



## The effect of Li-Pro-GP learning model on creative thinking ability and written communication ability in junior high school biology learning

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### ABSTRACT

Students' creativity and written communication are essential 21st-century skills, yet junior high school students often show low abilities in these areas due to passive, monotonous learning and limited writing practice. This study investigates the effect of the Li-Pro-GP learning model a project-based literacy approach integrated with the School Literacy Movement (SLM) and Strengthening Character Education (SCE) on improving students' creative thinking and written communication abilities. This study used a quantitative approach with a quasi-experimental non-equivalent control group design. The sampling technique used was purposive sampling based on equal number of students and gender balance. VIII F served as the experimental class and VIII G as the control class, each consisting of 34 students with 15 males and 19 females. The research instrument used to measure creative thinking ability and written communication ability is an essay question each designed with distinct indicators. Creative thinking instruments emphasize innovative ideas and solutions, while written communication instruments emphasize clarity, structure, and accuracy in expressing ideas. The data were analyzed using ANCOVA and Quade's Rank Analysis with the help of SPSS 27 and JASP applications. The results of the analysis showed that the Li-Pro-GP model had a significant effect on creative thinking ability with a value of  $F(1.65) = 32.644$ ,  $p < 0.001$  and written communication ability with a value of  $F(1.66) = 47.259$ ,  $p < 0.001$ . In conclusion, the application of the Li-Pro-GP learning model has an effect in improving the creative thinking and written communication ability of junior high school students.

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## INTRODUCTION

Creativity and Communication ability are two important abilities that are needed in the 21<sup>st</sup>-century era. During complex global challenges, students are required to not only master knowledge but also be able to think creatively in solving problems through ideas as effective and original solutions (Muntamah & Nawangsari, 2024; Purwanti et al., 2024). Meanwhile, written communication is a means for students to receive and present, abstracting the knowledge obtained consistently (Yusfeni & Sriyati, 2016). Creativity, reflected in creative thinking, is the ability to generate original, valuable, and meaningful ideas (Abe & Birabil, 2022; Mazeh, 2020; Rosen et al., 2020). It helps students face 21<sup>st</sup>-century challenges by fostering problem-solving, adaptability, and independent thinking (Hang et al., 2022). Creative learning also boosts engagement, curiosity, and lifelong learning (Kalogeratos et al., 2023; Rotaru & Gutu, 2024). Communication is a fundamental ability for human interaction, learning, and development, involving the transfer of information through verbal or non-verbal means (Reidhead, 2021). In education, written communication is especially important, as it enables students to express ideas clearly and coherently through structured texts (Borissova, 2020; Holley, 2023). It supports clarity, organization, and critical thinking, helping learners articulate arguments, summarize knowledge, and deepen understanding (Manzon, 2022).

Learning problems at the junior high school level reveal challenges in students' creative thinking and written communication abilities. Field observations and interviews in mid-2024 showed issues such as uncertain learning duration, low student participation, and lack of initiative to take notes without direction. Yet, creative thinking helps students find new solutions (Blegur & Tlonaen, 2017) while written communication enables clear abstraction of material, both supporting more effective and varied understanding. Indonesia ranked 87th out of 127 with a score of 30.10 in the Global Creativity Index 2018 (Sari et al., 2020). Similarly, Purwanti et al. (2024) found that in Central Java, creative thinking ability was still low at 39.25%, classified as less creative. Yusfeni & Sriyati (2016) also reported low written communication ability in West Sumatra, with a control class post-test average of 16.167 and an n-gain of 0.6, not reaching the high category. The low level of written communication ability is because students' learning activities are rarely presented with questions that test students' writing ability, and only use questions in the package book (Taryono et al., 2019). Another cause is the limited time for teachers to test written communication ability (Yusfeni & Sriyati, 2016). Meanwhile, students' low creative thinking ability is caused by passive and monotonous learning activities due to the school's focus only on aspects of knowledge and memory (Qomariyah & Subekti, 2021). In addition, teachers do not train students' creative thinking competencies and tend to memorize.

