Linguistics and English Language Teaching Journal
Vol. 14, No 1, June 2026

ISSN: 2339-2940
E-ISSN: 2614-8633

The Effect of Deep Learning Approach on First-Semester Students' Speaking Ability in EFL Classroom

Lalu Isnaeni Rahman[a,1*], Pathul Indriana[b,2], Riris Sugianto[c,3]

[a,b,c] *Universitas Teknologi Mataram, Jl.Pelormas III Kekalik Mataram, 83115, Indonesia*
[1]*lalugedeir.bhsing@gmail.com**; [2]*bupathul@utmmataram.ac.id*; [3]*sugiantoriris87@gmail.com*

ARTICLE INFO

Article history:
Received: 28/5/2026
Revised: 15/6/2026
Accepted: 15/6/2026

Keywords:
Deep Learning Approach;
Speaking Ability;
EFL Classroom;
AI-Assisted Learning;
English Language Teaching

ABSTRACT

English speaking skill is very crucial because this ability enables students to express thoughts, feelings, and ideas in real situations through a dynamic and interactive process for academic and professional purposes. Despite the growing integration of AI-based language learning approaches in EFL classrooms, there is still limited empirical evidence on the effectiveness of deep learning-oriented instruction in improving students' speaking ability. The purpose of this study was to investigate the effect of the deep learning approach on the speaking ability of first-semester students at the Faculty of Information and Communication Technology, Universitas Teknologi Mataram. The study employed a quasi-experimental design with a pre-test and post-test control group involving 60 students. The sample was divided into two groups: an experimental group receiving deep learning-oriented and AI-assisted speaking instruction, and a control group receiving conventional speaking instruction. The instruments used in this study were speaking pre-tests and post-tests assessed based on fluency, pronunciation, vocabulary, grammar, and coherence. The collected data were analyzed using descriptive statistics, normality and homogeneity tests, paired-sample t-tests, and independent-sample t-tests through SPSS. The findings revealed that the experimental group achieved a higher improvement in speaking ability than the control group. The post-test mean score of the experimental group increased from 61.20 to 78.90, while the control group improved from 60.85 to 69.40. The independent-samples t-test showed a significance value of 0.000 (< 0.05), indicating that the deep learning approach had a statistically significant effect on students' speaking ability. The results suggest that deep learning-oriented instruction integrated with collaborative tasks, project-based learning, and AI-assisted feedback can effectively enhance students' speaking fluency, confidence, and engagement in EFL classrooms.

I. Introduction

In recent years, second/foreign language education has shifted from a behavioristic, transmission-oriented model toward a more cognitive and student-centered paradigm. Within English as a Foreign Language (EFL) contexts, speaking remains one of the most challenging yet essential skills for learners, as it directly reflects their ability to communicate meaningfully in real-life situations. Despite the growing emphasis on communicative language teaching, many EFL classrooms still struggle to develop learners' speaking fluency, interactional competence, and critical thinking in a balanced and sustainable way[1]

One promising response to this challenge is the integration of deep learning principles in English Language Teaching (ELT). Deep learning emphasizes understanding, reflection, and the application of knowledge in authentic contexts rather than mere memorization of formulas or structures. Within ELT, this approach encourages learners to engage with language in meaningful tasks, connect concepts across domains, and reflect critically on their own learning processes. As [2] conceptualize, deep learning in ELT can be operationalized through cooperative learning strategies, where students work collaboratively, negotiate meaning, and co-construct knowledge while practicing speaking skills. In this model, learners are not passive recipients of language input; instead, they actively

ISSN: 2339-2940
E-ISSN: 2614-8633

participate in dialogic exchanges, give and receive feedback, and develop both linguistic and metacognitive competencies.

Alongside cooperative learning, the integration of project-based learning (PBL) with deep learning principles has also shown considerable potential in fostering speaking fluency and critical thinking in EFL settings [1]. In PBL-oriented deep learning, students engage in extended tasks that require inquiry, collaboration, and real-world application, such as designing projects, presenting findings, and discussing outcomes in English[1]. These activities naturally push learners to produce more complex and extended speech, to negotiate meaning with peers, and to justify their ideas—all of which support the development of speaking fluency and higher-order thinking skills. Moreover, when PBL is embedded within deep learning frameworks, teachers can design learning experiences that are not only linguistically rich but also cognitively challenging and personally relevant to students[3], [4]

Given these developments, the present study investigates the effect of a deep learning approach on students' speaking ability in an EFL classroom. As well as the conceptualization proposed by[2], the study aims to explore how deep learning–oriented instruction—particularly when integrated with cooperative and project-based tasks—can enhance learners' speaking performance, confidence, and critical thinking. By situating the research within these recent empirical and conceptual foundations, the study seeks to contribute to a growing body of literature on innovative, technology-informed, and student-centered approaches to teaching speaking in EFL classrooms.

In recent years, second/foreign language education has shifted from a behavioristic, transmission-oriented model toward a more cognitive and student-centered paradigm. Within English as a Foreign Language (EFL) contexts, speaking remains one of the most challenging yet essential skills for learners, as it directly reflects their ability to communicate meaningfully in real-life situations. Despite the growing emphasis on communicative language teaching, many EFL classrooms still struggle to develop learners' speaking fluency, interactional competence, and critical thinking in a balanced and sustainable way[1], [3], [4].

One promising response to this challenge is the integration of deep learning principles in English Language Teaching (ELT). Deep learning emphasizes understanding, reflection, and the application of knowledge in authentic contexts rather than mere memorization of formulas or structures. Within ELT, this approach encourages learners to engage with language in meaningful tasks, connect concepts across domains, and reflect critically on their own learning processes. As [2] conceptualize, deep learning in ELT can be operationalized through cooperative learning strategies, where students work collaboratively, negotiate meaning, and co-construct knowledge while practicing speaking skills. In this model, learners are not passive recipients of language input; instead, they actively participate in dialogic exchanges, give and receive feedback, and develop both linguistic and metacognitive competencies[3], [4].

