



Project-Based Learning Promotes Students' Creativity in Learning Living Organism Classification

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Abstract: This study describes students' creativity following Project-Based Learning (PjBL) in learning about the classification of living organisms. A quantitative descriptive approach with a one-shot case study design involved 27 seventh-grade students at SMP Negeri 1 Jatisrono. Data were collected through a creativity observation rubric covering four indicators: fluency, flexibility, originality, and elaboration. The instrument underwent content validation by two Biology Education experts, and data were analyzed using quantitative descriptive procedures. The results showed that fluency (83.02%) and flexibility (85.49%) were categorized as highly creative, whereas originality (79.32%) and elaboration (79.01%) were categorized as creative. Overall, 15 students (56%) were classified as creative and 12 students (44%) as highly creative. These findings provide a descriptive profile of students' creativity following PjBL implementation and indicate that the learning activities provided opportunities to generate, vary, refine, and elaborate ideas during project completion. The findings offer practical considerations for science teachers designing activities that provide opportunities for creative thinking.

Abstrak: Penelitian ini mendeskripsikan kreativitas siswa setelah penerapan Project-Based Learning (PjBL) pada pembelajaran klasifikasi makhluk hidup. Penelitian menggunakan pendekatan deskriptif kuantitatif dengan desain *one-shot case study* yang melibatkan 27 siswa kelas VII SMP Negeri 1 Jatisrono. Data dikumpulkan melalui rubrik observasi kreativitas yang mencakup empat indikator, yaitu *fluency*, *flexibility*, *originality*, dan *elaboration*. Instrumen divalidasi oleh dua ahli Pendidikan Biologi, sedangkan data dianalisis menggunakan prosedur deskriptif kuantitatif. Hasil penelitian menunjukkan bahwa *fluency* (83,02%) dan *flexibility* (85,49%) berada pada kategori sangat kreatif, sedangkan *originality* (79,32%) dan *elaboration* (79,01%) berada pada kategori kreatif. Secara keseluruhan, 15 siswa (56%) termasuk kategori kreatif dan 12 siswa (44%) kategori sangat kreatif. Temuan ini memberikan gambaran deskriptif mengenai kreativitas siswa setelah penerapan PjBL dan menunjukkan bahwa aktivitas pembelajaran menyediakan kesempatan bagi siswa untuk menghasilkan, memvariasikan, mengembangkan, dan mengelaborasi ide selama penyelesaian proyek. Temuan ini dapat menjadi pertimbangan bagi guru IPA dalam merancang aktivitas pembelajaran yang memberikan kesempatan untuk berpikir kreatif.

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A. Introduction

The development of 21st-century education requires schools to equip students with competencies that enable them to respond effectively to increasingly complex learning and real-world challenges. Creativity is one of these essential competencies because it enables students to generate ideas, explore alternative solutions, and apply knowledge in meaningful contexts (Thornhill-Miller et al., 2023). This emphasis is consistent with Sustainable Development Goal 4, which promotes quality education and learning opportunities that support students' development across diverse contexts (United Nations, 2023). Consequently, classroom learning should not be limited to the transmission of subject matter but should provide students with opportunities to explore, construct, and communicate ideas. In science education, this orientation is particularly relevant because students are expected not only to master scientific concepts but also to investigate phenomena, interpret information, and develop explanations based on evidence. Learning activities that provide opportunities for active exploration and hands-on experiences can therefore create conditions that support students' creative engagement (Rafik et al., 2022; Saputra et al., 2024; Fatmawati, 2023; Hamidah & Citra, 2021).