Improving students' creative thinking and written communication in science learning requires innovative approaches. One such approach is the Li-Pro-GP model, a literacy-based learning model integrating project-based learning (PjBL) steps within SLM activities and character education (Pantiwati, Nurrohman, et al., 2023). Packaged in PjBL syntax, this model encourages active, collaborative learning that connects theory with practice, supported by literacy and character development (Pantiwati, 2023). Previous studies also show that PjBL effectively develops creative thinking and written communication by engaging students in real-world problem-solving projects (Ningsih et al., 2021). The SLM is not just a reading activity but a transformative effort to develop students' ability to access, analyze, and apply information meaningfully from an early age. It involves three stages: habituation, development, and learning, integrated with SCE (Pantiwati, 2023). Activities include 15 minutes of reading, responding to enrichment books, and applying literacy across subjects to broaden horizons and improve learning outcomes (Soraya et al., 2023). In the Li-Pro-GP model, scientific literacy is prioritized by training students to apply science concepts in real life and communicate explanations with supporting relevant evidence (Cho, 2022; Pantiwati et al., 2025; Seema, 2024).

The Li-Pro-GP model integrates literacy and character education, emphasizing values like religiosity, independent, nationalism, mutual cooperation, and integrity. SCE is embedded in every learning stage to shape responsible, moral, and academically capable students supporting national progress and addressing moral crises (Cholifah & Faelasup, 2024; Pantiwati et al., 2025; Tukiran, 2023). This study focuses on analyzing how the Li-Pro-GP model enhances students' creative thinking and written communication abilities. The application of the Li-Pro-GP model can improve students' creative thinking ability which include indicators of creative thinking such as fluency (generate many ideas), originality (produce unique ideas), flexibility (change perspective), elaboration (add details), and

metaphorical thinking (use analogies in expressing ideas) (Nur et al., 2020). In addition to creative thinking, the Li-Pro-GP model is also able to improve students' written communication ability which include indicators of written communication such as changing the form of presentation, reading tables, explaining the results of experiments, and reading graphs (Yusfeni & Sriyati, 2016).

Through project activities, students design projects, explore ideas, and develop creative solutions (Ningsih et al., 2021). They document work processes, explain designs, write reports, structure writing, interpret data in graphs and tables, and explain results logically, all of which enhance their written communication ability (Lestari et al., 2016). SLM plays a key role in developing creative thinking and communication abilities by engaging students in structured reading across subjects. SLM enhances students' abilities to access, interpret, analyze, and reconstruct information core processes for both abilities. Its literacy components broaden horizons and sharpen ideas, thus expanding creative potential (Pratama et al., 2024). SLM also equips students with knowledge of text structure and effective language use for communication (Abdullah & Arsanti, 2024). Meaningful literacy practices stimulate idea generation, critical thinking, and clear written expression. When integrated into project-based learning, SLM helps students generate original ideas and organize them into structured, meaningful written outputs (Soraya et al., 2023).

SCE supports creative and communicative abilities by integrating values like religiosity, integrity, mutual cooperation, nationalism, and independent in all learning phases. Character values shape ethical individuals and foster students' open-mindedness (Pantiwati, Kusniarti, et al., 2022). Responsibility encourages ethical and consistent problem solving, supports creativity through an environment that encourages original, diverse, and useful thinking, while honest and clear communication improves written communication. SCE consistently shapes students' mindsets and expressions, as teachers integrate character development into learning scenarios.

Previous studies examined literacy's effect on written communication (Abdullah & Arsanti, 2024) and creative thinking (Irawan et al., 2023). PjBL improves both abilities (Lestari et al., 2016; Ningsih et al., 2021), while SCE enhances moral quality (Ritonga et al., 2024). However, integrated use of SLM, PjBL, and SCE remains limited. This study addresses the gap by analyzing the Li-Pro-GP model's impact on creative thinking and written communication in junior high school biology learning.

## METHODS

### Research Design

This study used a quantitative approach with a quasi-experimental design to examine the effect of treatment on the dependent variable. The non-equivalent control group design involved an experimental group receiving treatment and a control group without treatment. Pretest and posttest measurements were conducted to compare changes between groups.