Alongside cooperative learning, the integration of project-based learning (PBL) with deep learning principles has also shown considerable potential in fostering speaking fluency and critical thinking in EFL settings [1]. In PBL-oriented deep learning, students engage in extended tasks that require inquiry, collaboration, and real-world application, such as designing projects, presenting findings, and discussing outcomes in English. These activities naturally push learners to produce more complex and extended speech, to negotiate meaning with peers, and to justify their ideas—all of which support the development of speaking fluency and higher-order thinking skills[1]. Moreover, when PBL is embedded within deep learning frameworks, teachers can design learning experiences that are not only linguistically rich but also cognitively challenging and personally relevant to students.

Recent studies further clarify how deep learning can be implemented in the EFL classroom in ways that are mindful, meaningful, and joyful for learners. Zhang, et.all[5] , for instance, outlines practical strategies for implementing deep learning in EFL contexts, emphasizing the importance of relevance, authenticity, and emotional engagement in language tasks. Such strategies often include problem-based activities, collaborative discussions, and student-driven projects that align with learners' interests and real-world needs[4]. In this sense, deep learning is not only a cognitive framework but also an affective one that aims to reduce speaking anxiety, increase motivation to communicate, and foster a more positive attitude toward speaking in English through meaningful and emotionally engaging language tasks.

In contrast, in Indonesian context, the integration of deep learning–oriented instruction has been increasingly recognized as a viable approach to enhance both speaking performance and critical

ISSN: 2339-2940
E-ISSN: 2614-8633

thinking. [6] Dewi and Dalimunthe, for example, report that Indonesian EFL teachers perceive deep learning–oriented instruction—such as inquiry-based tasks, collaborative speaking activities, and reflective discussions—as particularly effective in encouraging students to express ideas more fluently and to think critically about language[6]. These teachers also highlight the importance of creating a supportive classroom environment where errors are treated as opportunities for learning rather than sources of judgment, a condition that is especially crucial for developing speaking confidence among Indonesian learners.

Beyond the classroom level, Zhang, Saleem, and Pasaribu along with Tiana D.M. Fitriyah provide a broader perspective on the role of deep learning in English language acquisition in general[7]. They argue that deep learning supports learners' engagement with language at multiple levels—lexical, syntactic, pragmatic, and sociocultural—by encouraging them to use English in rich, context-bound, and purposeful ways. In deep learning–oriented environments, learners are expected to interpret, analyze, and evaluate language use, not merely to reproduce it mechanically. This perspective aligns with previous research that has examined deep learning, suggesting that it can enhance vocabulary retention, grammatical accuracy, and discourse-level competence, all of which are closely related to speaking proficiency.

At the same time, offers a more general overview of the utilization of deep learning in education, highlighting its potential to transform traditional teaching practices into more learner-centered and inquiry-driven experiences. In language education, this transformation implies a shift from teacher-led drills and isolated grammar exercises toward integrated, communicative, and project-based learning. When applied to EFL speaking in the Indonesian context, such a shift means that learners are positioned as active meaning-makers who negotiate, explain, argue, and reflect—in English—rather than as passive repeaters of pre-set models. In Indonesia, this deep learning approach has been implemented in university-level speaking courses, particularly in the "Speaking English for IT" course for first-semester students in the Faculty of Information and Communication Technology at Universitas Teknologi Mataram. In this course, deep learning is operationalized through collaborative speaking tasks, project-based assignments (such as designing technical presentations and conducting interviews in English), and AI-assisted feedback systems that provide real-time pronunciation correction and fluency assessment. Indonesian EFL teachers report that such deep learning-oriented instruction encourages students to express ideas more fluently and think critically about language use in technology-related contexts[8], [9].

Given these developments, the present study investigates the effect of a deep learning approach on students' speaking ability in an EFL classroom. Drawing on the work of[1], [10], [11], [12], the study aims to explore how deep learning–oriented instruction—particularly when integrated with cooperative and project-based tasks—can enhance learners' speaking performance, fluency, and critical thinking. By situating the research within these recent empirical and conceptual foundations, the study seeks to contribute to a growing body of literature on innovative, student-centered approaches to teaching speaking in EFL classrooms, especially in the Indonesian educational context at the university level, specifically among first-semester undergraduate students.

Recent empirical studies also demonstrate how deep learning can be applied to analyze and enhance actual speaking performance in EFL contexts[4], [13], [14] for example, employ deep learning techniques to conduct multimodal analyses of public speaking performances by EFL learners, particularly focusing on facial movement and nonverbal behavior. Their work shows that successful speakers tend to use more expressive and contextually appropriate facial gestures, which can be systematically observed and interpreted through machine-learning models. This finding is consistent with previous studies on facial expression recognition in speaking subjects , which demonstrate that deep learning models can accurately capture and analyze nonverbal communication patterns, including facial movements and gestures, during speech production[4], [15].

Within the EFL speaking classroom, the role of dialogic feedback is crucial for scaffolding deep learning processes. [16] investigate how dialogic feedback in online learning environments can promote deep learning for EFL speaking learners. They report that when teachers and peers provide interactive, question-based, and elaborative feedback—rather than simple correction—students are more likely to reflect on their language use, justify their choices, and revise their output. In such dialogic interactions, learners gradually move from surface-level corrections (e.g., fixing a single word) to deeper engagement with meaning, organization, and rhetorical effectiveness. This suggests

ISSN: 2339-2940
E-ISSN: 2614-8633

that feedback itself can function as a mechanism to trigger deep learning, especially when it is embedded in collaborative speaking tasks.

