



The Effect of Integrating Problem-Based Learning with Interactive Multimedia on Students' Communication Skills in Pancasila Education

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ABSTRACT

Effective communication skills are essential competencies in 21st-century learning; however, students often demonstrate limited ability to express ideas, engage in discussions, and respond appropriately in classroom interactions. This issue highlights the need for innovative instructional approaches that actively involve students in meaningful learning processes. Therefore, this study aims to examine the effect of implementing the Problem-Based Learning (PBL) model supported by interactive multimedia on students' communication skills. This study employed a quasi-experimental nonequivalent control group design. The participants consisted of 64 eleventh-grade students at SMA Negeri 9 Surabaya, divided into an experimental group ($n = 32$) and a control group ($n = 32$), selected through convenience sampling. Data were collected using a communication skills performance test administered as a pretest and posttest. The instrument was validated by experts to ensure content validity. Data analysis included normality and homogeneity tests, followed by an independent samples t-test to examine differences between groups. The results showed that the experimental group achieved a higher mean posttest score ($M = 90.63$) compared to the control group ($M = 81.09$). The independent samples t-test yielded a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference between the two groups. In conclusion, the implementation of PBL supported by interactive multimedia has a significant positive effect on students' communication skills. This approach promotes active engagement and meaningful learning, making it an effective strategy for improving communication skills in Pancasila Education.

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■ INTRODUCTION

The 21st-century learning process requires students to possess communication skills as a crucial competency in facing global challenges. Pancasila Education plays an important role in developing these skills. Through activities such as discussions, debates, and social case analysis, students are trained to think critically, logically, and analytically, and to express their ideas with proper communication ethics. To foster these abilities, a learning model is needed that encourages students to actively participate in the learning process, supports them in discovering knowledge independently, and effectively utilizes technology to create meaningful learning experiences (Bhardwaj et al., 2025; Kalyani, 2024; Riskayanti, 2021).

Communication skills are an essential component of 21st-century competencies (Budiyanto et al., 2024; Muldagaliyeva et al.,

2023; Oluwagbohunmi & Alonge, 2023; Zamora & Zamora, 2022; Mursidah et al., 2019). They are also one of the eight dimensions of the graduate profile included in the national graduate competency standards. According to the Ministry of Education (Kemendikbud, 2024), the communication dimension refers to individuals who are able to listen, read, speak, and write effectively and appropriately, in accordance with ethical norms across different communication modes. Given the importance of communication skills for students, learning activities need to be designed to facilitate the development of effective communication aligned with the graduate profile (Tacilla Ramirez et al, 2022; Thake, 2026; Thelma et al., 2024). Conversely, if the learning design is not student-centered, students will find it difficult to practice and improve their communication abilities. Appropriate instructional design and learning

models can significantly enhance students' communication skills. Based on preliminary observations at SMA Negeri 9 Surabaya, students demonstrate a basic level of communication ability; however, their skills are not yet well-structured. This is evident during classroom presentations, where some groups ask poorly organized questions, speak unclearly, and often engage in heated debates with other groups. These conditions indicate that students' communication skills still need improvement.

The potential for conflict in a pluralistic society is often perceived as difficult to understand because it is not directly connected to students' everyday social experiences. Issues such as stereotypes, prejudice, differences in interests, and social inequality are generally presented in a theoretical manner, without concrete examples relevant to daily life. As a result, students struggle to understand how conflicts can emerge and develop within interactions at school, in the community, or in digital spaces. In fact, Pancasila Education should play a role in fostering multicultural awareness and the ability to resolve conflicts fairly and civilly (Oktaviana et al., 2025; Setyawan et al., 2024; Sutrisno et al., 2021). The lack of contextual learning leaves students insufficiently trained to identify signs of conflict and determine appropriate resolution strategies. Initial observation findings also indicate that, although students have learned about diversity, there remains a tendency toward exclusivity and competitiveness among groups. For example, in group work, students tend to interact only with peers they consider to be part of their "own group" and are less open to collaborating with others. This behavior reflects early signs of small-scale disintegration. Therefore, a learning strategy is needed that connects concepts to real social situations, enabling students to understand the potential for conflict more comprehensively and to develop constructive conflict-resolution skills.