**Table 1**

Research design

Class	Pretest	Treatment	Posttest
Experiment	O <sup>1</sup>	X	O <sup>2</sup>
Control	O <sup>3</sup>	-	O <sup>4</sup>

### Population and Samples

This research was conducted at Junior High School 11 Malang. The population in this study was all 8<sup>th</sup>-grade students in the 2024/2025 school year, with a total of 8 classes. The sampling technique in this study used purposive sampling. The determination of the class is based on two criteria of the same class, namely on the number of students in class VIII F and VIII G, which is equal to 34 students, and the number of equal gender in both classes.

### Instrument

The pretest and posttest instruments were validated by four experts: two Biology Education lecturers for content validity and two Indonesian Language Education lecturers for face validity, all from the Faculty of Teacher Training and Education. Universitas Muhammadiyah Malang. Experts rated item relevance (content validity) using a four-point Likert scale. Analysis showed all four instruments had S-CVI/Ave and S-CVI/UA values of 1.00 ( $\geq 0.80$ ), indicating high feasibility and relevance (Hamzah et al., 2024). Experts assessed the practicality of the items using a four-point Likert scale. Analysis showed all

four instruments had S-FVI/Ave and S-FVI/UA values of 1.00 ( $\geq 0.80$ ), indicating high levels of clarity, comprehension, readability, and feasibility (Akhtar et al., 2023).

Creative thinking instruments were developed based on five indicators: fluency, originality, flexibility, elaboration, and metaphorical thinking. Written communication instruments were developed in the form of essay questions based on four indicators: changing the form of presentation, reading tables, explaining experimental results, and reading graphs. The pretest and posttest instruments, both creative thinking and written communication were used different questions to avoid students taking the exact same test twice, provided that they should be comparable to ensure consistency of results (Sanders, 2019). The validity and reliability were tested for each of the pre-test and post-test instruments.

Item analysis was conducted using IBM SPSS version 27. Items were considered valid if the significance value was  $< 0.05$  (Liline et al., 2024). For creative thinking instruments, 25 valid items were obtained from a total of 50 across pretest and posttest. The reliability test showed high internal consistency, with Cronbach's Alpha values of 0.959 (pretest) and 0.962 (posttest), indicating the instruments were reliable and consistent (Shrestha, 2021). For written communication, the pretest instrument consisted of 10 main questions branching into 54 items, with 30 valid items. The post-test consisted of 10 main questions branching into 60 items, also yielding 30 valid items. Reliability tests resulted in Cronbach's Alpha values of 0.902 (pretest) and 0.865 (posttest), confirming good reliability.

The learning tools developed by the researchers were teaching modules and student worksheets, which were validated to determine their validity. The validation of the student worksheets and teaching modules was obtained from practitioners (science teachers) and expert judgment.

Experts and practitioners use a 1-5 rating scale for their assessments. Isnawati & Mustika (2021), guidelines were used as the basis for interpreting the validity of teaching modules and student worksheets. The validation of the student worksheets and teaching modules was obtained from practitioners (science teachers) from Junior High School 11 Malang and expert judgment from Biology Education Department at Yogyakarta State University. Result of the assessment of learning tools presented in Table 2.

**Table 2**

Result of the assessment of learning tools

learning tools	Validator	Result (%)	Description
Teaching modules	Practitioners	90,8	Very valid
	expert judgement	76,5	Valid
Student worksheet	practitioners	95,2	Very valid
	expert judgement	75,2	Valid

## Procedure

Research preparation is a stage carried out by researchers to prepare for the implementation of research. The research preparation is described in Figure 1. The following is a description of the activities at the research preparation stage: (1) Conducting a literature review to identify issues related to low levels of creative thinking and written communication; (2) Observing and interviewing science teachers at SMPN 11 Malang regarding learning conditions and student; (3) Developing learning tools based on the Li-Pro-GP model; (4) Developing instruments to measure creative thinking and written communication; (5) Validating learning tools by experts and teachers, then revising them if necessary; (6) Validate the research instruments with expert lecturers, then revise if necessary; (7) Test the instruments and analyze their validity and reliability.

The implementation and flow of the research were arranged to provide a clear picture of the systematic steps taken in the research process. The implementation and flow of the research describes in Figure 1. (1) Conducting research preparations; (2) Conducting a pretest on the control and experimental groups; (3) Implementing the Li-Pro-GP model in the experimental group; (4) Applying a commonly used learning model (discovery learning) to the control group; (5) Conducting a posttest on both groups; (6) Analyzing the data from the pretest and posttest; (7) Concluding the effect of the Li-Pro-GP model on creative thinking and written communication abilities.