The integration of deep learning with project-based learning and learner autonomy further strengthens its impact on speaking skills[11]. examine the impact of deep learning–oriented project-based learning on students' English speaking skills in an Indonesian EFL context. Their findings indicate that when learners engage in authentic, long-term projects—such as designing presentations, conducting interviews, or producing short videos—they not only improve their fluency and accuracy but also develop a stronger sense of responsibility for their learning . Learner autonomy, in particular, plays a mediating role: students who are encouraged to set their own goals, select resources, and monitor their progress tend to show more sustained engagement and higher speaking performance . In other words, deep learning–oriented PBL appears to foster both linguistic development and metacognitive self-regulation. While previous research has examined deep learning-oriented PBL primarily in high school contexts, this study extends prior research by focusing on first-semester university students in the "Speaking English for IT" course, where technical and professional speaking skills are essential. Additionally, this study integrates AI-assisted feedback with deep learning–oriented PBL, which has not been extensively explored in Indonesian university speaking classes. Therefore, this study completes previous research by (1) shifting the focus from high school to university-level first-semester students, (2) combining AI-assisted feedback with cooperative and project-based deep learning tasks, and (3) using a quasi-experimental design to measure statistically significant effects on multiple dimensions of speaking ability[3].

This connection to self-regulation is also emphasized in studies of Indonesian EFL learners[17], for instance, explore deep learning self-regulation strategies employed by Indonesian EFL learners during speaking tasks. They identify strategies such as goal setting, time management, self-monitoring, and reflection on performance as key elements that support learners' engagement in deep learning activities. When learners actively regulate their learning—by planning how to prepare for a speaking task, evaluating their own performance, and seeking feedback—they are more likely to internalize language knowledge and apply it flexibly in subsequent speaking events. In this way, self-regulation becomes a bridge between deep learning principles and observable improvements in speaking ability.

Taken together, these studies suggest that deep learning in EFL speaking instruction is not limited to a single method or technique, but rather involves a constellation of practices—multimodal analysis, dialogic feedback, project-based tasks, learner autonomy, and self-regulation—that collectively shape how students engage with language. By drawing on this body of work, the present study seeks to further explore how a deep learning approach, implemented through cooperative and project-oriented speaking tasks, can influence Indonesian EFL learners' speaking ability, confidence, and self-regulation in the classroom.

In recent years, the integration of Artificial Intelligence (AI) into English language learning has opened new pathways for enhancing speaking skills among EFL learners. Systematic reviews by Syair and Mujahid and Xing confirm that AI-assisted technologies—such as intelligent conversation agents, speech recognition systems, and intelligent feedback platforms—can significantly improve learners' pronunciation, fluency, and willingness to communicate in global EFL contexts. These reviews highlight that AI tools provide immediate, personalized feedback, reduce production anxiety, and increase opportunities for repeated practice outside the formal classroom. While these systematic reviews primarily focus on global contexts, recent studies in Indonesia also demonstrate similar benefits. For example, Indonesian EFL learners at vocational high schools and universities who use AI tools such as TalkPal.AI show significant improvements in speaking skills through real-time feedback. In this context, AI is not merely a supplementary gadget but a pedagogical mediator that supports the development of speaking competence through continuous, data-informed interaction both globally and in the Indonesian educational context[17].

At the same time, studies on the integration of AI in English Language Teaching (ELT) emphasize both the opportunities and challenges associated with its adoption. Handayani, Hermansyah, Rahim, and Sain for example, discuss how AI can enhance vocabulary instruction, writing practice, and speaking tasks while also raising concerns about teacher readiness, equity of access, and the potential over-reliance on technology . Their work suggests that AI-integrated ELT requires careful curriculum design, professional development, and ethical considerations. In parallel, McLean, Mcfulfia, and

ISSN: 2339-2940
E-ISSN: 2614-8633

Nugraha argue that the digital age calls for a re-conceptualization of teaching that combines deep learning principles with technological integration. They propose that when AI tools are embedded within deep learning frameworks—such as project-based, collaborative, and reflective tasks—learners are not only more competent in language use but also more critically aware of their learning processes[18], [19].

These developments suggest that contemporary EFL speaking instruction is increasingly shaped by the convergence of deep learning pedagogy and AI-enabled environments. Within this landscape, alternative models of deep learning have also emerged to bridge cognition and pedagogy in innovative ways. Mahayanti, Rismadewi, Asril, Tirtayani, and Laba , for instance, propose a transcendental meditation-based deep learning model in ELT that emphasizes mindfulness, reduced anxiety, and holistic engagement with language. While their model is distinct from AI-driven approaches, it shares a common goal: creating learning conditions where learners are cognitively, emotionally, and socially involved in language use[20].

However, despite the growing body of research on deep learning and AI in EFL, several research gaps remain. First, most studies on deep learning-oriented instruction have focused on high school contexts or general EFL populations without specifying educational level, with limited research examining its effect on first-semester university students. Second, while AI-assisted speaking instruction has been studied systematically in global contexts , its integration with deep learning principles in Indonesian university Speaking courses remains underexplored. Third, previous research has examined deep learning components separately (e.g., dialogic feedback , multimodal analysis, self-regulation), but few studies have investigated how these components work together through cooperative and project-based tasks with AI-assisted feedback in a quasi-experimental design. This study addresses these gaps by (1) focusing on first-semester university students rather than high school students, (2) integrating AI-assisted feedback with deep learning-oriented cooperative and project-based tasks in an Indonesian university context, and (3) using a quasi-experimental design with pre-test and post-test to measure statistically significant effects on speaking ability across multiple dimensions (fluency, pronunciation, vocabulary, grammar, and coherence)[3], [4].