The quality of Pancasila Education learning is also influenced by the limitations of instructional media used by teachers. Most teachers still rely on conventional media such as PowerPoint slides and text-based materials that are predominantly one-way, providing little opportunity for students to explore and actively interact. Less interactive learning media can lead to low levels of student motivation, participation, and emotional engagement during the learning process (Li et al., 2024; Dubey et al., 2023; Barut Tugtekin & Dursun, 2022; Capone & Lepore, 2022; Nurgiansyah & Khoerudin, 2021). Research shows that

interactive multimedia can enhance student engagement and understanding of abstract concepts by integrating visuals, audio, and animations (Abdullahi et al., 2024; Chisunum & Nwadiokwu, 2024; Hossain, 2023; Kilag et al., 2023; Suman, 2023; Muir et al., 2022; Saputra & Nugroho, 2020). Therefore, the use of more interactive media has become an essential need to support the effectiveness of Pancasila Education learning, making it more engaging, communicative, and contextual in line with the demands of the digital era. The limited opportunities for students to express their opinions and evaluate others' ideas result in the loss of reflective and dialogical dimensions in the learning process. Thus, it is necessary to implement learning approaches that provide students with active roles in discussion, collaboration, and problem-solving so that their critical thinking and communication skills can develop optimally.

The current conditions indicate a gap between the ideal goals of Pancasila Education and its actual implementation in the classroom. Ideally, Pancasila Education should foster students' communication and collaboration skills through contextual and reflective learning activities. Such an approach is essential to ensure that students not only understand the Pancasila values theoretically but also apply them in their social, economic, and cultural lives (Adrian et al., 2025; Afifah & Fadilah, 2023; Hapsari & Wahyuningtiyas, 2023; Hidayat & Nugroho, 2020). However, in practice, the learning process remains largely teacher-centered, emphasizing lectures and individual assignments that do not encourage active student participation. Students are rarely given opportunities to engage in discussions, present arguments, or solve real-world problems related to Pancasila values (Rionaldi et al., 2022). As a result, learning becomes less meaningful and fails to develop the expected 21st-century skills, particularly communication and collaboration (Rahman, 2021). This gap between ideal and actual conditions highlights the need for innovation in instructional strategies, models, and media to enable the learning of Pancasila values in a more engaging and contextual manner. Therefore, this article examines the effect of Problem-Based Learning supported by interactive multimedia on students' communication skills in Pancasila Education.

In recent years, numerous studies have examined the effectiveness of Problem-Based Learning (PBL) in improving higher-order thinking skills, including communication skills (Zou et al., 2024; Aba-Oli et al., 2025; Orhan, 2024). Similarly, the use of interactive

multimedia has been widely recognized for its ability to enhance student engagement and conceptual understanding. However, most existing studies investigate these two approaches separately, focusing either on instructional models or on technological media. Limited attention has been given to the integrated implementation of PBL and interactive multimedia, particularly in the context of Pancasila Education, which emphasizes not only cognitive understanding but also ethical communication and social interaction. This indicates a significant research gap, as combining student-centered pedagogical models with technology-enhanced learning environments may offer a more comprehensive approach to developing students' communication competencies. Therefore, exploring the integration of PBL with interactive multimedia in this specific educational context becomes both relevant and necessary.

Based on the identified research gap, the research question of this study is: Does integrating Problem-Based Learning with interactive multimedia significantly affect students' communication skills in Pancasila Education? Accordingly, the hypothesis of this study is formulated as follows:

- H₀*: There is no significant difference in students' communication skills between those who are taught using integrated Problem-Based Learning with interactive multimedia and those who are taught using conventional learning.
- H₁*: There is a significant difference in students' communication skills between those who are taught using integrated Problem-Based Learning with interactive multimedia and those who are taught using conventional learning.