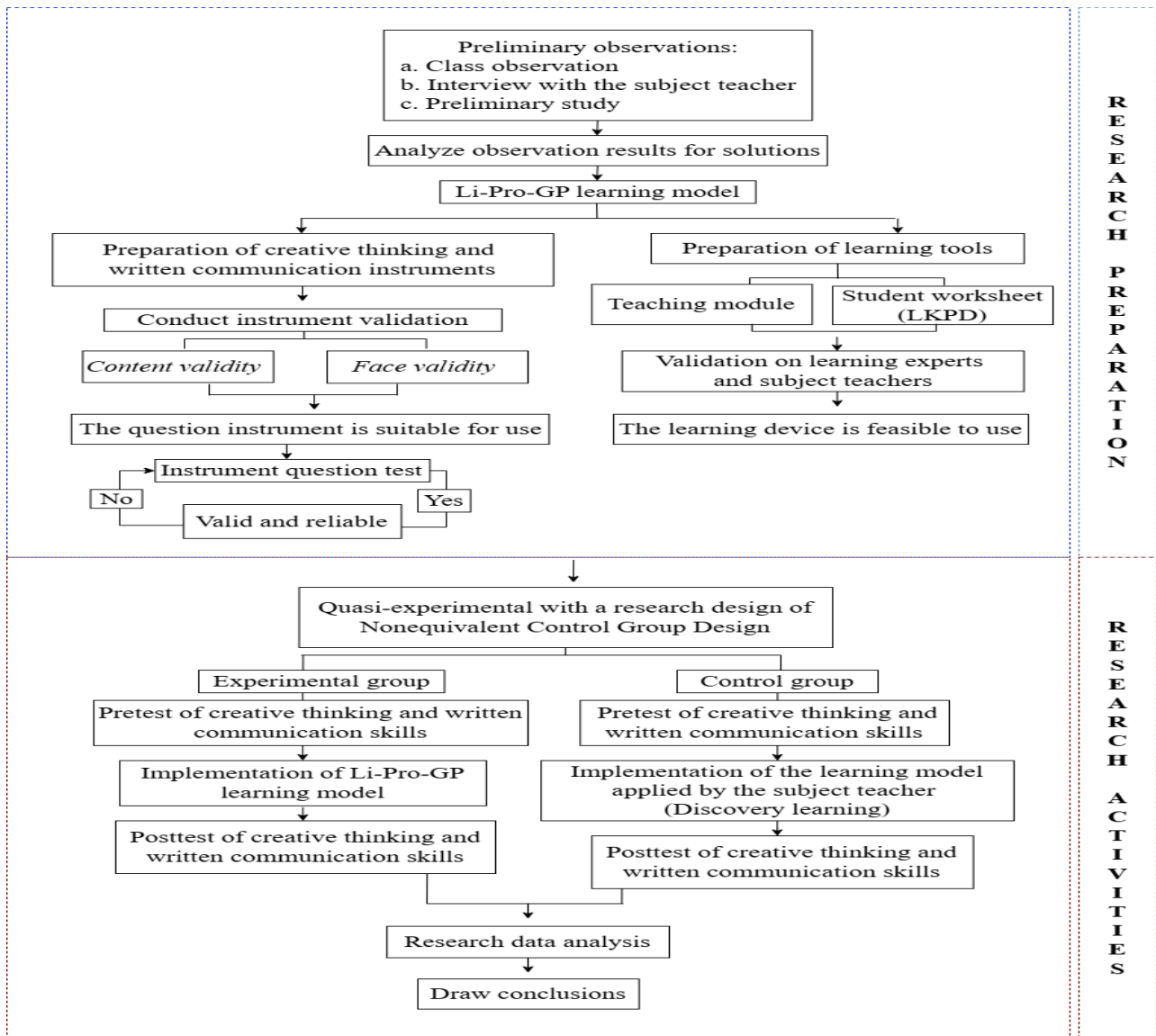


Figure 1. Implementation diagram and research flow

The implementation of learning using the Li-Pro-GP learning model in the experimental group was carried out in 8 meetings and consisted of six syntaxes presented in Table 3.