Despite this expectation, classroom instruction may still rely heavily on conventional practices in which teachers remain the primary source of information while students predominantly listen, take notes, and follow predetermined procedures. Such learning conditions can restrict opportunities for students to ask questions, express ideas, explore alternatives, and participate actively in problem-solving. Previous studies have associated teacher-centered learning with limited development of critical thinking, confidence in expressing opinions, and creativity (Azzahra et al., 2023; Ngabdiningsih et al., 2023; Muhtar et al., 2022). This issue is also relevant to the broader condition of science education in Indonesia. The 2022 Programme for International Student Assessment (PISA) reported that Indonesian students obtained a science literacy score of 383 points, compared with the OECD average of 485 points (OECD, 2023). Although science literacy and creativity are distinct constructs, this situation highlights the continuing need for learning environments that encourage students to engage actively with scientific ideas, investigate problems, and construct meaning through learning experiences rather than merely receive information.

Creativity itself is a multidimensional construct involving the capacity to generate and develop ideas in response to problems or learning situations. In educational contexts, creativity can be understood through four commonly recognized indicators: fluency, flexibility, originality, and elaboration (Torrance, 1966). Fluency refers to the ability to generate multiple ideas, flexibility concerns the ability to produce ideas or approaches from different perspectives, originality reflects the production of unique or uncommon ideas, and elaboration concerns the ability to develop and enrich ideas with relevant details. These dimensions provide a more comprehensive basis for examining how creativity is manifested during learning activities. Previous research has indicated that creativity can be stimulated when students are given opportunities to explore information, formulate ideas, and interpret knowledge derived from problems in their surrounding environment (Yulaikah et

al., 2022; Alfillaili et al., 2023; Sulisty, 2021). Therefore, examining creativity through its individual indicators is important because students may demonstrate stronger performance in generating and varying ideas while experiencing greater difficulty in developing those ideas into original and detailed products.

The characteristics of Project-Based Learning (PjBL) provide a relevant instructional context for such creative engagement. PjBL places students in learning activities that involve inquiry, problem-solving, planning, production, presentation, and reflection, allowing them to participate directly in the construction of project outcomes (Astuti & Putri, 2024; Malanita et al., 2025; Ayuningsih et al., 2022; Umbunan et al., 2025). Rather than receiving information passively, students are involved in designing and completing projects connected with meaningful or real-world problems (Ishartono et al., 2023). The project process can provide opportunities for students to discuss ideas, make decisions, revise their work, and communicate their results. Reflection and project development may also provide space for students to practice decision-making, critical thinking, and creative thinking (Nababan et al., 2023). Furthermore, presentation and peer feedback can enable students to exchange ideas and broaden their perspectives during project completion (Listiaji et al., 2022). In the PjBL framework applied in this study, learning consisted of six stages: determining a fundamental question, planning the project, creating a schedule, monitoring project activities, assessing project outcomes, and evaluating the learning experience (Sari et al., 2024). These stages provide a structured context in which different manifestations of creativity can be observed throughout the learning process.

The topic of living organism classification offers a particularly relevant context for implementing project-based science learning. Classification requires students to observe characteristics, compare organisms, identify similarities and differences, and group organisms according to particular characteristics (Sartika, 2022). Consequently, learning this topic involves more than memorizing biological terminology because students need to establish relationships among observable characteristics and classification concepts. Hands-on scientific activities can support students in developing a more concrete understanding of these relationships (Ansori, 2021; Astuti et al., 2023), while PjBL can engage students in observation, information gathering, and project development when learning classification concepts (Mulyandari et al., 2022; Yanti et al., 2025). This combination makes the topic suitable for observing how students generate, vary, develop, and elaborate ideas while completing a concrete learning product.

Previous studies have reported positive associations between PjBL and various dimensions of student learning. Nurmayasari et al (2022), for example, examined collaboration in the production of herbarium materials, while Ngabdiningsih et al (2023) reported improvements in students' creativity, particularly in flexibility and originality. Other research has similarly indicated that project-based learning can create opportunities for students to think critically, creatively, and actively during science learning (Wijayanti & Nurcahyanto, 2025). However, the existing literature does not provide sufficient descriptive evidence concerning how the four creativity indicators are manifested individually within

a specific science topic at the junior high school level. In particular, research focusing on the creativity profile of students learning living organism classification through PjBL remains limited, and information about the relative achievement of fluency, flexibility, originality, and elaboration is still insufficient. This gap is important because an overall creativity score may conceal differences among specific dimensions of creative thinking.