■ METHOD

Research Design

This study used a quasi-experimental quantitative design with a pretest-posttest control group. Each group was given a pretest at the beginning; the experimental group received treatment, and both groups were given a posttest (Creswell & Creswell, 2017). This study consisted of two groups: the first was the experimental group, which received treatment using Problem-Based Learning assisted by interactive multimedia. The second was the control group that underwent conventional learning activities. Conventional learning is the learning that is usually done. Usually, the school uses problem-based learning without interactive multimedia.

Participants

The subjects of this study were 64 eleventh-grade students from SMA Negeri 9 Surabaya, comprising two intact classes of 32 students each. The sampling technique used was convenience sampling, a type of non-probability sampling. This technique was selected for practical reasons, including accessibility, administrative feasibility, and the existing classroom structure, which did not permit random assignment of students to groups.

The use of intact classes is common in quasi-experimental research in educational settings, where randomization is often not feasible due to institutional constraints. Therefore, the selection of these two classes was based on their availability and academic similarity, as indicated by comparable prior learning outcomes and teacher evaluations. This was intended to minimize potential bias and ensure relatively equivalent baseline conditions between the experimental and control groups.

The choice of eleventh-grade students was based on pedagogical considerations. At this level, students are considered to have developed sufficient cognitive and social abilities to engage in higher-order thinking, discussion, and argumentation activities, which are essential components of communication skills. In addition, the Pancasila Education curriculum at the eleventh-grade level includes topics related to social interaction, diversity, and conflict resolution, making it particularly relevant for the implementation of Problem-Based Learning supported by interactive multimedia.

Instrument

The instrument used in this study was a communication-skills performance test consisting of five essay items on the topic "Potential Conflicts in a Diverse Society and Equitable Solutions." The instrument was designed to assess five indicators of communication skills, namely: (1) the ability to express ideas clearly and systematically, (2) the ability to listen and respond to others, (3) the ability to collaborate and engage in group discussions, (4) the ability to construct logical and evidence-based arguments, and (5) the ability to adapt messages effectively according to the context. Operationally, these items require the students to map the root causes of inter-religious school conflicts, provide empathetic responses to differing beliefs, design inclusive deliberation mechanisms for consensus, propose just solutions based on

Table 1. Communication ability analytical scoring rubric

No	Indicators	Description	Score
1	The ability to express ideas clearly and systematically.	Explains the roots of the conflict chronologically (beginning, process, consequences) with a very logical and easy-to-understand thought process.	4
		Explains the problem coherently, but one or two sections lack detail in the cause-and-effect flow.	3
		Explains the problem only in outline, with the thought process jumping around or being poorly organized.	2
		The explanation is very confusing and does not demonstrate an understanding of the problem.	1
		Demonstrates openness and high empathy; uses language that validates the feelings/rights of both parties in conflict.	4
2	The ability to listen and respond to others.	Demonstrates respect and neutrality, but the language of the response feels somewhat stiff or formal.	3
		Provides a response that focuses solely on the facts, showing little empathy or concern for the other party's complaints.	2
		Responses are judgmental, take sides, or ignore the other party's opinions.	1
		Developing an inclusive deliberation strategy (involving all parties) and offering a highly cooperative method for dividing tasks/roles.	4
		Developing a discussion plan that involves both parties, but the collaborative steps are impractical or lack depth.	3
3	The ability to collaborate and engage in group discussions.	Proposing discussions that only involve certain parties or focus solely on one-way rules.	2
		Lacking a collaborative plan; tending to propose unilateral decisions without a group discussion process.	1
		Providing just solutions based on rational reasoning and appropriately linked to Pancasila values (Principle 2/5) as evidence/basis.	4
		Providing logical solutions, but lacking a strong/in-depth connection to Pancasila values or supporting evidence.	3
		Arguments based solely on personal opinion, lacking logic, or not based on the principle of balanced justice.	2
4	The ability to construct logical and evidence-based arguments.	Arguments are illogical, or the proposed solutions could escalate conflict.	1
		Using very polite, persuasive (inviting) diction and perfectly adapting the language style to the student/social media context.	4
		Using polite and effective language, but the language style is less persuasive or inappropriate for the medium used.	3
		The language tends to be flat, overly formal, or less effective at capturing the target reader's attention.	2
		Using provocative, impolite, or completely inappropriate word choices for school communication.	1
5	The ability to adapt messages effectively according to the context.		

