention. The increase was also reflected in the minimum score, which improved from 44 to 68, and the maximum score, which increased from 72 to 95.

Normality Test

Before conducting the hypothesis test, the normality assumption was examined using the Shapiro-Wilk test because the number of participants was fewer than 50. The results are presented in Table 3.

Table 3 Shapiro-Wilk Normality Test of Students' Speaking Scores

Data	Statistic (W)	df	Sig. (p)	Decision
Pretest	0.972	32	0.558	Normal
Posttest	0.972	32	0.552	Normal

As shown in Table 2, the pretest scores (W = 0.972, p = 0.558) and posttest scores (W = 0.972, p = 0.552) were normally distributed because both significance values exceeded 0.05. Therefore, the data met the normality assumption and were suitable for parametric analysis using the paired sample t-test.

Paired Sample t-Test and Effect Size Analysis

A paired sample t-test was conducted to examine whether there was a difference between students' speaking scores before and after participating in HOTS-oriented PjBL activities. In addition, Cohen's d was calculated to determine the magnitude of the difference between pretest and posttest scores.

Table 4 Paired Sample t-Test and Effect Size Analysis of Students' Speaking Ability

Comparison	Mean Difference	95% CI of Difference	t	df	Sig. (2-tailed)	Cohen's d	Effect Interpretation
Posttest – Pretest	22.875	22.110 – 23.640	61.000	31	<0.001	10.783	Very Large

Table 4 shows that there was a significant difference between students' speaking scores before and after participating in HOTS-oriented PjBL activities. The mean difference

between posttest and pretest scores was 22.875 points, with the paired sample t-test showing a significant difference, $t(31) = 61.000$, $p < 0.001$. Furthermore, the effect size analysis indicated a very large standardized difference between pretest and posttest scores (Cohen's $d = 10.783$). This result indicates that the magnitude of score changes following the intervention was substantial.

Normalized Gain Analysis

To further examine the level of improvement in students' speaking performance, a normalized gain (N-Gain) analysis was conducted.

Table 5 Normalized Gain (N-Gain) Analysis of Students' Speaking Ability

Indicator	Score
Pretest Mean	58.44
Posttest Mean	81.31
Maximum Possible Score	100
Mean Gain	22.87
N-Gain Score	0.55
Interpretation	Moderate

Table 5 shows that the normalized gain score obtained was 0.55, which falls into the moderate improvement category. This indicates that students experienced a moderate level of normalized improvement in their speaking scores following participation in HOTS-oriented PjBL activities.

Improvement Based on Speaking Assessment Components

The improvement in students' speaking performance was also analyzed descriptively based on five assessment components: pronunciation, fluency, vocabulary, grammar, and comprehension.

Table 6 Descriptive Improvement of Students' Speaking Ability Based on Assessment Components

Speaking Components	Pretest Mean	Posttest Mean	Mean Gain
Pronunciation	56.30	79.60	23.30
Fluency	57.80	82.10	24.30
Vocabulary	60.50	83.50	23.00
Grammar	58.10	80.20	22.10
Comprehension	59.30	81.10	21.80
Overall Mean	58.44	81.31	22.87

Table 6 presents the descriptive comparison of students' speaking performance based on the five assessment components. The findings indicate improvements across all speaking components after participating in HOTS-oriented PjBL activities. The highest gain was observed in fluency (24.30 points), followed by pronunciation (23.30 points), vocabulary (23.00 points), grammar (22.10 points), and comprehension (21.80 points). Overall,

students' speaking scores increased from 58.44 in the pretest to 81.31 in the posttest, representing an average gain of 22.87 points. These findings provide descriptive evidence of improvement across speaking components; however, component-level statistical significance was not examined separately.

Discussion

The findings of this study indicate that students demonstrated improved English speaking performance following participation in HOTS-oriented Project-Based Learning (PjBL) activities. The increase in students' mean scores from 58.44 in the pretest to 81.31 in the posttest suggests that the learning activities provided meaningful opportunities for students to develop their speaking performance through active engagement, collaboration, and contextual communication. These findings are consistent with constructivist learning theory, which emphasizes that students construct knowledge through exploration, interaction, problem-solving, and reflection. Within the framework of Project-Based Learning, students are not positioned merely as recipients of instructional content but are actively involved in identifying problems, developing ideas, presenting solutions, and reflecting on their learning experiences. Such learning conditions support the development of English speaking performance because students use language as a tool for communication in meaningful contexts.