Taken together, these studies indicate that deep learning in EFL speaking can be operationalized through multiple pathways—be it technology-integrated, AI-assisted, or mindfulness-oriented—provided that the core principles of meaningful engagement, reflection, and autonomy are preserved. Grounded in this evolving body of scholarship and addressing the identified research gaps, the present study explores the effect of a deep learning approach on Indonesian EFL learners' speaking ability at Universitas Teknologi Mataram, with particular attention to how AI-assisted and project-based tasks interact with deep learning principles to foster speaking fluency, confidence, and self-regulation among first-semester students.

II. Method

1. Research design

This study employs a quasi-experimental design with a pre-test and post-test control group to investigate the effect of a deep learning approach integrated with AI-assisted speaking instruction on students' speaking ability in an EFL classroom. The study is guided by the following hypothesis: H_1: There is a significant effect of the deep learning approach integrated with AI-assisted speaking instruction on students' speaking ability compared to conventional instruction. The design involves two groups: (1) a treatment group exposed to a deep learning-oriented speaking instruction integrated with AI-assisted feedback, and (2) a control group taught through conventional EFL speaking instruction without the integration of AI and deep learning tasks. This design follows the pattern of recent experimental studies that examine the impact of AI-powered tools and deep learning-based instruction on speaking performance (e.g.,[21], [22]. By comparing pre-test and post-test speaking scores between the two groups, the study seeks to determine whether the intervention has a statistically significant effect on speaking ability.

2. Subject of the research

The population of this study consists of 150 first-semester students enrolled in the Faculty of Information and Communication Technology at Universitas Teknologi Mataram. A sample of 60 students was selected from this population: 30 students assigned to the treatment group and 30

ISSN: 2339-2940
E-ISSN: 2614-8633

students to the control group. The sample was determined using Slovin's formula with an acceptable margin of error of 10%, ensuring that the sample adequately represents the population. The students were selected through purposive sampling to include those who were enrolled in the compulsory English Speaking course and who had not previously received AI-assisted speaking instruction[23], [24], [25].

Purposive sampling is fit to this study because it allows the researcher to deliberately select participants who possess specific characteristics relevant to the research phenomena: (1) being first-semester students who are new to university-level EFL instruction, (2) enrolled in the compulsory English Speaking course, and (3) having no prior experience with AI-assisted speaking instruction. This sampling technique ensures that the selected participants can deliberately represent the core phenomena under investigation and allows for ideal participant selection, which is essential for experimental studies where participants need to have specific prior knowledge or lack of prior exposure to the intervention. This sampling strategy is consistent with several recent studies that investigate AI-driven mobile learning and AI-mediated assessment in EFL contexts[22], [26], [27].

3. Instrument in collecting the data

The primary instruments used to collect data are speaking pre-tests and post-tests in the form of structured speaking tasks administered before and after the intervention. The tasks require students to (1) describe pictures, (2) narrate events, or (3) respond to short prompts in English, while their performances are recorded and assessed based on fluency, pronunciation, vocabulary, grammar, and overall coherence. To explain how the deep learning approach was used as an experiment tool, the treatment group received deep learning-oriented speaking instruction that was implemented through the following specific strategies: (1) cooperative learning tasks where students worked collaboratively in pairs or small groups to negotiate meaning and co-construct knowledge while practicing speaking skills; (2) project-based learning activities such as designing presentations, conducting interviews, or producing short videos in English that require inquiry, collaboration, and real-world application; (3) reflective discussions where students critically reflect on their own learning processes and justify their language choices; and (4) inquiry-based tasks that encourage students to connect concepts across domains and engage with language in meaningful, authentic contexts. These deep learning strategies align with conceptualizations of deep learning in ELT that emphasize understanding, reflection, and application rather than mere memorization.

To support the speaking assessment, the treatment group utilized an AI-based speaking application inspired by recent work on AI-powered speech recognition and AI-mediated assessment Dennis and Nutpratha, T. A. Dakhil, . The kind of AI-mediated assessment used in this study is AI-powered speech recognition technology that provides real-time automated feedback on pronunciation, intonation, fluency, and grammatical accuracy. Specifically, the application functions as an intelligent conversation agent similar to TalkPal.AI or ELSA Speak, which offers immediate, personalized feedback, reduces production anxiety, and increases opportunities for repeated practice outside the formal classroom. The application provides diagnostic feedback that helps learners identify pronunciation errors, fluency issues, vocabulary gaps, and grammatical inaccuracies, enabling them to move past obstacles that hinder their speaking development. In addition, the study draws on the technical foundations of deep learning in speech processing and automatic facial expression recognition to enrich the understanding of multimodal speaking performance, even if full facial recognition is not implemented in this particular study[24], [28], [29].

4. Data analysis techniques

The quantitative data obtained from the pre-test and post-test scores are analyzed using the Statistical Package for the Social Sciences (SPSS). The data from the experimental and control groups are processed through descriptive statistics, including mean scores, standard deviations, and frequency distributions, to summarize the students' speaking performance before and after the treatment. After that, paired-sample t-tests are used to examine whether there is a significant difference between the pre-test and post-test scores within each group. In addition, an independent-samples t-test is applied to compare the post-test scores between the experimental and control groups in order to determine whether the deep learning-oriented, AI-assisted instruction has a greater effect than conventional instruction. These procedures are consistent with recent studies on AI-enhanced speaking skills and quasi-experimental designs in EFL contexts[22], [30], [31].

ISSN: 2339-2940
E-ISSN: 2614-8633

III. Results

Table 1 presents the descriptive statistics for the experimental and control groups in the pre-test and post-test. The experimental group obtained a mean score of 61.20 in the pre-test and 78.90 in the post-test, with standard deviations of 6.45 and 5.80, respectively. Meanwhile, the control group achieved a mean score of 60.85 in the pre-test and 69.40 in the post-test, with standard deviations of 6.10 and 6.25, respectively. These results indicate that both groups started the study at a relatively similar level of speaking ability, as reflected by the close pre-test means (61.20 and 60.85). This initial equivalence is important because it suggests that the participants possessed comparable speaking proficiency before the intervention, thereby reducing the possibility that post-test differences resulted from pre-existing ability gaps. Similar baseline conditions have been emphasized in quasi-experimental studies on EFL speaking instruction, where comparable pre-test scores are considered essential for ensuring the internal validity of treatment effects [17], [18]. Such initial similarity is important because it suggests that any later difference in performance is more likely attributable to the treatment rather than to pre-existing disparities between the two groups.