Accordingly, the present study addresses this gap by providing an indicator-level descriptive profile of students' creativity following the implementation of PjBL in learning about living organism classification. The study does not attempt to establish a causal effect of PjBL because it employs a one-shot case study without a pre-test or comparison group. Instead, it examines the level of students' creativity as manifested through four indicators: fluency, flexibility, originality, and elaboration. The research question is: What is the level of students' creativity across fluency, flexibility, originality, and elaboration following the implementation of Project-Based Learning in learning about living organism classification? By providing a detailed profile of these four indicators, this study contributes descriptive evidence that can help teachers identify aspects of creativity that are relatively strong and those that may require greater instructional attention when designing project-based science learning.

B. Method

This study employed a quantitative descriptive approach with a one-shot case study design to describe students' creativity following the implementation of Project-Based Learning (PjBL) in learning about the classification of living organisms. The study was conducted at SMP Negeri 1 Jatisrono, Wonogiri Regency, Central Java, during the even semester of the 2025/2026 academic year. The population consisted of seventh-grade students at the school. Two seventh-grade classes taught by the supervising teacher were identified as research clusters, and one class was selected through a random-draw procedure. Class VII D, consisting of 27 students, was selected as the research group (Lukiyati, 2022). Because the study used a one-shot case study without a pre-test or comparison group, the findings are interpreted descriptively and do not establish a causal effect of PjBL on students' creativity.

The research procedure consisted of three stages: preparation, implementation, and data analysis. The preparation stage included initial classroom observations, interviews with the science teacher, development of teaching materials, and development and validation of the research instruments. The implementation stage involved applying PjBL over three sessions through six stages: determining a fundamental question, planning the project, creating a schedule, monitoring project activities, assessing project outcomes, and evaluating the learning experience. During the project, students produced a three-dimensional learning panel on the classification of living organisms. The final stage involved collecting, scoring, and analyzing students' creativity data (Sari et al., 2024).

Data were collected through teacher interviews and direct observation. Interviews were conducted to obtain contextual information about the initial learning conditions,

whereas the primary quantitative data were obtained through an observation rubric covering four creativity indicators: fluency, flexibility, originality, and elaboration (Rajagukguk, 2023). Fluency referred to the ability to generate multiple ideas, flexibility to consider alternative approaches, originality to produce distinctive ideas, and elaboration to develop ideas with relevant details. The instrument underwent content validation by two lecturers from the Biology Education Study Program at Universitas Muhammadiyah Surakarta. The validation examined the relevance of the indicators, clarity of the assessment criteria, language, and representativeness of each aspect. Revisions were made based on the validators' recommendations before the instrument was used (Chimam & Aryani, 2024).

The overall research flow is presented in Figure 1. The study began with a preparation stage involving initial observation, teacher interviews, teaching material development, and instrument development and validation. This was followed by the implementation of PjBL through six stages, namely determining a fundamental question, planning the project, creating a schedule, monitoring project activities, assessing project outcomes, and evaluating the learning experience. Students' creativity was then observed based on four indicators: fluency, flexibility, originality, and elaboration. Finally, the collected data were analyzed descriptively to determine the creativity profile of the students.