Pancasila values (Principles 2 & 5), and compose persuasive peace messages using conflict-reducing diction. A four-point Likert scale was used to evaluate each indicator, with the following criteria: 4 = very good, 3 = good, 2 = fair, and 1 = poor.

Prior to implementation, the communication skills performance test instrument underwent expert validation to

ensure content validity. The validation process involved experts in education and assessment who evaluated the relevance, clarity, and appropriateness of each item and its alignment with the intended communication-skill indicators. The evaluation was conducted using a five-point Likert scale ranging from 1 (very poor) to 5 (excellent). Based on expert judgment, the instrument was considered valid

and suitable for measuring students' communication skills in the context of Pancasila Education. After the communication skills instrument underwent content validity testing by experts, reliability testing was subsequently conducted. The reliability analysis used Cronbach's Alpha with 10 items. The results showed a reliability coefficient of .795, indicating that the instrument is reliable.

Data Analysis

The data in this study were analyzed using an independent-samples t-test to examine significant differences in posttest scores between the experimental and control groups. This statistical test was selected as it is appropriate for comparing the means of two independent groups to determine the effect of a treatment. Prior to hypothesis testing, the data were subjected to prerequisite tests, including tests of normality and homogeneity, to ensure that the assumptions of parametric analysis were met. The independent-samples t-test provides a more robust basis for evaluating the effectiveness of the intervention than a within-group analysis, as it directly compares the performance of students exposed to the Problem-Based Learning model supported by interactive multimedia with that of students receiving conventional instruction. Therefore, this approach allows for a more valid and objective assessment of the comparative effectiveness of the applied learning model.

RESULTS AND DISCUSSION

The interactive multimedia used in this study is a web-based learning medium that integrates text, images, videos, and user interaction into a single platform, accessible via smartphones and laptops over the internet by scanning a barcode. This multimedia resource presents instructional materials, real-world,

case-based videos, and contextual problems designed to support the implementation of the Problem-Based Learning model. Its main components include explanatory texts, visual illustrations, videos, and interactive navigation buttons such as next, back, home, menu options, and answer selections. The interactive features include case-based exercises with immediate feedback, open-ended questions to encourage communication, and guided scenarios for discussion and presentation. Therefore, this multimedia serves not only as a content delivery tool but also as an interactive learning medium that facilitates active student engagement, enhances communication skills, and effectively supports problem-based learning.

This study aims to examine the effect of implementing the Problem-Based Learning (PBL) model, supported by interactive multimedia, on the communication skills of eleventh-grade students at SMA Negeri 9 Surabaya. The research subjects consisted of two groups: an experimental class (XI-A, $n = 32$) and a control class (XI-B, $n = 32$). These groups were selected without randomization, following a nonequivalent control group design. Data were collected through performance tests aligned with communication skill indicators, which were administered as pretests and posttests to both classes.

Before proceeding to the main analysis, prerequisite tests consisting of normality and homogeneity evaluations were conducted on the pretest and posttest results of both groups. The normality of the data was assessed using the Kolmogorov-Smirnov test. The analysis revealed that the pretest data for both the experimental and control classes were normally distributed, yielding significance values of 0.069 and 0.060, respectively. Similarly, the posttest data also demonstrated normal



Figure 1. Interactive Multimedia Display Screenshot

distributions, with significance values of 0.092 for the experimental class and 0.094 for the control class. Because all of these significance (p) values exceed the 0.05 threshold, it can be concluded that the communication skill data from both groups follow a normal distribution.

Following the normality assessment, a homogeneity test was conducted using Levene's Test to ensure that the groups had equal variances. Based on the mean values, the pretest data yielded a Levene statistic of 2.141 with a significance probability of 0.148. Meanwhile, the posttest data produced a Levene statistic of 1.788 with a significance probability of 0.186. Since the significance values for both the pretest and posttest are greater than 0.05, the data from both the experimental and control classes are considered homogeneous, confirming that they originate from populations with equal variances.