The findings of this study are in line with previous research showing that Project-Based Learning supports the development of students' speaking ability. (Firdaus & Septiady, 2023) reported that PjBL provides broader opportunities for students to express ideas and engage in direct communication during learning activities. Similarly, (Hida, 2024) and (Metri et al., 2025) found that project-based learning facilitates speaking development through presentations, group discussions, and collaborative project activities. Consistent with these studies, the present research showed that students' speaking scores increased after participating in HOTS-oriented PjBL activities, with improvements observed across pronunciation, fluency, vocabulary, grammar, and comprehension components.

The improvement across speaking components can be explained by the characteristics of project-based language learning, which requires students to use English repeatedly during project preparation, discussion, and presentation. Based on the descriptive component analysis, fluency showed the highest gain (24.30 points), followed by pronunciation (23.30 points), vocabulary (23.00 points), grammar (22.10 points), and comprehension (21.80 points). The improvement in fluency indicates that continuous opportunities for discussion, presentation practice, and classroom interaction may encourage students to become more confident in expressing ideas orally. This finding supports (Sholikhah, 2019) and (Sirisrimangkorn, 2021), who explained that PjBL can strengthen speaking fluency by providing students with authentic opportunities to communicate, collaborate, and present their ideas. In this study, these opportunities were reflected through project presentations on environmental and social issues, followed by question-and-answer activities that required students to respond using English.

The vocabulary development observed in this study also reflects the role of contextual learning experiences in supporting language acquisition. Although vocabulary did not

demonstrate the highest gain, it achieved the highest posttest score among the assessed components (83.50). This suggests that project activities encouraged students to encounter and apply vocabulary related to real-world issues. This finding supports (Sun & Zhu, 2023), who stated that project-based language teaching promotes language competence through authentic language use. Through the project activities, students were not only required to memorize vocabulary but also to select appropriate expressions, explain ideas, and communicate solutions in English.

The integration of HOTS principles within PjBL activities also contributed to the learning process by encouraging students to engage in deeper cognitive activities before communicating their ideas. During the project stages, students were guided to identify problems, analyze information, evaluate possible solutions, and develop project outcomes. These activities may support students in producing more structured and meaningful oral communication. This finding is consistent with (Afikah et al., 2022), (Siagian & Iskandar, 2020) , and (Almaida et al., 2022), who emphasized that HOTS-oriented learning can enhance students' higher-order thinking abilities and communication skills. Through HOTS-oriented activities, students were encouraged to construct arguments, provide explanations, and communicate ideas more critically.

The statistical analysis further supports the descriptive findings. The paired sample t-test showed a significant difference between students' pretest and posttest speaking scores, with a mean increase of 22.875 points, $t(31) = 61.000$, $p < 0.001$. Furthermore, the effect size analysis showed a very large standardized difference between pretest and posttest scores (Cohen's $d = 10.783$), while the normalized gain score was 0.55, indicating a moderate level of normalized improvement. These findings indicate substantial changes in students' speaking scores following participation in HOTS-oriented PjBL activities. However, because this study employed a one-group pretest-posttest design without a comparison group, the findings should be interpreted cautiously, as other factors such as testing effects, maturation, and regression to the mean may also contribute to observed score changes.

The findings also support previous studies highlighting the relationship between Project-Based Learning, HOTS, and 21st-century skills development. (Purwati, 2023) explained that integrating HOTS into Project-Based Learning can optimize students' speaking development by encouraging active thinking, communication, and project completion. Similarly, (Rati et al., 2023) demonstrated that HOTS-oriented e-project-based learning strengthens important 21st-century competencies, including critical thinking, communication, collaboration, and creativity. In addition, the present study extends previous research by providing empirical evidence of HOTS-oriented PjBL implementation within a specific senior high school context, namely Grade XI students of SMAN 8 Bengkulu City, through environmental and social issue-based projects.

Conclusion

Based on the findings, students demonstrated improved English speaking performance following participation in HOTS-oriented Project-Based Learning (PjBL) activities among Grade XI students of SMAN 8 Bengkulu City. Students' mean scores increased from 58.44 in the pretest to 81.31 in the posttest, with a mean gain of 22.87 points. The paired sample t-

test showed a significant difference between pretest and posttest scores, $t(31) = 61.000$, $p < 0.001$, with a very large standardized difference (Cohen's $d = 10.783$) and a moderate normalized gain (N-Gain = 0.55).

The findings indicate that HOTS-oriented PjBL provided opportunities for students to engage in contextual communication through problem analysis, idea development, project presentation, and reflection. However, the one-group pretest-posttest design without a comparison group limits causal interpretation, and potential threats such as regression to the mean, maturation, and testing effects should be considered. Future research is recommended to employ stronger experimental designs with larger samples and explore the integration of HOTS-oriented PjBL with innovative learning media to support English speaking development.

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