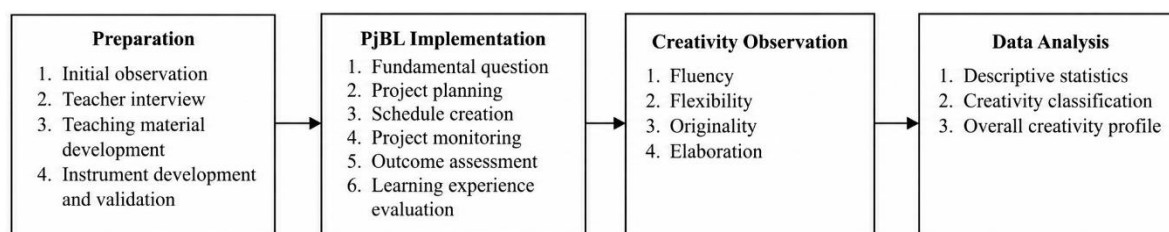


Figure 1. Research Flow

Because the observation was conducted by a single observer, inter-rater reliability was not calculated. Scoring consistency was maintained by using the same rubric, predetermined criteria, and indicator definitions throughout all three sessions. Mean, minimum, maximum, and standard deviation were calculated for each creativity indicator. Overall creativity was determined based on the aggregate scores across the four indicators for each student. Students were then classified into creativity categories based on their overall scores, and the frequency and percentage of students in each category were calculated from the total of 27 students. This analysis was intended to describe students' creativity following PjBL implementation rather than to measure improvement or establish causality.

C. Result

The results describe students' creativity following the implementation of Project-Based Learning (PjBL) on the classification of living organisms. Creativity was assessed through four indicators, namely fluency, flexibility, originality, and elaboration. The analysis focused on the descriptive scores obtained from the 27 participating students. The

results are presented according to each creativity indicator and the overall creativity category.

Overall Creativity Profile

The overall descriptive analysis provides an initial profile of students' creativity across the four assessed indicators. Each indicator was analyzed based on the minimum score, maximum score, mean, standard deviation, percentage score, and corresponding creativity category. The classification criteria used in the study placed scores of 80–100% in the Highly Creative category and scores of 60–80% in the Creative category.

Table 1. Descriptive Statistics of Students' Creativity

Indicator	N	Minimum	Maximum	Mean	SD	Score (%)	Category
Fluency	27	2	4	3.3210	0.80354	83.02	Highly Creative
Flexibility	27	1	4	3.4198	0.73465	85.49	Highly Creative
Originality	27	1	4	3.1728	0.79231	79.32	Creative
Elaboration	27	2	4	3.1605	0.70981	79.01	Creative

As shown in Table 1, the four indicators were classified as either Creative or Highly Creative. Flexibility obtained the highest mean score ($M = 3.4198$) and percentage score (85.49%), followed by fluency ($M = 3.3210$; 83.02%). Both indicators were categorized as Highly Creative. Originality obtained a mean score of 3.1728 and a percentage score of 79.32%, while elaboration obtained a mean score of 3.1605 and a percentage score of 79.01%. Both were categorized as Creative.

The standard deviation values also differed across the four indicators. Fluency had the largest standard deviation ($SD = 0.80354$), followed by originality ($SD = 0.79231$), flexibility ($SD = 0.73465$), and elaboration ($SD = 0.70981$). Thus, the observed scores showed the greatest dispersion for fluency and the smallest dispersion for elaboration. The minimum and maximum scores ranged from 1 to 4 for flexibility and originality and from 2 to 4 for fluency and elaboration.

Fluency

Fluency refers to one of the four creativity indicators assessed during the learning activities. The indicator was measured using the predetermined observation rubric, and the scores obtained from the 27 students were summarized using descriptive statistics. The results for the fluency indicator are presented in Table 2.

Table 2. Students' Fluency Scores

Measure	Result
N	27
Minimum	2
Maximum	4

Measure	Result
Mean	3.3210
Standard Deviation	0.80354
Percentage	83.02%
Category	Highly Creative

The fluency indicator obtained a mean score of 3.3210, corresponding to a percentage score of 83.02%. Based on the established classification criteria, this result placed fluency in the Highly Creative category. The observed scores ranged from 2 to 4, while the standard deviation was 0.80354.

Among the four indicators, fluency had the second-highest percentage score after flexibility. Its standard deviation was also the largest among the four indicators, indicating that the fluency scores had the greatest dispersion around the mean. These findings describe the observed level and distribution of students' fluency scores following the PjBL implementation.

Flexibility

Flexibility was assessed to describe students' creativity based on the variety of responses or approaches observed during the project activities. As with the other indicators, the assessment was conducted using the predetermined creativity rubric. The descriptive results for flexibility are presented in Table 3.