Table 3  
Li-Pro-GP Model Implementation in Experimental Class

Meeting	Syntax	SLM	SCE
1	<ul style="list-style-type: none"> <li>- Start with the big question Teachers present real-world problems through reading texts, while students identify problems, analyze them, and discuss solutions.</li> <li>- Develop a project plan Students collaborate in groups to plan project activities, formulate project ideas, and discuss necessary tools, materials, and costs based on prior solutions.</li> </ul>	Habituation stage by training students to read from various reading sources, Development stage by training students to respond to written and visual information, then develop it into real projects. Learning stage by using literacy actions in reading, summarizing, and discussing in the learning process.	Mutual cooperation
2	<ul style="list-style-type: none"> <li>- Developing a project plan Students develop the project by discussing the product's working principle.</li> <li>- Developing a project schedule Following the teacher's instructions, student</li> </ul>	Learning stage by Connecting reading knowledge with product working principles through understanding, analysis, planning, and time	Mutual cooperation, nationalism, and integrity

Meeting	Syntax	SLM	SCE
	groups prepare a project implementation schedule.	management.	
3	- Monitoring project activities The teacher monitors and guides students in developing project products.	Habituation stage by trains students to read various sources for experimental analysis, while the learning stage connects literacy with discussions.	Mutual cooperation, nationalism, and integrity
4 and 5	- Monitoring project activities Students complete and test their products, and conduct simple experiments, while the teacher monitors and provides guidance.	Habituation stage by encouraging students to read from multiple sources to provide feedback and notes.	Mutual cooperation, nationalism, independent and integrity
6	- Assessing the result Students present products and receive feedback from the teacher and peers.	Development stage by encouraging students to present their work and relate it to what they have read.	
6	- Evaluating students' experience The teacher clarifies unclear concepts and guides students to prepare and discuss their product reports in groups.	learning stage by strengthening concept understanding through multiple reading sources.	Integrity and independent
7	- Evaluating students' experience The teacher reinforces material and guides students in reflection and evaluation.	Habituation and learning stage by connecting new knowledge to personal experience or prior knowledge.	Independent, integrity and religious
8	Summative test Students take tests to assess their understanding of the material they have learned.	Independent reading activity to review material before the test.	Independent character and integrity.

### Data Analysis Techniques

In this study, hypothesis testing used ANCOVA to compare post-test results between experimental and control classes, controlling pre-test scores as covariates. The ANCOVA analysis was conducted using JASP after meeting normality (Q-Q Plot) and homogeneity (Levene's test) assumptions. If assumptions were unmet, Quade's rank analysis of covariance was applied using SPSS 27. Hypothesis testing decisions are based on significance value: if Sig. < 0.05, Ho was rejected; if Sig. > 0.05, Ho was accepted.

### RESULTS AND DISCUSSION

Table 4 shows the results of creative thinking ability in control and experimental groups, average pretest score of 34.85 in the control group and 34.47 in the experimental group. The average posttest score was 61 for the control group and 72.65 for the experimental group.

**Table 4**

Creative thinking scores

Component	Control group		Experimental group	
	Pretest	Posttest	Pretest	Posttest
Average	34.85	61.00	34.47	72.65
Highest score	51.00	70.00	52.00	95.00
Lowest score	30.00	37.00	30.00	55.00

Table 5 shows that both groups improved in all five creative thinking indicators, but the experimental group showed greater gains. Significant increases were seen in fluency (33.69 to 69.26), originality (33.09 to 68.38), flexibility (up to 80.29), elaboration (up to 80.00), and metaphorical thinking (28.24 to 65.29), outperforming the control group.

**Table 5**  
Comparison of creative thinking scores

Indicator	Experimental group		Control group	
	$\bar{x}$ Pretest	$\bar{x}$ Posttest	$\bar{x}$ Pretest	$\bar{x}$ Posttest
Fluency	33.68	69.26	32.65	60.74
Originality	33.09	68.38	32.21	62.65
Flexibility	34.71	80.29	32.35	50.15
Elaboration	42.65	80.00	47.21	73.24
Metaphorical thinking	28.24	65.29	29.85	58.24

The results of written communication ability test carried out in the balanced control and experimental groups consisting of 34 students, found that the average pretest score in the control group was 46.51, and the experimental group was 46.54. The average posttest score in the control group was 58.08, and the experimental group was 75.20. Data on students' written communication ability in this study are presented in [Table 6](#).