After the treatment, however, the experimental group showed a much greater improvement than the control group. The increase in the experimental group's mean score from 61.20 to 78.90 represents a gain of 17.70 points, indicating substantial improvement in students' speaking performance. This improvement suggests that students developed stronger fluency, pronunciation, vocabulary use, grammatical accuracy, and overall coherence during speaking tasks. The magnitude of this gain is consistent with previous studies reporting that deep learning-oriented instruction and AI-assisted speaking practice contribute significantly to oral language development. For example, Sukariani, Agung, and Sulindawati[11]found that deep learning-oriented project-based learning enhanced students' speaking fluency and communicative competence through meaningful and collaborative learning activities. Similarly, Dennis and Nutprapha [21] reported that AI-powered speech recognition technology improved learners' pronunciation and speaking skills by providing immediate and personalized feedback. These findings support the interpretation that the substantial gain observed in the experimental group resulted from the integration of deep learning principles, collaborative learning, and AI-assisted speaking practice. Whereas the control group improved more modestly from 60.85 to 69.40, the experimental group demonstrated greater progress, suggesting that the intervention was more effective in promoting speaking development.

Table 1. Descriptive Statistics

Group	N	Mean	Std. Deviation
Experimental Pre-test	30	61.20	6.45
Experimental Post-test	30	78.90	5.80
Control Pre-test	30	60.85	6.10
Control Post-test	30	69.40	6.25

Before presenting the results in Table 2, it is important to examine whether the data meet the assumption of normality, since this determines the suitability of subsequent parametric tests. In this study, the Kolmogorov–Smirnov test was used to assess the distribution of scores in both groups. Normality testing is essential because parametric analyses require data to be normally distributed in order to produce valid statistical inferences. Similar procedures were employed in previous quasi-experimental studies examining the impact of AI-mediated language learning interventions on EFL learners' speaking performance[22].

Table 2. Normality Test

Group	N	Sig. (KS)
Experimental	30	0.20
Control	30	0.12

Table 2 shows that the experimental group obtained a significance value of 0.20, while the control group obtained 0.12. Because both values are greater than 0.05, the data from the two groups can be regarded as normally distributed. This means that the score distributions did not deviate significantly from normality, so the data satisfied one of the main assumptions required for parametric analysis.

ISSN: 2339-2940
E-ISSN: 2614-8633

Before conducting the independent samples t-test, it is necessary to verify whether the variance of the two groups is equal. This step ensures that the statistical comparison is valid and that the assumption of homogeneity has been properly met.

Table 3. Homogeneity Test

Test	F	df	Sig.
Based on Mean	2.11	58	0.15

Table 3 shows that the homogeneity test result based on Levene's test produced a significance value of 0.15. Since this value is greater than 0.05, the variances of the experimental and control groups can be considered homogeneous. The fulfillment of the homogeneity assumption suggests that the variability of scores across groups was sufficiently similar, allowing for a valid comparison of mean differences through an independent samples t-test. Similar statistical procedures have been employed in previous studies investigating the effects of AI-assisted language learning interventions on EFL learners' speaking performance[22].

Table 4 presents the results of the independent samples t-test. The analysis yielded a t-value of 5.21 with 58 degrees of freedom and a two-tailed significance value of 0.000. Because the significance value is below 0.05, there was a statistically significant difference between the experimental and control groups. The mean difference of 9.5 points further indicates that the experimental group outperformed the control group in speaking achievement.

Table 4. Independent Samples T-Test

Assumption	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	5.21	58	0.000	9.5

IV. Discussion

The findings demonstrate that the deep learning approach had a significant positive effect on students' speaking ability. The experimental group's post-test mean score was markedly higher than that of the control group, suggesting that the treatment facilitated greater improvement in oral performance. In the present study, the treatment consisted of deep learning-oriented instruction integrated with collaborative speaking activities, project-based tasks, reflective learning processes, and AI-assisted feedback on pronunciation and fluency. Through these activities, students were encouraged to actively construct meaning, interact with peers, solve communicative problems, and revise their speaking performance based on feedback. These learning experiences provided more opportunities for authentic language use than the conventional instruction received by the control group.

This result is consistent with[11], who found that deep learning-oriented project-based learning and learner autonomy contributed positively to students' English speaking skills. The similarity between their study and the present research lies in the emphasis on active student participation, collaborative learning, meaningful tasks, and learner responsibility. In both studies, students were required to engage actively in speaking activities rather than merely receiving teacher-centered instruction. Such active engagement, learner responsibility, and task-based interaction appear to support speaking development by increasing opportunities for language production, negotiation of meaning, and self-reflection during the learning process.

The present findings also align with[31], who reported that a deep learning approach could enhance English listening and speaking skills when instruction is aligned with core competences. In their study, deep learning was implemented through meaningful learning activities that required students to apply language knowledge in authentic contexts, think critically, and participate actively in communication tasks. Similarly, in the present study, students were involved in collaborative discussions, project-based speaking tasks, and AI-assisted speaking practice, which encouraged them to process language more deeply and use English for meaningful communication. As a result, speaking improvement appears to emerge not from repetitive drills but from sustained engagement in authentic learning experiences that promote fluency, pronunciation, vocabulary development, and communicative confidence.

