



## **The Effectiveness of Inquiry-Based Learning in Enhancing Student Creativity as a Dimension of Deep Learning and Its Impact on Learning Outcomes in Elementary Education**

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**Abstract:** This study aims to investigate the effectiveness of inquiry-based learning in enhancing students' creativity as a dimension of deep learning and its impact on learning outcomes in elementary education. The research was conducted with sixth-grade students at SDN Wanamulya, Pemalang Regency. A quantitative approach with a pre-experimental one-group pretest–posttest design was employed. The instruments included a creativity observation checklist and an IPAS learning achievement test. Data were analyzed using descriptive statistics and comparative analysis to examine changes in students' creativity and learning outcomes before and after the implementation of inquiry-based learning. The findings indicate that students' creativity improved following the implementation of inquiry-based learning, as reflected in the increase in the mean creativity score from 2.34 in the pretest to 3.54 in the posttest. Improvements were observed across several dimensions, including idea fluency, flexibility in problem-solving, originality, and elaboration. In addition, students' learning outcomes showed a significant increase, with the class average score rising from 63.40 in the pretest to 82.15 in the posttest. The percentage of students achieving the minimum mastery criterion also increased from 45% to 85%. In conclusion, inquiry-based learning is effective in promoting meaningful learning and supporting deep learning by enhancing students' creativity and improving learning outcomes in elementary education.

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## **Introduction**

Contemporary elementary education is expected to facilitate learning experiences that not only emphasize knowledge acquisition but also promote higher-order thinking skills, creativity, and meaningful understanding. In the context of 21st-century learning, students are required to actively construct knowledge, explore ideas, and apply concepts in real-life situations. This is in line with recent studies emphasizing that 21st-century education prioritizes critical thinking, collaboration, creativity, and problem-solving skills as essential competencies for learners (Kurniawan et al., 2023). Furthermore, learning is viewed as an active process in which students construct knowledge through experience, interaction, and engagement, as highlighted in contemporary constructivist-based learning research (Pratama et al., 2022). Recent studies also indicate that integrating constructivist and inquiry-based approaches significantly enhances students' conceptual understanding, engagement, and critical thinking skills (Sari et al., 2024). Therefore, instructional approaches in elementary schools must support meaningful learning processes that foster both cognitive achievement and holistic personal development. One instructional approach that supports these goals is Inquiry-Based Learning (IBL). Inquiry-Based Learning refers to a student-centered



instructional approach in which learners actively investigate problems, formulate questions, gather and analyze information, and construct conclusions based on evidence. Through this process, students engage in exploration and reflective thinking that encourages deeper conceptual understanding and meaningful learning experiences.

One educational approach that has gained increasing attention in recent years is deep learning. In educational discourse, deep learning refers to a learning process that enables students to develop deep conceptual understanding, critical and creative thinking skills, independence, collaboration, communication abilities, and positive character traits. Recent studies conceptualize deep learning as a multidimensional construct integrating cognitive, social, and affective aspects of learning. (Allolinggi et al., 2025) emphasize that effective implementation of deep learning in elementary education requires instructional designs that actively engage students in inquiry, exploration, and reflection. Similarly, (Hatima, 2025) highlights that deep learning-oriented instruction shifts classroom practices from teacher-centered transmission of knowledge toward student-centered meaning-making activities.

Creativity constitutes a crucial dimension of deep learning, particularly in elementary education, where students are at a formative stage of cognitive, emotional, and imaginative development. Creative learners demonstrate fluency in generating ideas, flexibility in approaching problems, originality in expressing thoughts, and the ability to elaborate solutions. Previous research indicates that student creativity can be enhanced through active and student-centered learning models, such as project-based learning and problem-based learning (Iswari et al., 2023) and (Syara et al., 2025). However, many of these studies position creativity as an isolated learning outcome rather than explicitly framing it as an integral dimension of deep learning.

