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The Influence of STEAM-Integrated Project-Based Science Learning Viewed from Scientific Attitudes on Student Creativity

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Abstract

This study aims to explore the impact of integrated STEAM-based project-based science learning, considering scientific attitudes, on students' creativity. Despite a growing body of literature supporting the benefits of STEAM, few studies have examined the interaction between scientific attitudes and creativity in project-based learning contexts. This research uses a quantitative approach with a factorial experimental design, including two main factors: class type (experimental vs. control) and scientific attitude (high vs. low). The sample consists of 74 students from the PGMI FTK UIN Mataram study program, who were randomly assigned to experimental and control groups. Data collection involved pretests and posttests to measure creativity, alongside scientific attitude questionnaires. Descriptive and inferential statistics, including two-way ANOVA, were used to analyze the data. The results show that the experimental group participating in STEAM-based project learning exhibited a significant increase in creativity ($p=0.000$; partial $\eta^2 = .681$) compared to the control group. Scientific attitude also had a significant effect on creativity ($p=0.000$; partial $\eta^2 = .165$). However, no interaction effect between class type and scientific attitude on creativity was found ($p=0.925$). These findings suggest that both STEAM-based project learning and scientific attitude independently contribute to enhancing creativity. This study provides new insights by addressing the gap in research concerning the role of scientific attitudes in project-based STEAM learning. It also highlights the potential for designing science curricula that integrate both innovative teaching methods and the fostering of positive scientific attitudes to enhance student creativity.

Keywords: Creativity, Project-Based Science Learning**,** Scientific Attitude, STEAM

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INTRODUCTION

Effective science education focuses not only on mastering scientific concepts, but also on developing students' creative skills that can be applied in real life (Sucilestari et al., 2025). Creativity is important in this context because it encourages students to think critically, find innovative solutions to everyday problems, and connect theoretical knowledge with real-life situations (Arizona, Sucilestari, & Suhardi, 2025). Through creativity, students not only memorize facts, but also learn to explore ideas, design experiments, and create new products or ideas that are useful to society (Sucilestari et al., 2023). Thus, creativity in science education plays an important role in shaping a generation that is adaptive, solution-oriented, and ready to face the challenges of an ever-evolving world (Dewi et al., 2022; Hong & Song, 2020; Setiawan et al., 2023).

Project-Based Learning (PBL) has been identified as an effective approach to stimulate student creativity, as it encourages them to think critically and solve real-world problems through collaboration and exploration (Markula & Aksela, 2022; Tsybulsky & Muchnik-Rozanov, 2021). This approach is gaining attention in educational research because of its great potential to promote deeper learning and increase student engagement (Shin et al., 2021; Yustina et al., 2020). The integration of STEAM (Science, Technology, Engineering, Arts, and Mathematics) into the PBL framework further enhances its effectiveness by incorporating elements of art into science, technology, and engineering, enabling the development of creativity and problem-solving skills in a more holistic manner. This interdisciplinary approach is designed to break down traditional boundaries between subjects and encourage innovative thinking among students (Setianingrum et al., 2023; Suryaningsih, 2023; Tran, 2021).

Previous studies have shown that STEAM-based learning approaches have the potential to improve student learning outcomes, both in terms of knowledge acquisition and creativity development (Fatma, 2021; Segarra et al., 2018). Although many studies have examined the influence of STEAM on creativity, few studies have highlighted the role of scientific attitudes in this context. Scientific attitudes are believed to be important in encouraging students to think creatively and find innovative solutions to problems (Fatonah et al., 2023; Kareem, 2022).

However, research examining the interaction between scientific attitudes and STEAM-based learning is still very limited, especially in the context of project-based learning (Arizona, Sucilestari, Mutiara, et al., 2025; Asyari et al., 2024). In addition, most previous studies used qualitative approaches or did not involve experimental designs that were robust enough to test the effect of STEAM-based project learning on creativity, taking into account students' scientific attitudes. Therefore, this study aims to fill this gap by using a factorial experimental design to test the relationship between integrated STEAM-based project learning, scientific attitudes, and creativity among university students.