Table 3. Students' Flexibility Scores

Measure	Result
N	27
Minimum	1
Maximum	4
Mean	3.4198
Standard Deviation	0.73465
Percentage	85.49%
Category	Highly Creative

Flexibility recorded the highest mean score among the four indicators, with a mean of 3.4198 and a percentage score of 85.49%. This result placed the flexibility indicator in the Highly Creative category. The observed scores ranged from 1 to 4, with a standard deviation of 0.73465.

The percentage score for flexibility was 2.47 percentage points higher than fluency, making it the highest-performing indicator in the descriptive results. Its standard deviation was lower than those of fluency and originality but higher than that of elaboration. Thus, flexibility showed the highest observed average score while maintaining a relatively narrower score distribution than fluency.

Originality

Originality was the third creativity indicator assessed in the study. The indicator was analyzed from the scores obtained by the 27 students during the observation of the learning activities. The descriptive statistics for originality are presented in Table 4.

Table 4. Students' Originality Scores

Measure	Result
N	27
Minimum	1
Maximum	4
Mean	3.1728
Standard Deviation	0.79231
Percentage	79.32%
Category	Creative

The originality indicator obtained a mean score of 3.1728 and a percentage score of 79.32%. According to the classification criteria, this result was categorized as Creative. The observed scores ranged from 1 to 4, with a standard deviation of 0.79231.

The percentage score for originality was lower than those for flexibility and fluency but higher than that for elaboration. The standard deviation of 0.79231 was the second largest among the four indicators, indicating that originality scores showed relatively greater dispersion compared with flexibility and elaboration.

Elaboration and Overall Creativity Category

Elaboration was the fourth creativity indicator assessed in the study. The indicator describes the final dimension included in the creativity rubric and was analyzed using the same descriptive procedure applied to fluency, flexibility, and originality. The results are presented in Table 5.

Table 5. Students' Elaboration Scores

Measure	Result
N	27
Minimum	2
Maximum	4
Mean	3.1605
Standard Deviation	0.70981
Percentage	79.01%
Category	Creative

Elaboration obtained a mean score of 3.1605 and a percentage score of 79.01%. Based on the classification criteria, elaboration was categorized as Creative. The observed scores ranged from 2 to 4, with a standard deviation of 0.70981.

Elaboration recorded the lowest percentage score among the four indicators, although it remained within the Creative category. Its standard deviation was also the smallest among the four indicators, indicating the least dispersion in the observed scores. To provide an overall description of students' creativity, the aggregate scores across the four indicators were used to classify each student into an overall creativity category. The resulting distribution is presented in Table 6.

Table 6. Overall Distribution of Students' Creativity

Creativity Category	Frequency	Percentage (%)
Creative	15	55.56
Highly Creative	12	44.44
Moderately Creative	-	-
Low Creativity	-	-
Very Low Creativity	-	-
Total	27	100.00

The overall distribution shows that 15 students (55.56%) were classified as Creative, while 12 students (44.44%) were classified as Highly Creative. Therefore, all 27 participating students were included in the Creative or Highly Creative categories. The frequencies were obtained from the classification of each student's aggregate creativity score across the four assessed indicators. The original results reported these proportions as 56% and 44%, respectively.

Overall, the descriptive results indicate that flexibility was the highest-scoring creativity indicator (85.49%), followed by fluency (83.02%), originality (79.32%), and elaboration (79.01%). Thus, the results directly address the research question by showing the observed level of students' creativity for each of the four specified indicators.

D. Discussion

The findings showed that students' creativity following the implementation of Project-Based Learning (PjBL) was within the Creative to Highly Creative categories across all four assessed indicators. Flexibility obtained the highest percentage score (85.49%), followed by fluency (83.02%), originality (79.32%), and elaboration (79.01%). At the overall level, 15 of the 27 students (55.56%) were classified as Creative, while 12 students (44.44%) were classified as Highly Creative. These findings indicate that the students demonstrated relatively strong observed creativity across the four indicators after participating in PjBL activities. However, because this study employed a quantitative descriptive method with a One-Shot Case Study design, these results should be interpreted as a description of students' creativity following PjBL implementation rather than evidence that PjBL caused an increase in creativity. The findings therefore provide a profile of how the four dimensions of creativity appeared within the learning context examined.