ISSN: 2339-2940
E-ISSN: 2614-8633

In addition, the significant gain in the experimental group may be associated with the use of AI-assisted speaking practice and feedback. Previous studies have shown that AI-based tools can provide immediate feedback on pronunciation, fluency, and speaking accuracy, thereby helping learners refine their oral output more effectively.[32], for example, emphasizes that real-time feedback contributes to better speaking performance because learners can identify errors at the point of production and revise them promptly. Similarly[33], found that automatic speech recognition technology can improve pronunciation and overall speaking skills in second language learning. These findings support the interpretation that the present treatment was effective because it combined deep learning principles with technology-supported speaking practice. Specifically, deep learning principles were applied through meaningful communication tasks, collaborative learning activities, reflective revision of speaking performance, and learner-centered engagement. The AI-assisted tools supported these principles by providing immediate feedback on pronunciation and fluency, enabling students to reflect on their performance, identify weaknesses, and make continuous improvements. Rather than merely practicing language forms through repetition, students were encouraged to engage in authentic speaking tasks, evaluate feedback critically, and actively construct their speaking competence through repeated cycles of practice, reflection, and revision. This combination of meaningful learning experiences and technology-mediated feedback appears to have contributed to the substantial improvement observed in the experimental group.

The results also correspond with [34] and [35] who reported that personalized, technology-enhanced speaking environments can improve learner performance and willingness to communicate. Deep learning in this study likely worked not only as a pedagogical framework but also as a mechanism for personalization, collaboration, and sustained engagement. From this perspective, the significant improvement in speaking ability reflects both cognitive development and increased learner involvement in the learning process.

Furthermore, the present findings have practical implications for EFL instruction in higher education. [6] reported that teachers in Indonesian EFL classrooms perceive deep learning-oriented instruction as a promising approach for promoting students' speaking ability and critical thinking through meaningful and student-centered learning activities. This finding is relevant to the current study because the experimental group was also engaged in deep learning-oriented activities, including collaborative speaking tasks, project-based learning, reflective practice, and AI-assisted feedback. The significant improvement observed in the experimental group suggests that such instructional practices can effectively enhance speaking performance in higher education EFL contexts. In addition,[15], [36], [37] similarly emphasize that supportive communicative learning environments can strengthen learners' oral performance by reducing speaking anxiety and encouraging active participation. Therefore, the current results reinforce the importance of integrating cognitive, social, and technological dimensions into EFL speaking instruction to promote meaningful language learning and sustained speaking development.

The statistical analysis confirmed that the experimental group significantly outperformed the control group in speaking achievement, with a mean difference of 9.5 points and a significance value of 0.000. These results indicate that the deep learning approach was effective in improving students' speaking ability in the EFL classroom. The findings are consistent with prior research on deep learning-oriented instruction, AI-assisted speaking practice, and learner-centered language teaching.

V. Conclusion

The present study demonstrates that the deep learning approach significantly improved the speaking ability of first-semester students in an Indonesian higher education EFL context. The experimental group achieved a higher post-test mean score than the control group, and the independent samples t-test confirmed that the difference was statistically significant. These findings indicate that deep learning-oriented instruction, implemented through collaborative speaking activities, project-based tasks, reflective learning processes, and AI-assisted feedback, can serve as an effective pedagogical strategy for enhancing students' speaking performance in higher education settings.

The findings are consistent with previous studies showing that AI-assisted and deep learning-based language instruction can support speaking development by providing opportunities for meaningful communication, continuous practice, and timely feedback[13], [17]. In the present study, students were encouraged to engage actively in authentic speaking tasks, collaborate with peers, reflect on their

ISSN: 2339-2940
E-ISSN: 2614-8633

performance, and utilize AI-generated feedback to improve pronunciation and fluency. These learning experiences appear to have contributed to the substantial improvement observed in the experimental group.

The study therefore suggests that integrating deep learning principles with AI-supported speaking activities can create a more engaging and effective learning environment for developing speaking skills among EFL learners. Future studies may extend this research by involving larger samples, longer intervention periods, and different educational levels to further examine the effectiveness of deep learning-oriented instruction in language learning contexts.

These results also align with[22] who found that AI integration in English language teaching can enhance speaking and vocabulary learning while also demanding teacher readiness, infrastructure, and ethical attention. In addition, [38] highlight that deep learning-oriented instruction is perceived by teachers as valuable for fostering speaking and critical thinking in Indonesian EFL classrooms. [12] further argue that deep learning and technological integration are increasingly important in supporting EFL learners in the digital age, particularly when learners are encouraged to engage actively, reflect critically, and learn autonomously.

In practical terms, the present findings suggest that teachers should consider combining deep learning principles with collaborative tasks, guided practice, and AI-supported feedback to strengthen speaking instruction. Such an approach may help learners improve speaking fluency, pronunciation, vocabulary use, grammatical accuracy, and coherence while encouraging active participation in speaking activities. Future research may further investigate whether deep learning-oriented instruction also influences affective factors such as speaking confidence, motivation, and self-regulation, which were not directly examined in the present study.

References

[1] R. Rampeng, R. J. Hamid, R. A. Maing, and S. Sujariati, "Integrating Project-Based Learning and Deep Learning Principles to Foster Speaking Fluency and Critical Thinking in EFL," *Jo-ELT (Journal of English Language Teaching) Fakultas Pendidikan Bahasa & Seni Prodi Pendidikan Bahasa Inggris IKIP*, vol. 12, no. 2, pp. 510–520, Dec. 2025, doi: https://doi.org/10.33394/jo-elt.v12i2.17578.

[2] S. Safira and P. Astuti, "Conceptualizing the Implementation of Deep Learning in ELT through Cooperative Learning for Teaching Speaking Skills at the High School Level," 2025. doi: https://doi.org/10.15294/jpp.v42i2.30754.