The novelty of this study lies in the use of a factorial experimental design to explore the interaction between project-based learning and scientific attitudes in the context of STEAM. This interaction has not been widely discussed in prior research, especially concerning the specific context of pre-service PGMI students. While many studies have explored the effectiveness of STEAM, few have examined the role of scientific attitudes in influencing creativity in project-based learning settings. This study specifically aims to investigate how students' scientific attitudes may influence their creativity in an integrated STEAM-based learning environment. The research seeks to fill this gap by testing the relationship between integrated STEAM-based project learning, scientific attitudes, and creativity using a factorial experimental design.

The objectives of this study are to (1) evaluate the effects of STEAM-based project learning on students' creativity, (2) examine the role of scientific attitudes in enhancing creativity, and (3) explore whether there is an interaction effect between STEAM-based learning and scientific attitudes on creativity. The hypothesis is that both STEAM-based project learning and scientific attitudes will independently contribute to an increase in student creativity, but no significant interaction will be found between the two variables.

In addition, this study is expected to deepen our understanding of how scientific attitudes can strengthen the outcomes of STEAM-based learning. By focusing on pre-service PGMI students from the UIN Mataram study program, the findings of this study are expected to provide insights into how scientific attitudes can be integrated into teaching strategies to improve creativity outcomes in science education. This study aims to contribute to the growing body of knowledge on the application of interdisciplinary approaches in fostering creativity among students in higher education. The findings will provide practical guidance for educators to design curricula that better integrate scientific attitudes and innovative teaching methods to enhance students' creative capacities.

METHOD

Research Design

This study employs a quantitative approach with a factorial experimental design to explore the impact of integrated STEAM project-based learning, considering scientific attitudes, on students' creativity. This design allows for the examination of the interaction between project-based learning and scientific attitudes, and how these two factors contribute to the enhancement of students' creativity. Figure 1 illustrates the 2x2 factorial experimental design used to test the effect of the STEAM-PBSL method on scientific attitudes. The design involves two variables: scientific attitude (high and low) and class type (experiment with STEAM-PBSL and control). There are four groups tested: participants with high scientific attitudes in the experimental group (X_1Y_1), participants with low scientific attitudes in the experimental group (X_1Y_2), participants with high scientific attitudes in the control group (X_2Y_1), and participants with low scientific attitudes in the control group (X_2Y_2). The dependent variable (DV) is creativity, and scientific attitude is treated as a moderator in this design.

		Scientific Attitude (Y)	
		High (Y_1)	Low (Y_2)
Class (X)	Experiment (STEAM-PBSL) (X_1)	X_1Y_1	X_1Y_2
	Control (X_2)	X_2Y_1	X_2Y_2

Figure 1. Factorial Experiment 2x2 Research Design

Population and Sample

The participants in this study were 74 students from the PGMI FTK UIN Mataram Study Program, enrolled in science courses during the 2025 academic semester. The students were selected through cluster random sampling, with the randomization unit being the individual student within each class. Inclusion criteria required students to be actively enrolled in the PGMI FTK UIN Mataram Study Program and to have full attendance throughout the study period. Students who were absent for any part of the data collection period were excluded from the study. Demographic information, including age, gender, and academic background, was collected to ensure baseline equivalence across the groups. Pretest measures of creativity and scientific attitude were also used to assess equivalence. Ethical approval was granted and all participants provided informed consent prior to their involvement in the study.

Table 1. Demographic Distribution of Study Sample

Category	Subcategory	Quantity	Percentage
Gender	Female	67	90.54%
	Male	7	9.46%
Age	Age 18-19 Years	22	29.73%
	Age 20-21 Years	41	55.41%
	Age 23-24 Years	6	8.11%
Class	Experimental Class	37	50.00%
	Control Class	37	50.00%

The data in Table 1 illustrates the demographic composition of the study sample consisting of 74 participants. The majority were female (90.54%), while males comprised only 9.46%. In terms of age, more than half of the participants (55.41%) were between 20 and 21 years old, followed by 29.73% aged 18–19 years, and 8.11% aged 23–24 years. Both the experimental and control classes were evenly distributed, each comprising 50% of the total sample.