The relatively high scores across the four indicators may be related to the characteristics of the project activities implemented in the classroom. During the three learning sessions, students engaged in a project involving the development of a 3D learning panel on the classification of living organisms. The PjBL procedure provided opportunities for students to determine fundamental questions, plan the project, create a schedule, monitor project activities, assess project outcomes, and evaluate the learning experience. Such activities required students to participate actively in generating ideas, selecting approaches, developing project components, and presenting the resulting product. From a theoretical perspective, creativity involves the ability to generate, develop, and elaborate ideas, while fluency, flexibility, originality, and elaboration represent important dimensions for describing creative performance (Torrance, 1966). Thus, the project context provided observable opportunities for students to demonstrate different dimensions of creativity rather than relying solely on conventional responses to teacher-delivered instruction.

Flexibility emerged as the strongest indicator, with a percentage score of 85.49% and a mean score of 3.4198. This result suggests that students showed the highest observed performance in flexibility compared with the other creativity indicators. One possible explanation is that project-based activities allow students to consider different ideas and approaches while completing a product. Unlike activities that require students to follow a single predetermined procedure, project development can involve decisions about how information is organized, how the product is designed, and how ideas are represented. The theory of creativity proposed by Torrance (1966) places flexibility among the central dimensions of creative thinking, particularly in relation to the ability to shift among different ideas or approaches. This finding is consistent with Ngabdiningsih et al (2023), who reported that PjBL contributes to students' creativity, particularly in flexibility and originality. Therefore, the relatively high flexibility score in the present study is consistent with previous evidence that project-based learning contexts can provide opportunities for students to demonstrate flexible creative responses.

Fluency also reached the Highly Creative category, with a percentage score of 83.02% and a mean score of 3.3210. The result indicates that students demonstrated a relatively high observed ability to produce ideas or responses during the project activities. The project required students to engage with information, contribute ideas, and develop components of the learning product, which may have created opportunities for multiple responses to emerge. From the perspective of Torrance's theory of creative thinking, fluency represents an important dimension of creativity because creative performance involves generating ideas rather than producing only a single response (Torrance, 1966). The present finding is also broadly supported by previous research showing that PjBL can provide learning environments that encourage students to think creatively and actively. Wijayanti & Nurcahyanto (2025), for example, reported that PjBL encourages students to think critically, creatively, and actively during learning. The fluency finding therefore reinforces the relevance of project activities as a context in which students' generation of ideas can be observed.

In contrast, originality and elaboration obtained slightly lower scores, at 79.32% and 79.01%, respectively, although both remained in the Creative category. The difference between these indicators and flexibility may indicate that generating alternative ideas was somewhat more readily observed than producing highly novel ideas or developing ideas with extensive detail. Originality requires students to move beyond commonly available responses, whereas elaboration requires them to extend and refine an idea by adding relevant details. These dimensions may demand more extensive development of an initial idea than simply generating or shifting among alternatives. The finding is noteworthy because previous research by Ngabdiningsih et al (2023) also identified flexibility and originality as important creativity dimensions in PjBL contexts. In the present study, originality was still classified as Creative, but its lower score compared with flexibility suggests that creativity should not be treated as a single, uniform ability. Different dimensions may appear at different levels within the same learning context.

The study extends the existing literature by providing a more specific descriptive profile of creativity across four indicators within a junior high school science context focused on the classification of living organisms. Previous studies cited in this research have examined PjBL in relation to creativity, collaboration, critical thinking, or learning outcomes (Karmana, 2024; Mashfiya & Ahsani, 2024; Wafiyah et al., 2025), while research specifically describing fluency, flexibility, originality, and elaboration together in this particular topic and educational context remains limited. The present findings therefore add more detailed evidence by showing that flexibility was the strongest observed indicator, followed by fluency, originality, and elaboration. Overall, the findings answer the research question by showing that, following PjBL implementation, students' creativity was classified as Highly Creative for fluency and flexibility and Creative for originality and elaboration. The overall distribution further showed that 55.56% of students were Creative and 44.44% were Highly Creative. Thus, the study provides a descriptive profile of students' creativity across the four indicators without extending the findings to claims of improvement or causal effects of PjBL.