[3] M. Faqih Al Farisi and F. Susanto, "The Effect of Project-Based Learning on Speaking Skills: A Quasi-Experimental Study in a Sports-Talent High School," *Journal of Innovation in Teaching and Instructional Media*, vol. 6, no. 1, pp. 479–490, doi: https://doi.org/10.52690/jitim.v6i1.1386.

[4] T. Oktavianingsih, L. Holman Siahaan, Y. Rusmiati, and I. / Lembaga Penulis, "The Effect of Online Learning Educational Content Video on Social Media on Student Speaking Skills at SMP Al-Hidayah Kota Bekasi." doi: http://dx.doi.org/10.33365jorle.v6i2.353.

[5] N. N. Benu, N. Beeh, and S. A. Nenotek, "Implementing Deep Learning in the EFL Classroom: Strategies for Fostering Mindful, Meaningful and Joyful Language Learning," *LedTure Journal on Language*, vol. 3, no. 1, 2025, doi: https://doi.org/10.33323/l.v3i1.64.

[6] U. Dewi and M. Dalimunthe, "Article History: Integrating Deep Learning-Oriented Instruction in Indonesian EFL Classrooms: Teachers' Perspectives," *Jurnal Ilmiah Religiosity Entity Humanity (JIREH)*, vol. 8, no. 1, pp. 1–8, 2026, doi: https://doi.org/10.37364/jireh.v8i1.673.

[7] D. M. Tiana, F. Fitriyah, R. Lestari, and A. Aprillia, "The Influence of Students' Anxiety on Speaking Performance in EFL Large Class: A Survey Study," *Scope : Journal of English Language Teaching*, vol. 8, no. 2, p. 342, May 2024, doi: http://dx.doi.org/10.30998/scope.v8i2.19537.

[8] A. Nan Cendikia and T. Wintolo Apoko, "Examining the Efficacy of the Project-Based Learning in Enhancing English-Speaking Skills among Students," *International Journal of Research in Education*, vol. 5, no. 2, pp. 2745–3553, 2025, doi: http://dx.doi.org/10.26877/ijre.v5i2.2018.

ISSN: 2339-2940
E-ISSN: 2614-8633

[9] E. Ani, A. Senjaya, and A. Muhtadi, "The Effectiveness of the Flipped Classroom Method on Students' Speaking Ability: A Meta-Analysis Study," vol. 25, no. 1, pp. 140–153, 2023, doi: http://dx.doi.org/10.21009/JTP2001.6.

[10] Q. Zhang, A. Saleem, and G. Rahis Pasaribu, "The Role of Deep Learning in Improving English Language Acquisition," vol. 3, 2025, doi: https://doi.org/10.61721/pebsas.v3i2.601.

[11] A. Sri Ayu Sukariani, A. Agung Gede Agung, and N. Luh Gede Erni Sulindawati, "The impact of deep learning–oriented project-based learning and learner autonomy on students' english speaking skills," *SCHOULID: Indonesian Journal of School Counseling*, vol. 10, no. 3, pp. 168–177, Dec. 2025, doi: https://doi.org/10.23916/086792011.

[12] A. Wahyuni B, S. Maneba, and N. Syafitri, "Deep Learning Self-Regulation Strategies of Indonesian Learners of English as a Foreign Language," *PANYONARA: Journal of English Education*, vol. 7, no. 2, Sep. 2025, doi: https://doi.org/10.19105/panyonara.v7i2.20622.

[13] Chuxuan Xing, "A Systematic Review on Artificial Intelligence (AI) Technologies in ESL/EFL Speaking Skills," *International Journal of TESOL Studies*, Sep. 2025, doi: https://doi.org/10.58304/ijts.250908.

[14] S. Bursic, G. Boccignone, A. Ferrara, A. D'Amelio, and R. Lanzarotti, "Improving the accuracy of automatic facial expression recognition in speaking subjects with deep learning," *Applied Sciences (Switzerland)*, vol. 10, no. 11, Jun. 2020, doi: https://doi.org/10.3390/app10114002.

[15] E. Donati, C. Chousidis, H. D. M. Ribeiro, and N. Russo, "Classification of Speaking and Singing Voices Using Bioimpedance Measurements and Deep Learning," *Journal of Voice*, vol. 39, no. 5, pp. 1163–1170, Sep. 2025, doi: https://doi.org/10.1016/j.jvoice.2023.03.018.

[16] P. Arinda and I. S. Sadikin, "Dialogic Feedback to Promote Deep Learning for EFL Speaking Learners in Online Learning Environment: Students' Voices," vol. 4, no. 5, 2021, doi: https://doi.org/10.22460/project.v4i5.p803-813.

[17] S. Nurazizah Syair and K. Mujahid, "IDEAS Journal on Language Teaching and Learning, Linguistics and Literature Artificial Intelligence as an Assisted-Language Learning Tool: A Systematic Review of Its Efficacy in Enhancing Speaking Skills Among EFL Learners," vol. 13, no. 2, pp. 7955–7981, 2025, doi: https://doi.org/10.24256/ideas.v13i2.9004.

[18] F. Handayani, S. Hermansyah, T. R. Rahim, and Y. Sain, "The Integration of Artificial Intelligence in English Language Teaching: Opportunities and Challenges," 2026. doi: https://journal.adityarifqisam.org/index.php/macca/article/view/258.

[19] H. Y. Mclean, H. Y. Mcfulfia, and R. E. Nugraha, "Empowering EFL Learners in the Digital Age: The Role of Deep Learning and Technological Integration," *Arus Jurnal Sosial dan Humaniora*, vol. 5, no. 3, pp. 4582–4592, 2025, doi: https://jurnal.ardenjaya.com/index.php/ajsh.

[20] N. W. S. Mahayanti, N. W. M. Rismadewi, N. C. Asril, L. A. Tirtayani, and M. Laba, "Bridging Cognition and Pedagogy: A Transcendental Meditation-Based Deep Learning Model in English Language Teaching," *Journal of Educational Study (JoES)*, vol. 6, no. 1, pp. 86–104, 2026, doi: https://doi.org/10.36663/joes.v6i1.1142.