Instruments and Procedures

The creativity test employed in this study was specifically designed to assess various dimensions of creativity within the context of science learning. The test evaluates four key dimensions: fluency, flexibility, originality, and elaboration. The test consists of four items, each related to the themes of ecosystems and the environment. These items were carefully developed to challenge students' ability to generate multiple responses, think divergently, and elaborate on innovative ideas concerning environmental issues. The scale was developed based on existing creativity research, and its reliability and validity were tested using expert judgment and psychometric methods.

The scientific attitude questionnaire used in this study consists of 7 indicators and 17 descriptors (statements). The scale's reliability and validity were assessed using factor analysis and Cronbach's alpha. The 17 statements were scored on a Likert scale (1-5), allowing for a comprehensive evaluation of students' scientific attitudes across various dimensions. **Table 2** outlines the indicators and corresponding statements used to assess scientific attitudes in this study. The indicators encompass various dimensions of scientific attitudes, such as attitudes toward scientific inquiry, the application of scientific attitudes, and curiosity. Each indicator is represented by a set of statements that reflect students' beliefs, behaviors, and tendencies related to science learning.

Table 2. Indicators and Statements of Scientific Attitude

Indicators	Statements
1) Attitude Toward Scientific Inquiry	(1) I believe it is important to follow proper procedures in scientific research. (2) I am interested in testing hypotheses through experiments. (3) I believe scientific research can help solve societal problems.
2) Application of Scientific Attitudes	(4) I always seek valid evidence before drawing conclusions. (5) I avoid making decisions without a strong scientific foundation.
3) Attitude Toward Science	(6) I enjoy studying natural phenomena and the principles of science. (7) I feel that science has a significant impact on everyday life. (8) I often seek more information on science topics.
4) Science Learning Experience	(9) I believe that my science learning experiences are valuable to my life. (10) I often feel challenged when learning science.
5) Curiosity Attitude	(11) I am always curious to learn more about new things. (12) When I hear something I don't understand, I seek to learn more about it.
6) Open-mindedness Attitude	(13) I am open to ideas and opinions that are different from my own. (14) I respect others' viewpoints, even when they differ from my own.
7) Behavioral Tendency for Science Learning	(15) I often take time to study science, even without assignments. (16) I feel comfortable seeking additional information about science beyond the lessons. (17) I tend to apply scientific knowledge in my daily life.

The STEAM-PBSL intervention was carried out following the established procedures for project-based learning, integrating science, technology, engineering, art, and mathematics. This approach aimed to foster creativity through hands-on, real-world projects, promoting critical thinking, collaboration, and innovation. The projects were designed to encourage interdisciplinary problem-solving, with each session including group work, lecturer-led discussions, and peer feedback. Both students and lecturers were provided with assessment rubrics to ensure the integrity and consistency of the learning process. Meanwhile, the control group adhered to a traditional curriculum, which consisted of structured lectures and individual assignments.

Data Analysis Techniques

Data from the creativity test and the scientific attitude questionnaire were analyzed using descriptive statistics. For scientific attitude, data were categorized into high and low using z-scores. Creativity data were analyzed using pretest and posttest mean scores, and N-gain scores, with statistical comparisons made using two-way analysis of variance (ANOVA). If the posttest was used as the dependent variable (DV), an ANCOVA model was applied with pretest scores as a covariate to control for baseline differences. The N-gain scores were used as an alternative outcome measure to assess the overall increase in creativity across the study period.

The homogeneity of variance was tested using Levene's test and normality was assessed using the One-Sample Kolmogorov-Smirnov test ($p = 0.200$). The interaction between the class type and scientific attitude was analyzed to examine the moderating effect of scientific attitude on creativity outcomes. The significance of main effects and interactions was tested using ANOVA, with partial eta squared ($\eta^2 p$) used to report effect sizes. Post-hoc comparisons and simple effects analysis were conducted to explore significant findings further. This technique was used to test the main effects and interactions between STEAM-PBSL learning and scientific attitudes on students' creativity. The analysis was conducted using Microsoft Excel and SPSS version 26.

RESULTS AND DISCUSSION

Research Results

Figure 2 presents a comparison of the average creativity scores between the experimental and control groups in three conditions: pretest, posttest, and N-Gain. The experimental group showed a significant increase from the pretest (46.33) to the posttest (79.05), with the highest N-Gain (61.49), while the control group only experienced a small increase from the pretest (45.73) to the posttest (57.18), resulting in a lower N-Gain (20.56). This indicates that the experimental group experienced a greater increase in creativity compared to the control group after the treatment was administered.