Inquiry-based learning is widely recognized as an instructional model that promotes active participation, critical inquiry, and problem-solving through systematic investigation. Through inquiry activities, students are encouraged to observe phenomena, formulate questions, collect and analyze data, and draw conclusions based on evidence. Prior studies have shown that inquiry-based learning positively influences students' creative thinking skills and learning outcomes, particularly in science-related subjects (Krismanita & Qosyim, 2021). Nevertheless, existing research predominantly focuses on cognitive achievement and scientific process skills, while creativity is frequently treated as an isolated cognitive outcome rather than being integrated within a broader deep learning framework in elementary education.

Recent discussions on deep learning within the Indonesian educational context have largely emphasized curriculum transformation, teacher competence, and character education aligned with the Pancasila Student Profile (Julkifli & Syamratulangi, 2025) and (Saridudin, 2025). Although these studies contribute important theoretical and policy-related insights, empirical research examining how inquiry-based learning can simultaneously enhance student creativity as a deep learning dimension and improve learning outcomes in elementary classrooms remains limited. This gap is particularly evident in IPAS instruction at the elementary school level.

Based on this gap, the novelty of the present study lies in its focus on investigating inquiry-based learning as a pedagogical approach that strengthens student creativity as a central dimension of deep learning while also improving learning outcomes. This study integrates creativity indicators fluency, flexibility, originality, and elaboration within a deep learning framework and provides empirical evidence from elementary IPAS learning. This study aims to examine the effectiveness of inquiry-based learning in promoting creativity



within a deep learning framework and to analyze its implications for learning outcomes among elementary school students.

### **Research Method**

A quantitative approach was applied using a pre-experimental design with a one-group *pretest posttest* format to capture changes in students' creativity and learning outcomes following the implementation of inquiry-based learning (Sugiyono, 2019). This design allows measurement of learning progress by comparing conditions before and after instructional treatment without the inclusion of a comparison group. The research setting was SDN Wanamulya, Pematang Regency, conducted during the second semester of the academic year. The research population comprised all sixth-grade students enrolled at the school. Due to the limited population size, all students were included as research participants through a total sampling technique, ensuring full population representation in the data collection process (Arikunto, 2018).

Inquiry-based learning was integrated into IPAS instructional activities through a structured sequence consisting of problem orientation, question development, data gathering, data interpretation, and conclusion formulation. Throughout these stages, students actively engaged in observing learning phenomena, exchanging ideas, and collaboratively solving problems under teacher facilitation, in line with inquiry learning principles (Hmelo-Silver et al., 2007).

Data were collected using two main instruments. Students' creativity was assessed using an observation sheet developed based on four indicators of creativity, namely fluency, flexibility, originality, and elaboration, which are widely recognized dimensions of creative performance (Widodo, 2021). Learning outcomes were measured using an IPAS achievement test administered before and after the implementation of inquiry-based learning. Prior to their use, both instruments were reviewed and validated through expert judgment by two specialists in elementary education and educational evaluation to ensure their clarity, relevance, and alignment with the research objectives.

Data analysis employed descriptive and inferential statistical techniques. Descriptive statistics were used to summarize students' creativity levels and learning achievement scores obtained during the pretest and posttest phases. Prior to inferential testing, a normality test was conducted to determine the distribution of the data. If the data were normally distributed, a paired-sample t-test was applied to examine the differences between pretest and posttest scores. If the normality assumption was not met, the Wilcoxon Signed Rank Test was used as a non-parametric alternative. These analyses were conducted to evaluate the effectiveness of inquiry-based learning in enhancing students' creativity as a component of deep learning and improving academic outcomes (Creswell & Creswell, 2018; Pallant, 2020).

### **Results and Discussion**

The findings of this study indicate that the implementation of inquiry-based learning positively influenced students' creativity, which is considered a key dimension of deep learning in elementary IPAS instruction. Improvements were observed across multiple creativity indicators, including idea fluency, problem-solving flexibility, originality of responses, and the ability to elaborate ideas in a structured manner. These results suggest that inquiry-based learning fosters an engaging learning environment where students are actively involved in exploration, encouraged to generate and develop ideas, and supported in thinking critically and creatively throughout the learning process (Marfilinda et al., 2025).



