



Application of the Inquiry Learning Model in Throwing and Catching Games to Enhance Students' Critical Thinking Skills at SDN Pualam Sari 3

Yoga Firmansyah*, Arie Rakhman, Norma Anggara, Rahmadi

Physical Education Study Program, Lambung Mangkurat University, Taruna Praja Raya Street, North Loktabat, North Banjarbaru, South Kalimantan, Indonesia 70714.

Email Correspondence: yyoga5446@gmail.com

Abstract

The development of critical thinking skills has become an important objective in physical education, as learning activities frequently emphasize motor performance while providing limited opportunities for higher-order cognitive engagement. In the context of catch-and-throw game instruction, students are often required to execute movement skills without being sufficiently encouraged to analyze situations, evaluate alternatives, or make reasoned decisions during learning activities. This study therefore investigated changes in students' critical thinking skills following the implementation of an inquiry-based learning model in physical education classes at SDN Pualam Sari 3. A quantitative approach was adopted using a pre-experimental one-group pretest–posttest design. The participants consisted of 30 students selected through total sampling. Critical thinking ability was assessed using a Higher Order Thinking Skills (HOTS)-oriented test instrument that had previously met validity and reliability criteria. Data were collected before and after the intervention and subsequently analyzed using descriptive statistics and a paired-samples t-test with a significance level of 0.05. The findings demonstrated a substantial improvement in students' critical thinking performance after the learning intervention. The mean score increased from 59.33 on the pretest to 91.00 on the posttest, representing an average gain of 31.67 points. Statistical analysis further confirmed that the difference between the two measurements was significant, $t(29) = -28.027$, $p < .001$. These results indicate that the use of the inquiry learning model was associated with enhanced critical thinking skills in catch-and-throw game learning activities. Although the findings provide empirical support for the potential educational value of inquiry-based instruction in physical education, the absence of a comparison group limits the strength of causal interpretation. Future studies are therefore encouraged to employ more rigorous experimental designs involving control groups and broader participant populations to obtain stronger evidence regarding the effectiveness of the intervention.

Keywords: Inquiry Learning Model; Critical Thinking; Physical Education; Throwing and Catching Game.

How to Cite: Firmansyah, Y., Rakhman, A., Anggara, N., & Rahmadi, R. (2026). Application of the Inquiry Learning Model in Throwing and Catching Games to Enhance Students' Critical Thinking Skills at SDN Pualam Sari 3. *Empiricism Journal*, 7(2), 1441-1448. <https://doi.org/10.36312/ej.v7i2.5556>



<https://doi.org/10.36312/ej.v7i2.5556>

Copyright© 2026, Firmansyah et al.

This is an open-access article under the [CC-BY-SA](#) License.



INTRODUCTION

Physical Education, Sports, and Health (PJOK) constitutes an essential component of the educational process, contributing not only to students' physical development but also to their cognitive, affective, and social growth. Through structured physical activities, learners are provided with opportunities to develop movement competence, maintain physical fitness, strengthen interpersonal skills, and cultivate healthy lifestyle habits. Physical education is therefore expected to support holistic student development rather than focusing exclusively on motor performance (Anggara, 2024, p. 731). As noted by Suherman (2007, p. 12), physical education utilizes movement-based experiences as a medium for fostering comprehensive developmental outcomes. Consequently, learning activities should be designed to promote both physical proficiency and higher-order thinking skills.

The implementation of the Merdeka Curriculum places greater emphasis on the development of twenty-first-century competencies, including critical thinking, creativity, communication, and collaboration. Among these competencies, critical thinking occupies a central position because it enables learners to examine information objectively, evaluate alternative solutions, solve problems systematically, and make reasoned decisions (Fauzan et al, 2024, p. 3). According to Maulidia and Ridwan (2021, p. 3), critical thinking involves the capacity to interpret, analyze, and evaluate issues through rational consideration and evidence-based reasoning. Despite its importance, classroom practices in physical education

frequently prioritize skill execution and physical participation, often leaving limited space for cognitive engagement and reflective thinking processes.

One learning context that offers considerable potential for fostering critical thinking is the catch-and-throw game, a fundamental manipulative movement activity commonly taught in elementary school physical education. Successful participation in such activities requires more than the mechanical execution of throwing and catching techniques. Learners must continuously observe game situations, assess movement options, determine the appropriate direction and force of a throw, anticipate outcomes, and evaluate the effectiveness of their actions. These cognitive demands suggest that catch-and-throw activities can serve as an effective medium for integrating motor skill development with higher-order thinking processes.

Preliminary observations conducted at SDN Pualam Sari 3 revealed several challenges related to the development of critical thinking during physical education instruction. Learning activities were predominantly characterized by teacher demonstrations followed by repetitive practice sessions, with students largely expected to imitate predetermined movements. As a result, opportunities for questioning, analyzing situations, expressing reasoning, and evaluating performance were relatively limited. Discussions with the physical education teacher further indicated that many students experienced difficulties when asked to explain game strategies, justify movement choices, or reflect on mistakes encountered during learning activities. These findings suggest that the cognitive dimension of physical education, particularly critical thinking, has not yet been fully optimized and requires greater instructional attention.

To address this issue, inquiry-based learning has been identified as a promising pedagogical approach. Inquiry learning encourages students to take an active role in constructing knowledge through exploration, questioning, investigation, analysis, and reflection. Rather than receiving information passively, learners are guided to discover concepts independently through meaningful learning experiences. Sanjaya (2016, p. 196) argues that inquiry-oriented instruction promotes deeper understanding and supports the development of higher-order thinking skills. Within physical education settings, this approach may encourage students not only to perform movements but also to understand the reasoning, objectives, and strategic considerations underlying their actions. Such an environment can facilitate a more balanced integration of cognitive and psychomotor learning outcomes.