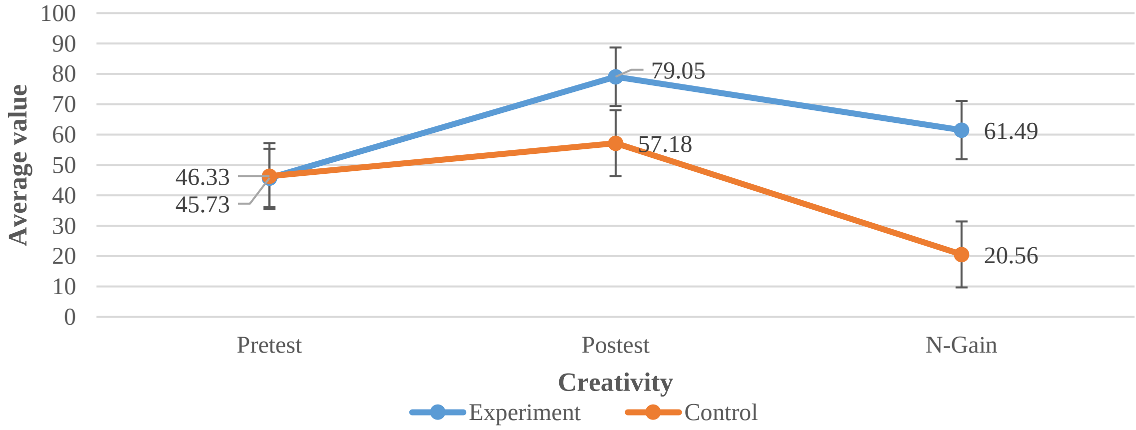

Figure 2. Comparison of average pretest, posttest, and N-gain creativity scores

Figure 3 illustrates the comparison between the experimental and control groups on four indicators of creativity, namely fluency, flexibility, originality, and elaboration. This graph shows the average scores at three measurement points: pretest, posttest, and N-gain. The experimental group showed significant improvements in all creativity indicators after the intervention, with higher posttest average scores compared to pretest scores, particularly in flexibility and elaboration. Meanwhile, the control group showed smaller changes, with relatively low N-gain scores on most indicators. This graph highlights the effectiveness of the intervention in enhancing creativity among participants in the experimental group.

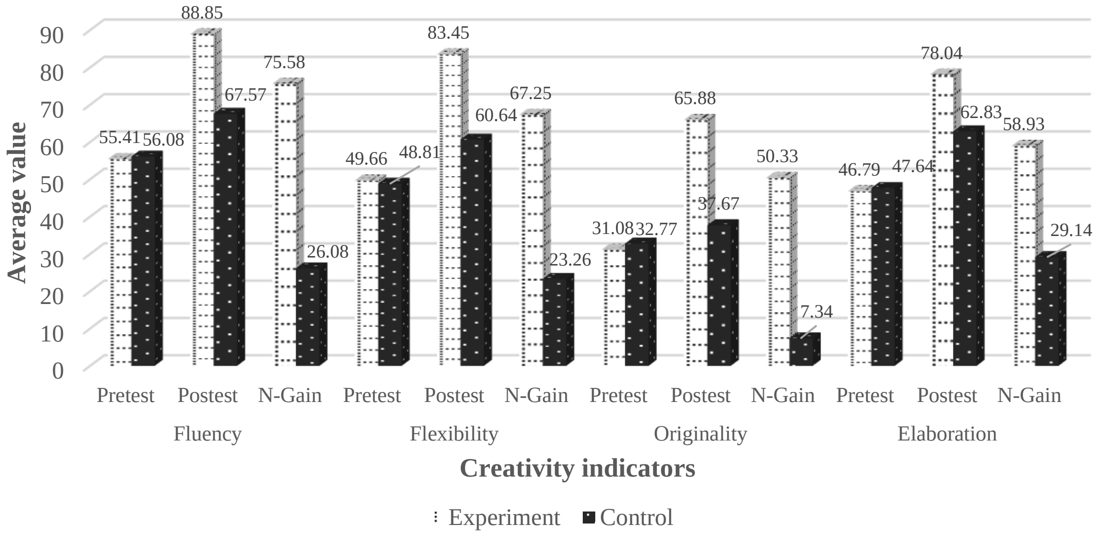

Figure 3. Comparison of the average pretest, posttest, and N-gain creativity scores