**Table 6**  
Written communication scores

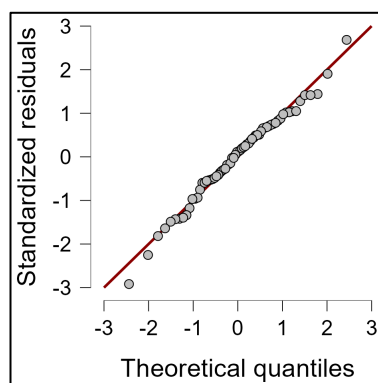
Component	Control group		Experimental group	
	Pretest	Posttest	Pretest	Posttest
Average	46.51	58.08	46.54	75.20
Highest score	70.21	68.46	84.83	92.50
Lowest score	33.04	33.96	30.54	53.50

[Table 7](#) shows that both groups experienced score increases across all four written communication indicators, but the experimental group improved more significantly. The experimental group showed greater gains in changing presentation forms (33.4 to 45.69), reading tables (49.65 to 89.41), explaining experimental results (46.42 to 75.93), and reading graphs (56.66 to 89.90) compared to the control group.

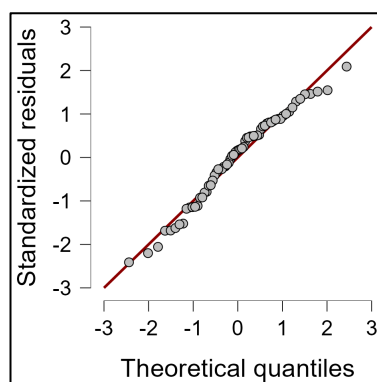
**Table 7**  
Comparison of written communication scores

Indicator	Experimental group		Control group	
	$\bar{x}$ Pretest	$\bar{x}$ Posttest	$\bar{x}$ Pretest	$\bar{x}$ Posttest
Changing the form of presentation	33.40	45.69	33.90	35.32
Reading tables	49.65	89.41	50.82	67.41
Explaining the results of experiments	46.42	75.93	45.05	50.37
Reading graphs	56.66	89.80	56.28	79.22

The normality test showed that data points close to the diagonal line indicated a normal distribution (Adawiyah et al., 2024). [Figure 2](#) and [3](#) shows that in this study, the creative thinking and written communication data points are clustered around the diagonal line, indicating that the data is normally distributed.



**Figure 2.** Q-Q plots graph of creative thinking



**Figure 3.** Q-Q plots graph of written communication

The results in [Table 8](#) show that creative thinking data had homogeneous variance (sig. 0.149 > 0.05), while written communication data had non-homogeneous variance (sig. 0.016 < 0.05).

**Table 8**  
Homogeneity Test Results

Data	F	df1	df2	P
Creative thinking	2.131	1.000	66.000	0.149
Written communication	6.148	1.000	66.000	0.016

Hypothesis testing of creative thinking ability using ANCOVA in JASP showed a significant difference,  $F(1,65) = 32.644$ ,  $p < 0.001$ , indicating that there was an effect of the Li-Pro-GP learning model on creative thinking ability ([Table 9](#)).

**Table 9**  
ANCOVA Result of Creative Thinking

Cases	Sum of Squares	df	Mean Square	F	P
Pretest	73.948	1	73.948	1.064	0.306
Class	2268.900	1	2268.900	32.644	< .001
Residuals	4517.817	65	69.505		

Hypothesis testing of written communication ability using Quade's rank analysis in SPSS 27 showed a significant difference,  $F(1,66) = 47.259$ ,  $p < 0.001$ , indicating that there was an effect of the Li-Pro-GP learning model on written communication ability ([Table 10](#)).