The descriptive statistics for the pretest scores of the control group ($n = 32$) indicate that all five communication skill indicators shared a minimum score of 10 and a maximum score of 15. Specifically, Indicator 1 recorded a mean score of 12.81 with a standard deviation of 2.520. Indicators 2, 3, and 4 yielded identical results, each obtaining a mean of 13.28 and a standard deviation of 2.413. Meanwhile, Indicator 5 resulted in a mean score of 12.34 with a standard deviation of 2.535.

Similarly, the pretest data for the experimental group ($n = 32$) demonstrated the exact same score range across all indicators, with a minimum of 10 and a maximum of 15. Within this group, Indicators 1, 2, and 4 achieved identical results, recording a mean of 13.13 and a standard deviation of 2.459. Indicator 3 obtained the highest average in the experimental class, with a mean of 13.41 and a standard deviation of 2.340. Finally, Indicator 5 yielded a mean of 12.34 and a standard deviation of 2.535, perfectly mirroring the pretest result observed in the control group.

Regarding the posttest results for the control group ($n = 32$), the descriptive statistics indicate that all five communication skill indicators ranged from a minimum score of 10 to a maximum score of 20. Specifically,

Indicator 1 recorded a mean score of 15.78 with a standard deviation of 3.139. Indicator 2 achieved a mean of 16.41 ($SD = 3.859$), while Indicator 3 obtained a mean of 16.09 ($SD = 3.532$). The highest average within this group was observed in Indicator 4, which recorded a mean of 17.34 with a standard deviation of 3.356. Finally, Indicator 5 resulted in the lowest average in the control class, yielding a mean of 15.47 and a standard deviation of 3.203.

In contrast, the posttest outcomes for the experimental group ($n = 32$) demonstrated higher overall averages. While Indicators 1 through 4 maintained a score range from a minimum of 10 to a maximum of 20, Indicator 5 exhibited a higher minimum score of 15 and a maximum of 20. Looking at the individual components, Indicator 1 recorded a mean of 17.81 with a standard deviation of 2.822. Indicators 3 and 4 yielded identical results, each producing a mean score of 17.97 and a standard deviation of 3.074. The highest average scores in the experimental class were achieved by Indicator 2 ($SD = 2.675$) and Indicator 5 ($SD = 2.355$), both sharing the exact same mean value of 18.44.

A mean analysis of the pretest scores regarding students' communication ability shows that the experimental group obtained a mean score of 65.00 ($SD = 4.92$), while the control group achieved 65.13 ($SD = 5.86$). To further evaluate this initial equivalence, an independent-samples t-test was conducted on the pretest data. Assuming equal variances, the test yielded a t-value of -0.092 with 62 degrees of freedom. The two-tailed significance value was 0.927, which is well above the 0.050 threshold, alongside a mean difference of -0.125 (95% CI [-2.829, 2.579]). A visual analysis of the pretest score distribution aligns perfectly with these statistical findings. The individual data points for both the experimental and control groups are similarly dispersed, primarily clustering in the 55 to 75 score range. This overlapping distribution visually confirms that there was no significant difference in communication skills between the two groups prior to the intervention, establishing a balanced baseline.

Table 2. Independent samples t-test results for pretest and posttest of communication skills

Source	Variances Assumption	F	Sig.	t	df	Sig. (2-tailed)	MD	SE Difference	95% CI Lower	95% CI Upper
Pre-test	Equal variances assumed	1.521	0.222	-0.092	62	0.927	-0.125	1.353	-2.829	2.579
	Equal variances not assumed			-0.092	60.182	0.927	-0.125	1.353	-2.831	2.581
Post-test	Equal variances assumed	4.829	0.032	6.513	62	0	9.531	1.463	6.606	12.456
	Equal variances not assumed			6.513	46.068	0	9.531	1.463	6.586	12.477