Table 3 presents a comparison of the average creativity scores of students based on scientific attitudes in both the experimental and control groups. In the experimental group, students with high scientific attitudes had an average creativity score of 82.38, while those with low scientific attitudes scored 75.91. In the control group, students with high scientific attitudes obtained an average score of 60.68, while those with low scientific attitudes only obtained 53.87. Overall, students in the experimental group had a higher average score (79.06) compared to the control group (57.18). In total, students with high scientific attitudes achieved an average score of 71.53, while those with low scientific attitudes obtained an average score of 64.89, with an overall total score of 68.12.

Table 3. Comparison of average creativity scores of students based on scientific attitudes

Class	Scientific attitude	Mean	Std. Deviation	N
Experiment	high	82.3806	8.35120	18
	low	75.9053	8.17351	19
	Total	79.0554	8.78082	37
Control	hight	60.6771	7.69675	18
	low	53.8651	6.45010	19
	Total	57.1791	7.79042	37
Total	high	71.5288	13.55630	36
	low	64.8852	13.32156	38
	Total	68.1172	13.75629	74

Next, a test was conducted to determine the effect of integrated STEAM PBSL on student creativity, with scientific attitude as a moderating variable using a two-way ANOVA test. However, prior to this, parametric statistical prerequisite tests were conducted, namely normality and homogeneity tests. Table 4 shows the results of the One-Sample Kolmogorov-Smirnov test to test the normality of creativity data with a sample size (N) of 74. The statistical test value was 0.065 with significance (Asymp. Sig.) of 0.200. Since the p-value > 0.05, the data did not show a significant difference from the normal distribution, meaning that the creativity data was normally distributed. Thus, the normality assumption was accepted, allowing the use of parametric methods in further analysis.

Tabel 4. One-Sample Kolmogorov-Smirnov Test

		creativity
N		74
Normal Parameters	Mean	68.1172
	Std. Deviation	13.75629
Most Extreme Differences	Absolute	.065
	Positive	.065
	Negative	-.060
Test Statistic		.065
Asymp. Sig. (2-tailed)		.200

Table 5 presents the results of the Levene test to examine the homogeneity of variance in creativity data. The test results show the Levene statistical values for various methods (based on Mean, Median, Median with adjusted degrees of freedom, and Trimmed Mean). The significance values (Sig.) for all methods are greater than 0.05, with values of 0.267, 0.360, 0.361, and 0.282, respectively. Since all significance values are greater than 0.05, it can be concluded that there are no significant differences in variance between groups. Therefore, the data can be considered to have homogeneous variance, which satisfies one of the important assumptions in analysis of variance (ANOVA).

Tabel 5. Levene's Test of Equality

		Levene Statistic	df1	df2	Sig.
creativity	Based on Mean	1.344	3	70	.267
	Based on Median	1.087	3	70	.360
	Based on Median and with adjusted df	1.087	3	69.387	.361
	Based on trimmed mean	1.299	3	70	.282

Table 6 shows the results of the Tests of Between-Subjects Effects, which reveal a significant influence of the main variables on creativity. The overall model has a large effect with an F value of 54.448 and significance of 0.000 ($p < 0.05$), as well as a partial eta squared of 0.700, indicating that 70% of the variation in creativity can be explained by the model. The Class variable (experimental vs. control group) has a significant effect with an F value of 149.380 and p = 0.000, while the SA variable (scientific attitude) also shows a significant difference between high and low scientific attitudes with an F value of 13.783 and p = 0.000. However, the interaction between Class and SA does not show a significant effect, with an F value of 0.009 and a p value of 0.925, indicating that there is no significant interaction between the two variables.

Based on data analysis using two-way analysis of variance (ANOVA), it was found that there was a significant difference between the experimental group and the control group in terms of student creativity. The experimental group that participated in STEAM-PBSL showed higher creativity than the control group that participated in conventional learning. In addition, the analysis showed that students' scientific attitudes had a significant influence on increasing creativity. Students with positive (high) scientific attitudes who participated in STEAM-PBSL experienced greater increases in creativity compared to students with low scientific attitudes, even though both were in different treatment groups.