E. Implication

The findings have several implications for science education, particularly in the use of Project-Based Learning (PjBL) to provide opportunities for students to demonstrate different dimensions of creativity. The relatively high scores across fluency, flexibility, originality, and elaboration suggest that project activities can serve as a meaningful classroom context for observing students' creative performance, especially through activities that involve generating ideas, considering alternative approaches, developing original responses, and elaborating project products. For teachers, the findings imply that PjBL activities can be designed with explicit creativity indicators so that students are given opportunities to demonstrate different forms of creative thinking rather than being assessed only through final products (Aditama et al., 2022). The differences among the four indicators also suggest that teachers may need to provide additional opportunities for students to develop originality and elaboration, which showed lower observed scores than flexibility

and fluency. For researchers, this study provides a more detailed descriptive profile of creativity in the context of living organism classification and demonstrates the usefulness of assessing creativity through four specific indicators. However, the implications should be interpreted within the descriptive nature of the study, as the One-Shot Case Study design does not allow conclusions about the causal effectiveness of PjBL or changes in students' creativity over time.

F. Limitations and Suggestions for Further Research

This study has several limitations that should be considered when interpreting the findings. First, the study employed a One-Shot Case Study design involving only 27 students from one seventh-grade class at SMP Negeri 1 Jatisrono. Therefore, the findings describe the creativity profile of the participating students following the implementation of PjBL and cannot be generalized broadly or interpreted as evidence that PjBL caused an increase in creativity. Second, creativity was assessed through observation by a single observer, so inter-rater reliability could not be calculated. Although scoring consistency was maintained by applying the same rubric and predetermined criteria throughout the three sessions, the possibility of observer-related subjectivity remains. In addition, the study focused specifically on four creativity indicators, namely fluency, flexibility, originality, and elaboration, without measuring other variables such as conceptual understanding, learning outcomes, or changes in creativity over time. These limitations are consistent with the descriptive scope of the research and should be considered when interpreting the results.

Further research is therefore recommended to employ stronger research designs, such as pretest-posttest, quasi-experimental, or experimental designs with comparison groups, to examine changes in students' creativity and provide stronger evidence regarding the contribution of PjBL. Future studies could also involve larger and more diverse samples from different schools and educational contexts to improve the transferability of the findings. To strengthen the objectivity of creativity assessment, researchers are encouraged to involve more than one observer and calculate inter-rater reliability. Future research may also investigate the development of each creativity indicator across different PjBL stages and examine how project characteristics, instructional strategies, and assessment approaches relate to students' creative performance. In addition, researchers may consider examining creativity together with relevant learning variables, such as conceptual understanding or learning outcomes, provided that these variables are explicitly measured.

G. Conclusion

This study concludes that students' creativity following the implementation of Project-Based Learning (PjBL) in the classification of living organisms topic was generally at a high level across the four assessed indicators. Flexibility obtained the highest score of 85.49% and was categorized as Highly Creative, followed by fluency at 83.02%, also categorized as Highly Creative, while originality and elaboration obtained scores of 79.32%

and 79.01%, respectively, and were categorized as Creative. Overall, 15 students (55.56%) were categorized as Creative and 12 students (44.44%) as Highly Creative. These findings directly answer the research question by showing that the observed creativity profile varied across the four indicators, with flexibility and fluency demonstrating stronger performance than originality and elaboration. The findings provide a descriptive profile of students' creativity following PjBL implementation; however, given the One-Shot Case Study design, they should not be interpreted as evidence that PjBL caused an increase or improvement in students' creativity.

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