Following the implementation of the learning activities, the posttest data indicated a distinct shift in performance. Students in the experimental group achieved a significantly higher mean score of 90.63, compared to the control group's mean score of 81.09. The independent samples t-test for the posttest scores (using equal variances not assumed, as Levene's test indicated unequal variances with $p = 0.032$) revealed a t-value of 6.513 with 46.068 degrees of freedom. The resulting two-tailed significance value was 0.000, confirming a statistically significant difference with a mean difference of 9.531 (95% CI [6.586, 12.477]). The distribution of these posttest scores further illustrates the intervention's impact. The individual data points for the experimental group are tightly concentrated at the higher end of the scale, predominantly clustering between 85 and 95. In contrast, the control group's scores are more widely dispersed across a lower range, roughly from 65 to 95. This clear upward shift and tighter clustering of high scores in the experimental group visually substantiate the statistical conclusion: the Problem-Based Learning model supported by interactive multimedia had a significant, positive effect on students' communication skills.

Overall, the findings demonstrate that implementing the Problem-Based Learning (PBL) model supported by interactive multimedia significantly enhances students' communication skills. This conclusion is anchored by the hypothesis test results ($p < 0.001$), which confirmed a meaningful disparity in post-treatment outcomes between the experimental and control groups. Theoretically, these results align with the constructivist perspective, which posits that learning occurs through active engagement with the environment. In this context, PBL provides structured opportunities for students to construct knowledge through hands-on problem-solving (Andrianto & Qodr, 2025), driving the active peer interactions necessary to foster communication. This mirrors recent literature suggesting that collaborative, problem-driven discussions inside a PBL framework act as a primary catalyst for communication skill acquisition (Hmelo-Silver et al., 2025). Furthermore, integrating interactive multimedia elevates student engagement throughout these exercises (Liu, 2025). By bridging a robust pedagogical approach with digital scaffolding, this model creates a highly dynamic learning environment that allows communication abilities to develop optimally (Hidayat et al., 2022), offering strong empirical backing for its adoption in the

classroom.

The first indicator, namely the ability to express ideas or opinions clearly and systematically, showed a significant improvement in this study. This improvement is closely related to the characteristics of the Problem-Based Learning (PBL) model, which requires students to present the results of their discussions and the solutions they have developed (Erwanto et al., 2025). These presentation activities indirectly train students to organize and structure their ideas logically before conveying them to others. In addition, the use of interactive multimedia helps students understand the material in a more visual and contextual manner. With the support of such media, students find it easier to connect the concepts they have learned with the structured delivery of their ideas. This finding is consistent with Dolmans et al. (2021), who state that PBL can enhance communication skills through structured presentation and discussion activities. Through this process, students not only gain a deeper understanding of the subject matter but also develop the ability to communicate it more effectively. This skill is particularly important in meeting the demands of 21st-century learning, which emphasizes communication competencies. Students are expected to articulate their ideas clearly across various situations and contexts. Therefore, the improvement in this indicator reflects the effectiveness of the implemented learning model. Active student involvement during the learning process is a key driver of this development. Furthermore, an interactive and collaborative learning environment strengthens students' ability to express ideas in a systematic manner.

The second indicator, namely the ability to listen and provide relevant responses, also showed a meaningful improvement. This enhancement occurs because, in the Problem-Based Learning (PBL) model, students are actively engaged in intensive group discussions. Such situations require students not only to speak but also to carefully listen to their peers' opinions. Through this process, students learn to understand the content of a discussion before providing appropriate responses. This finding aligns with interpersonal communication theory, which emphasizes the balance between receptive and productive communication skills (DeVito, 2021). In addition, interaction within small groups allows students to explore diverse perspectives. This condition helps them develop the ability to evaluate and respond to ideas more critically. Thus, the communication that develops is no longer one-way but

becomes interactive and dialogical. Students also learn to respect differing viewpoints during discussions, which positively contributes to the development of their social skills. Therefore, the improvement in this indicator reflects the overall enhancement of students' communication abilities.