[21] Dennis and Nutprapha K, "Using AI-Powered Speech Recognition Technology to Improve English Pronunciation and Speaking Skills," *IAFOR Journal of Education: Technology in Education*, vol. 12, 2024, doi: https://doi.org/10.22492/ije.12.2.05.

[22] T. A. Dakhil, F. Karimi, R. A. U. Al-Jashami, and Z. Ghabanchi, "The Effect of Artificial Intelligence (AI)-Mediated Speaking Assessment on Speaking Performance and Willingness to Communicate of Iraqi EFL Learners," *International Journal of Language Testing*, vol. 15, no. 2, pp. 1–18, 2025, doi: https://doi.org/10.22034/ijlt.2024.486564.1383.

[23] D. Oktavianus and A. Rido, "Deep Learning in English Language Teaching: A Conceptual Paper," *Journal of Research on Language Education (JoRLE)*, vol. 6, no. 2, pp. 1–10, 2025, doi: http://dx.doi.org/10.33365jorle.v6i2.353.

[24] Y. Rahmawati, S. W. Fitriati, Widhiyanto, and S. Wahyuni, "A Four-Stranded Approach to AI-Assisted Pre-Class Learning Modules: EFL Teachers' Practices in Designing Daily Conversation Content for Flipped Classrooms," *Language Teaching Research Quarterly*, vol. 49, pp. 90–112, 2025, doi: http://dx.doi.org/10.32038/ltrq.2025.49.05.

ISSN: 2339-2940
E-ISSN: 2614-8633

[25] W. Kusmaryani, Ramli, and Winarno, "Effectiveness of AI Speech Recognition on Students' English Pronunciation," *Script Journal: Journal of Linguistics and English Teaching*, vol. 11, no. 1, pp. 77–98, Apr. 2026, doi: http://dx.doi.org/10.24903/sj.v11i1.2282.

[26] R. M. Putra, M. Rasuki, and I. Astutik, "AI-Driven Mobile Learning in Enhancing Learners' Speaking Confidence in EFL Context," Online, 2026. doi: https://doi.org/10.47200/aoej.v17i1.3338.

[27] K. Anwar and N. Maruf, "Artificial intelligence on EFL in vocational high school: the impact of Talkpal.AI on speaking skill," *Indonesian EFL Journal*, vol. 11, no. 3, p. 625, 2025, doi: https://doi.org/10.25134/ieflj.v11i3.41.

[28] M. S. Aras and M. Ybnu, "Using Talk PAL AI to Enhance Speaking Skills: An Experimental Study Among EFL Learners," *Journal of Education Science*, vol. 5, no. 1, pp. 348–359, 2026, doi: https://doi.org/10.58917/aijes.v5i1.556.

[29] Y. A. Telaumbanua, A. Gulo, F. Gea, R. I. Ndruru, and C. A. Maulana, "English Teacher's Modeling and Deep Learning in Overcoming Students' Vocabulary and Speaking Confidence Issues," *JOURNAL OF EDUCATION*, vol. 6, no. 2, pp. 311–324, 2025, doi: http://dx.doi.org/10.54168/ahje.v6i2.493.

[30] Y. Wang, "Exploring student engagement with multimodal generative AI in task-based Chinese language learning," *Comput. Assist. Lang. Learn.*, 2026, doi: https://doi.org/10.1080/09588221.2026.2645428.

[31] K. Fan and L. Long, "Enhancing High School English Listening and Speaking Skills: A Deep Learning Approach Aligned with Core Competences," *Pacific International Journal*, vol. 7, no. 4, pp. 70–78, Aug. 2024, doi: https://doi.org/10.55014/pij.v7i4.654.

[32] L. Herlina, "The integration of artificial intelligence technology in english language learning to enhance speaking skills through real-time feedback," *Jurnal Konseling dan Pendidikan*, vol. 14, no. 1, pp. 57–68, Mar. 2026, doi: https://doi.org/10.29210/1188500.

[33] E. Akhter, "The Impact of Human-Machine Interaction on English Pronunciation and Fluency: Case Studies Using AI Speech Assistants," *Review of Applied Science and Technology*, vol. 04, no. 02, pp. 473–500, Jun. 2025, doi: https://doi.org/10.63125/1wyj3p84.

[34] Y. Liu, "Using Deep Learning and Swarm Intelligence to Achieve Personalized English-Speaking Education," *International Journal of Swarm Intelligence Research*, vol. 15, no. 1, 2024, doi: https://doi.org/10.4018/IJSIR.343989.

[35] W. Juan, H. H. Binti Ismail, and A. Z. Mansor, "Enhancing Chinese EFL Learners' Speaking Proficiency through AI-Integrated POA," *Educational Sciences: Theory and Practice*, vol. 25, no. 2, pp. 44–57, Jun. 2025, doi: https://doi.org/10.12738/jestp.2024.2.018.

[36] A. M. Ghufron, *Chapter 23: Nurturing Early Language Acquisition through Deep Learning in TEFL*. Rizquna, 2025.

[37] S. M. Abdelhalim and R. A. Alsehibany, "Integrating AI-powered tools in EFL pronunciation instruction: effects on accuracy and L2 motivation," *Comput. Assist. Lang. Learn.*, 2025, doi: https://doi.org/10.1080/09588221.2025.2534015.

[38] Z. Slam and N. Nugroho, "Model Talking Stick Based Deep Learning untuk Pengembangan High Order Thinking Skills Mahasiswa," *Prosiding Seminar Nasional FITK UIN Syarif Hidayatullah Jakarta*, vol. 2, no. 1, 2025, doi: https://doi.org/10.64277/semnas.v2i1.166.