**Table 1. Descriptive Statistics of Students' Creativity Scores**

| <b>Creativity Indicator</b> | <b>Pretest (Mean)</b> | <b>Posttest (Mean)</b> | <b>Description</b>            |
|-----------------------------|-----------------------|------------------------|-------------------------------|
| Fluency                     | 2.45                  | 3.62                   | Improved                      |
| Flexibility                 | 2.38                  | 3.55                   | Improved                      |
| Originality                 | 2.21                  | 3.41                   | Improved                      |
| Elaboration                 | 2.30                  | 3.58                   | Improved                      |
| <b>Overall Mean</b>         | <b>2.34</b>           | <b>3.54</b>            | <b>Significantly improved</b> |

The increase in students' creativity reflects the essential characteristics of inquiry-based learning, which emphasize investigation, exploration, and knowledge construction. Learning activities that require students to observe phenomena, formulate questions, collect relevant information, and draw evidence-based conclusions stimulate divergent thinking processes. Such instructional practices encourage students to explore multiple solution pathways and express ideas independently, thereby supporting the development of creativity within a meaningful learning context. This finding is consistent with previous studies highlighting the role of inquiry-based learning in enhancing creative thinking through active student engagement (Marianingsih, 2025) and (Pratiwi et al., 2025). The improvement in students' creativity can be further explained through several key stages of the inquiry-based learning process implemented during the instructional activities. During the problem orientation stage, students were introduced to real-life phenomena related to IPAS topics, which stimulated curiosity and encouraged them to generate initial ideas. This stage particularly supported the development of idea fluency, as students attempted to propose multiple explanations for the observed phenomena.

The question development stage also played an important role in strengthening creativity. When students formulated and refined investigative questions collaboratively, they practiced examining problems from different perspectives. This process contributed to the development of flexibility in thinking, as students explored alternative ways of understanding the learning problem.

Furthermore, during the data gathering and investigation stage, students actively searched for information through observation, discussion, and simple experimentation. This stage allowed students to test their ideas and compare different possible solutions, which supported the emergence of original responses and unique interpretations of the learning content. Inquiry-based learning in this context engages students in hands-on exploration and peer discussion, enabling them to construct knowledge actively and develop creative problem-solving skills (Nurdarmayanti, 2025).

Finally, in the data interpretation and conclusion stage, students organized their findings and explained their reasoning. This activity encouraged them to expand, clarify, and refine their ideas, thereby strengthening their elaboration skills. Through these structured inquiry stages, students were not merely receiving information but actively constructing knowledge, which stimulated divergent thinking and creative expression.

The observed improvement in creativity also reflects the characteristics of deep learning-oriented instruction. Deep learning emphasizes sustained cognitive engagement, conceptual understanding, and the ability to apply knowledge in new contexts. Through inquiry activities, students were encouraged to investigate problems, evaluate evidence, and communicate their ideas, which required higher levels of cognitive processing. The development of creativity across fluency, flexibility, originality, and elaboration therefore indicates that students actively constructed knowledge rather than passively receiving information. This outcome supports recent perspectives emphasizing that deep learning in

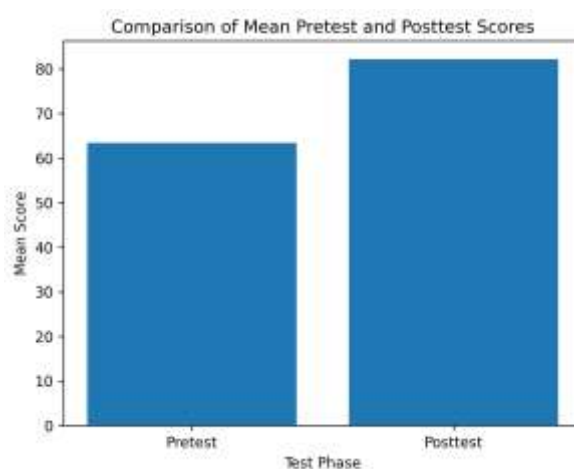


elementary education requires inquiry-driven activities that promote exploration, reflection, and active student participation (Nafi & Faruq, 2025).

Learning outcomes in IPAS also showed measurable improvement following the application of inquiry-based learning. The increase in mean scores and learning mastery percentages demonstrates that students achieved a deeper understanding of the instructional content after participating in inquiry-oriented activities.