**Table 10**  
Quade's Rank Analysis of Covariance Result of Written Communication

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10881.756	1	10881.756	47.259	< .001
Within Groups	15196.968	66	230.257		
Total	26078.724	67			

The Li-Pro-GP model has a significant effect on improving creative thinking ability, with the average post-test score of the experimental group (72.65) higher than that of the control group (61). Statistical analysis confirms a significant effect,  $F(1,65) = 32.644$ ,  $p < 0.001$ . This finding aligns with [Pantiwati et al \(2022\)](#), who found the Li-Pro-GP model significantly enhanced student creativity. Creative thinking, as part of creativity, involves viewing problems differently and finding unique solutions ([Suardipa, 2019](#)), while creativity more broadly includes realizing ideas, risk-taking, and self-actualization ([Febrianti, 2022](#)).

This effect occurs because the Li-Pro-GP model encourages active exploration, discussion, and idea development ([Pantiwati et al., 2024](#)). Project learning allows students to generate, elaborate, and analogize ideas, enhancing both understanding and creative thinking ([Hera et al., 2021](#)). [Sari et al \(2021\)](#) also found project-based learning improves creativity through active student involvement. Literacy activities in learning support creative thinking by broadening perspectives and encouraging idea

development (Pratiwi et al., 2023). Access to diverse readings helps students analyze, evaluate, and connect information, fostering creative thinking and highlight literacy's role in enhancing creativity, sharpening ideas and critical analysis (Irawan et al., 2023; Pratama et al., 2024).

This model integrates SCE to build students' ethics and character alongside academic ability. Values like independent, mutual cooperation, nationalism, and religiosity are instilled to foster empathy and responsibility (Rahayu, 2021). Independent encourages confidence in developing ideas, confident in contributing and sharing ideas, while mutual cooperation fosters discussions that generate diverse perspectives (Regina & Sastromiharjo, 2023). Nationalism emerges through respecting differing opinions and making fair group decisions (Sukmawati et al., 2021). Character education forms an ethical foundation supporting creativity, innovation, and personal development in navigating real-world challenges.

The Li-Pro-GP model model has a significant effect on improving students' written communication ability, with the average post-test score of the experimental group (75.20) compared to the control group (58.08). Statistical analysis confirmed a significant difference,  $F(1,66) = 47.259$ ,  $p < 0.001$ , indicating the model's effectiveness in improving written communication. This finding aligns with Pantiwati et al (2023), who found the Li-Pro-GP model improved oral communication. Since oral and written communication are both forms of verbal communication, ability in organizing and expressing ideas orally (Ramadina & Rosdiana, 2021) Similar to written communication, it enables individuals to convey messages with clarity and good structure (Rohmah et al., 2023).

In learning, students actively seek, process, and present information in writing to clearly abstract knowledge. Project-based learning supports written communication (Gabuardi, 2021). In the early learning stages, fundamental questions that underlies project, planning by presenting readings that contain information in various forms, so that students are trained in understanding and reorganizing the information in writing. simple experiments, training students to explain results in writing. Project reports further help students structure information, describe project activities, and present data clearly (Haryanti & Suwama, 2018). Literacy in learning familiarizes students with reading various sources, including visuals like graphs and tables, as well as narratives (Rinekso et al., 2021). Literacy builds understanding of information (Solihat & Riansi, 2018), while written communication conveys that understanding clearly (Parianto & Marisa, 2022). Literacy also broadens insights, supporting clear information delivery (Lestari et al., 2021)

The integration of SCE in the Li-Pro-GP model aims to build students' character based on the Pancasila learner profile, fostering values like religiosity, independent, nationalism, cooperation, and integrity, which are reflected in their written communication. For example, integrity-shown through honesty and commitment to moral values-is reflected when students write experiment results and reports honestly (Ulya & Anisah, 2021). Cooperation is reflected in structured writing activities with students in the preparation of project reports, worksheets, and analysis of experimental results (Rahayu et al., 2024). Independent is shown as students responsibly complete group reports and worksheets through individual contributions (Winaya, 2020). Religious character is shown when students link experiment results to religious values, such as expressing gratitude for natural phenomena as part of God's greatness (Dariyanto & Awiria, 2024).

## CONCLUSION

This study concludes that the Li-Pro-GP model improves creative thinking and written communication abilities, as indicated by higher post-test scores in the experimental class. This is supported by the results of the hypothesis test: creative thinking,  $F(1,65) = 32.644$ ,  $p < 0.001$ , and written communication,  $F(1,66) = 47.259$ ,  $p < 0.001$ .

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