Tabel 6. Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9670.108[a]	3	3223.369	54.448	.000	.700
Intercept	344011.034	1	344011.034	5810.880	.000	.988
Class	8843.486	1	8843.486	149.380	.000	.681
SA	815.951	1	815.951	13.783	.000	.165
Class * SA	.524	1	.524	.009	.925	.000
Error	4144.083	70	59.201			
Total	357171.008	74				
Corrected Total	13814.191	73				

a. R Squared = ,700 (Adjusted R Squared = ,687)

Discussion

The results of this study provide compelling evidence that integrated STEAM-PBSL significantly improves student creativity. The experimental group, which participated in STEAM-based learning, demonstrated greater creativity compared to the control group that followed conventional learning. This improvement was reflected in the average pretest and posttest scores, with higher N-Gain values in the experimental group. These findings can be explained by the interdisciplinary nature of the STEAM approach, which integrates science, technology, engineering, art, and mathematics to foster creative thinking skills (Oanh & Dang, 2025; Tsuchiya & Gyobu, 2025; Yeomans et al., 2025). Additionally, STEAM-based learning requires students to engage more actively in problem-solving and interaction across various disciplines, which likely contributed to the observed improvements in creativity (Amanova et al., 2025; Corrigan et al., 2025; Syaipul Hayat et al., 2025). Conversely, conventional learning tends to be more structured and less connected to real-world applications, offering limited opportunities to enhance creativity.

Integrated STEAM project-based learning allows students to work on real-world projects that involve creative and thinking skills, enabling them to connect the concepts they learn with practical applications. This approach is consistent with previous studies that have demonstrated the positive impact of STEAM-based learning on creativity in various educational settings (Maričić & Lavicza, 2024; Martínez et al., 2024; Spyropoulou & Kameas, 2024). The integration of multiple disciplines in STEAM provides students with the opportunity to develop more complex critical thinking, problem-solving, and creativity skills (Ayanwale et al., 2024). By engaging students in interdisciplinary learning, STEAM fosters creativity through real-world problem-solving that connects theoretical knowledge to practical applications, enhancing students' ability to think creatively (Aghasafari et al., 2025; Arango-Caro et al., 2025; Arizona, 2020a).

The STEAM approach, with its focus on project-based learning, also encourages collaboration among students to solve problems. Collaboration is a crucial element in developing creativity, as it promotes open thinking, the sharing of innovative ideas, and the enrichment of understanding across creativity (Asyari et al., 2024; Martínez et al., 2024; Oanh & Dang, 2025). This is in contrast to the more structured and theory-based conventional approach, which leaves little room for students to explore creative ideas (Arizona, Sucilestari, & Suhardi, 2025; Dewi et al., 2022). Thus, the STEAM approach provides a more conducive environment for the natural development of creativity (Ahmad et al., 2021; Kijima et al., 2021; Maričić & Lavicza, 2024; Nur & Nugraha, 2023; Spyropoulou & Kameas, 2024).

Additionally, this study emphasizes the importance of scientific attitudes in enhancing creativity. Students with a high scientific attitude tend to be more engaged and active in project-based learning. As observed in the experimental group, students with high scientific attitudes obtained higher average creativity scores compared to those with low scientific attitudes. Positive scientific attitudes, which include curiosity, perseverance, and openness to new ideas, appear to motivate students to explore new solutions, be more open to feedback, and take unconventional approaches to problem-solving. These findings align with Dewey's theory, which posits that positive scientific attitudes are foundational for developing critical and creative thinking skills in experience-based learning (Aghasafari et al., 2025; Arizona, 2020b). Students with a positive scientific attitude tend to approach problems more critically and creatively, which enhances their ability to generate innovative (Martínez et al., 2024; Suryandai et al., 2022; Rosa et al., 2020).