**Table 2. Comparison of Students' Learning Outcomes**

| Test Phase | Mean Score | Mastery Percentage |
|------------|------------|--------------------|
| Pretest    | 63.40      | 45%                |
| Posttest   | 82.15      | 85%                |



**Figure 1. Comparison of Mean Pretest and Posttest Scores**

Figure 1 shows a substantial increase in students' IPAS learning outcomes after the implementation of inquiry-based learning, as indicated by higher posttest mean scores compared to pretest results. The improvement in learning outcomes indicates that active involvement in inquiry processes supported students' conceptual understanding of IPAS content. Instruction that positions students as active learners facilitates meaningful learning experiences, enabling students to connect concepts, analyze information, and apply knowledge more effectively. These findings are consistent with recent studies reporting that inquiry-based and problem-based learning approaches contribute significantly to improved academic performance and conceptual comprehension in elementary education (Winarti & Fatirul, 2020) and (Sutarningsih, 2022).

A clear relationship between creativity development and learning outcomes emerged in this study. Creativity enhanced students' ability to understand concepts, integrate information, and apply knowledge to problem-solving situations. This relationship confirms that creativity functions as an integral component of deep learning and directly supports academic achievement in elementary classrooms (Nly & Udit, 2023).

The effectiveness of inquiry-based learning was also influenced by the teacher's role as a learning facilitator. Structured guidance provided by the teacher supported student inquiry without dominating cognitive processes, allowing learners to maintain autonomy while engaging in systematic investigation. This instructional balance aligns with deep learning principles and supports the development of independent, creative learners within the context of elementary education and the Pancasila Student Profile framework (Siswanto & Yogyanto, 2025) and (Mustagfiroh et al., 2025).



Overall, the results provide empirical evidence that inquiry-based learning effectively enhances students' creativity as a central dimension of deep learning while simultaneously improving IPAS learning outcomes in elementary education. The integration of inquiry-based instruction represents a relevant pedagogical strategy for promoting meaningful learning, strengthening 21st-century competencies, and supporting the transformation of elementary education.

### **Conclusion**

This study demonstrates that the implementation of inquiry-based learning effectively enhances students' creativity as a dimension of deep learning in elementary IPAS instruction. The findings show a clear improvement in students' creativity across the indicators of fluency, flexibility, originality, and elaboration, as reflected in the increase of the overall mean score from 2.34 in the pretest to 3.54 in the posttest. In addition, students' learning outcomes improved significantly, with the average score rising from 63.40 to 82.15 and the percentage of learning mastery increasing from 45% to 85%.

These findings indicate that inquiry-based learning provides meaningful learning experiences that encourage students to actively investigate problems, construct knowledge, and express ideas creatively. Such learning processes support the development of creativity while simultaneously strengthening conceptual understanding and academic achievement. From a pedagogical perspective, this study provides empirical evidence that inquiry-based learning is aligned with the principles of deep learning in elementary education. Therefore, inquiry-based instruction can be considered an effective strategy for fostering creativity and improving learning outcomes in response to the demands of 21st-century education.

### **Recommendation**

Based on the findings of this study, several recommendations can be proposed for educational practice and future research. For teachers, the implementation of inquiry-based learning is recommended as an instructional strategy to foster students' creativity and improve learning outcomes in elementary IPAS learning. Teachers are encouraged to design learning activities that emphasize problem orientation, student-generated questions, investigation, and reflective discussion so that students can actively construct knowledge and develop creative thinking skills. For schools and educational practitioners, it is important to provide adequate learning resources and professional support for teachers to effectively implement inquiry-based learning in classroom practice. Such support may include teacher training, collaborative lesson planning, and the integration of inquiry-oriented learning materials. For future researchers, further studies are recommended to employ more rigorous research designs, such as quasi-experimental or experimental methods with control groups, to strengthen the evidence of the effectiveness of inquiry-based learning. In addition, future research may explore other dimensions of deep learning, such as critical thinking, collaboration, and problem-solving skills, in different subjects and educational contexts to provide a more comprehensive understanding of the impact of inquiry-based learning in elementary education.



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