The third indicator, namely the ability to collaborate and engage in group discussions, showed the most significant improvement. This enhancement is closely related to the characteristics of the Problem-Based Learning (PBL) model, which emphasizes collaborative learning. During implementation, students are guided to work in groups to solve the given problems. This process fosters active and continuous social interaction among group members. Through these activities, students not only contribute individually but also learn to build shared understanding. Research by Le et al. (2021) indicates that PBL is effective in improving both collaboration and communication skills. In addition, group work provides opportunities for students to exchange ideas and learning experiences, enabling them to gain new perspectives that enrich their understanding of the material. Thus, the improvement in this indicator is a direct result of implementing PBL. Students learn that success is determined not only by individual ability but also by teamwork. This process also strengthens social skills and a sense of shared responsibility. Therefore, collaborative learning is a key factor in the optimal development of students' communication skills.

The fourth indicator, namely the ability to construct logical arguments supported by evidence, showed a significant improvement. This is closely related to the characteristics of Problem-Based Learning (PBL), which presents students with complex problems that require data- and evidence-based solutions. Such situations encourage students to develop critical and analytical thinking skills in processing information. Through this process, students learn to integrate various sources of information to strengthen the arguments they present. Research by Abrami et al. (2015) indicates that problem-based learning is effective in enhancing both critical thinking and students' argumentation skills. In addition, the use of interactive multimedia provides diverse, visually engaging, and easily accessible learning resources. This helps students understand problems more comprehensively. With deeper understanding, students can construct more structured and convincing arguments. This ability is an essential component of academic communication, in which students are expected

not only to express opinions but also to support them with reasoned arguments. Therefore, the improvement in this indicator demonstrates that PBL contributes not only to communication skills but also to the development of higher-order thinking skills.

The fifth indicator, the ability to use language according to communicative context, showed significant improvement. Under the Problem-Based Learning (PBL) model, students are exposed to diverse situations that require them to adapt their language flexibly. Through discussions and presentations, they learn to tailor messages to specific audiences. Additionally, interactive multimedia provides concrete examples of formal and informal language variations. Consequently, students become more skilled at adjusting their delivery, a vital skill for both academic and social life. This improvement reflects the success of a learning approach that is both contextual and practical.

This research confirms that the data meets normality and homogeneity assumptions, ensuring statistically valid and scientifically accountable results. The findings provide strong empirical evidence that Problem-Based Learning (PBL) integrated with interactive multimedia effectively enhances students' communication skills, aligning with 21st-century educational demands for collaboration and critical thinking. By combining PBL with technology, this study not only reinforces previous research but also offers a novel, engaging, and contextual approach that increases student participation. Ultimately, these results serve as a significant reference for modern education, encouraging teachers to adopt innovative models to improve the quality of learning and meet evolving academic challenges.

From a theoretical standpoint, improvements in students' communication skills are driven by student-centered learning and social constructivism, in which students act as active subjects who build knowledge through continuous interaction and collaborative problem-solving. This process is further optimized by Cognitive Load Theory, as interactive multimedia reduces cognitive strain by organizing information through visual and auditory cues, allowing students to focus more on structuring their ideas. Furthermore, the real-world relevance of Problem-Based Learning (PBL) boosts intrinsic motivation, encouraging students to engage more deeply in discussions and interpersonal exchanges. In practice, these findings suggest that integrating innovative models with technology is essential for modern education, providing a robust

framework for teachers to enhance 21st-century competencies such as critical thinking and collaboration.

■ CONCLUSION

This study concludes that implementing the Problem-Based Learning (PBL) model, supported by interactive multimedia, has a significant positive effect on students' communication skills. The findings demonstrate that students in the experimental group achieved higher posttest mean scores compared to those in the control group, indicating the effectiveness of the intervention. The results of the independent samples t-test further confirm a statistically significant difference between the two groups. These findings suggest that integrating PBL with interactive multimedia facilitates more active student engagement, promotes meaningful learning experiences, and enhances students' ability to express ideas, construct arguments, and communicate effectively. Therefore, this approach can be considered a viable and effective instructional strategy to improve communication skills in the context of Pancasila Education at the senior high school level.

■ DECLARATION OF GENERATIVE AI USAGE IN THE WRITING PROCESS

During the writing of this manuscript, the author(s) employed OpenAI to assist with language refinement/proofreading. The author(s) have reviewed and edited the content generated by this tool and assume full responsibility for the content of the published article.

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