However, despite the significant effects of both integrated STEAM project-based learning and scientific attitudes on creativity, this study did not find a significant interaction between the two variables. This lack of interaction is an important finding that warrants further investigation. While we acknowledge that the interaction between STEAM project-based learning and scientific attitudes did not reach significance, it is important to recognize that the absence of an interaction may be attributed to various factors, such as reduced power resulting from the dichotomization of scientific attitudes, range restriction, or variability in implementation fidelity. Moreover, the lack of interaction might stem from differences in research contexts, uncontrolled variables, or limitations in the research design, such as sample size and analytical methods. These factors could have influenced the results, and thus, additional studies with larger sample sizes and refined methodologies are needed to further explore these interactions (Chung et al., 2018; Kim & Na, 2022; Koutstaal et al., 2022; Roth et al., 2022; Zhan et al., 2022).

In addition, although students with high scientific attitudes showed greater improvements in creativity, scientific attitudes alone may not be sufficient to moderate or amplify the influence of STEAM-based learning. Other factors such as motivation levels, prior experiences, and social or academic support could play an essential role in determining creativity outcomes. Further research should consider these additional variables to provide a more comprehensive understanding of how scientific attitudes, STEAM-based learning, and other contextual factors interact to shape student creativity.

The novelty of this study lies in its use of a 2x2 factorial experimental design to investigate the effects of integrated STEAM project-based learning, with scientific attitudes as a moderating variable. While previous studies have examined the impact of STEAM on creativity, few have considered the role of scientific attitudes as a factor that influences creative outcomes. This study fills an important gap in the existing literature by highlighting the potential of scientific attitudes in moderating the effects of STEAM-based learning on student creativity. This contribution is particularly relevant for curriculum development in higher education, especially in the context of the PGMI Study Program at UIN Mataram, where the integration of STEAM and the development of scientific attitudes can promote student creativity.

Overall, while no significant interaction was found between scientific attitudes and STEAM-based learning, the results provide important insights into how each factor contributes independently to enhancing student creativity. STEAM-based learning fosters creativity by providing space for students to explore new ideas, while positive scientific attitudes support this process by promoting a more critical and innovative approach to problem-solving. Further research is needed to explore other factors, such as intrinsic motivation or background experiences, that may enrich the relationship between scientific attitudes, STEAM-based learning, and student creativity.

CONCLUSION

This study shows that STEAM-PBSL significantly enhances student creativity, with the experimental group outperforming the control group in terms of creativity. Scientific attitudes also play a crucial role in fostering creativity, as students with higher scientific attitudes exhibited stronger creativity outcomes than their peers with lower scientific attitudes. However, no interaction effect between class type and scientific attitudes on creativity was found. These findings indicate that both STEAM-PBSL and scientific attitudes independently contribute to creativity enhancement. For educators, this study suggests the importance of integrating STEAM-PBSL units with structured creativity rubrics to provide clear, consistent feedback that fosters creativity. Additionally, educators should cultivate scientific attitudedispositions by implementing specific pedagogical strategies such as encouraging curiosity, perseverance, and openness to feedback throughout the learning process. By designing project-based learning tasks that integrate interdisciplinary content, educators can create a more conducive environment for creativity to flourish.

RECOMMENDATION

In future research, it is recommended to explore additional factors, such as students' prior knowledge, learning styles, and external motivation, to assess their influence on STEAM-PBSL outcomes. Expanding the scope to different educational levels or disciplines could provide valuable insights into how these findings can be generalized across various contexts. Furthermore, future studies could examine moderating variables or explore other interventions that may enhance the interaction between STEAM-PBSL and scientific attitudes, improving creativity even further. Some limitations of this study include the small sample size and specific research context, which may limit the generalizability of the results. Additionally, variability in students' initial attitudes toward science and their engagement in learning may have influenced the outcomes, suggesting the need for stricter controls to address potential biases. Ensuring consistent implementation of the STEAM model across different educational settings is another challenge that should be addressed in future research to maintain the uniformity of results.

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Author Contributions Statement

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Kurniawan Arizona	✓	✓	✓			✓		✓	✓	✓	✓	✓		✓
Lalu Ahmad Didik M			✓	✓			✓			✓			✓	
Masiah					✓		✓			✓		✓	✓	
Rendi Restiana Sukardi					✓		✓					✓	✓	

Data Availability

All data necessary to support the conclusions of this study are available upon reasonable request from the corresponding author, RS.

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