Previous studies have reported positive educational outcomes associated with inquiry-based instruction. Maulidia and Ridwan (2021) found that inquiry learning contributed to improvements in students' critical thinking abilities. Similarly, Rahman and Putra (2023) reported enhanced student engagement and learning outcomes in physical education contexts following the implementation of inquiry-oriented strategies. Saleh (2022) also demonstrated that game-based learning environments can strengthen learners' decision-making and problem-solving abilities. Although these findings highlight the educational value of inquiry learning, most existing studies have focused on general learning outcomes, classroom participation, or critical thinking in broader academic contexts.

Research specifically examining the integration of inquiry-based learning within catch-and-throw activities to enhance Higher Order Thinking Skills (HOTS)-oriented critical thinking among elementary school students remains relatively scarce. This limitation indicates the existence of a research gap that warrants further investigation. The novelty of the present study lies in its attempt to combine inquiry-based instructional principles with catch-and-throw game activities, thereby positioning critical thinking development alongside motor skill acquisition. Through activities involving game analysis, strategic decision-making, problem-solving, and reflective evaluation of movement performance, students are expected to engage in deeper cognitive processes during physical education learning.

Accordingly, this study was conducted to examine the effect of implementing an inquiry learning model in catch-and-throw game instruction on the critical thinking skills of students at SDN Pualam Sari 3. The study hypothesized that a significant difference would exist between students' critical thinking performance before and after participation in inquiry-based learning activities.

METHOD

This study employed a quantitative approach to investigate changes in students' critical thinking performance following the implementation of inquiry-based learning in physical education. A pre-experimental framework was adopted using a one-group pretest–posttest design, in which the same participants were assessed before and after the instructional intervention. This design was selected to examine potential changes associated with the learning treatment by comparing students' performance across two measurement points. However, because no comparison or control group was included, the findings should be interpreted as evidence of change following the intervention rather than definitive proof of causality (Sugiyono, 2015, pp. 108–109).

The research was conducted at SDN Pualam Sari 3 during the academic year in accordance with the school schedule. The target population consisted of 89 students enrolled at the school, while the accessible population included all Grade V and Grade VI students. Since the number of eligible participants was relatively limited, a total sampling technique was employed, allowing every member of the accessible population to participate in the study. Consequently, the final sample comprised 30 students.

The study examined two primary variables. Inquiry-based learning served as the independent variable, while students' critical thinking skills constituted the dependent variable. Inquiry learning was operationalized as a student-centered instructional approach that encourages learners to construct understanding through questioning, investigation, evidence gathering, analysis, and conclusion drawing. Critical thinking was defined as students' ability to interpret information, analyze situations, evaluate evidence, formulate inferences, justify decisions, and reflect on problem-solving processes encountered during physical education activities.

The assessment framework was developed based on key dimensions of critical thinking proposed by Facione (2015, pp. 5–7), including interpretation, analysis, evaluation, inference, explanation, decision-making, and reflection. These dimensions were contextualized within catch-and-throw game situations to ensure alignment with learning objectives. To measure these competencies, each indicator was translated into Higher Order Thinking Skills (HOTS)-oriented assessment items requiring students to analyze scenarios, evaluate alternatives, and justify their responses rather than merely recall factual information.

Data were collected using a multiple-choice critical thinking test designed according to HOTS principles. The initial instrument consisted of 20 items, which subsequently underwent validity and reliability testing. The validation process identified 16 items as valid, while four items failed to meet the required validity threshold based on the comparison between calculated and critical correlation values. Only the validated items were retained for data collection. Reliability analysis yielded a Cronbach's alpha coefficient of 0.644, indicating an acceptable level of internal consistency for educational research purposes (Ghozali, 2021, p. 48).

Two complementary data collection techniques were employed. The primary data source was the critical thinking test, administered both before and after the intervention. The pretest was used to establish students' baseline critical thinking performance, whereas the posttest was intended to capture potential changes following the learning treatment (Arikunto, 2018, p. 193). Supporting data were obtained through documentation, including classroom activity records, student reflection notes, and administrative information related to participant enrollment (Sugiyono, 2019, p. 314).

The intervention was implemented across four instructional sessions. The first session was devoted to pretest administration. The second and third sessions involved the application of inquiry-based learning during catch-and-throw game activities, with each session lasting 2 × 35 minutes. Learning activities followed the core stages of inquiry instruction: problem orientation, problem formulation, hypothesis generation, information gathering, hypothesis testing, and conclusion drawing. During these activities, students were encouraged to investigate practical game-related challenges, formulate tentative solutions, engage in collaborative gameplay, observe outcomes, discuss strategic alternatives, and evaluate the effectiveness of their decisions. Rather than functioning as the primary source of information, the teacher assumed the role of facilitator, guiding discussion, observation, analysis, and

reflection throughout the learning process. The fourth session was allocated for posttest administration.

Data analysis was conducted in two stages. Descriptive statistics were first employed to summarize participant performance through measures such as mean, minimum score, maximum score, and standard deviation (Sugiyono, 2019, p. 207). Subsequently, assumption testing was performed prior to hypothesis testing. The normality of the difference scores between pretest and posttest results was examined using the Shapiro–Wilk test, as the paired-samples t-test requires normally distributed score differences. After the normality assumption was confirmed, inferential analysis was conducted using a paired-samples t-test at a significance level of 0.05 to determine whether statistically significant differences existed between students' critical thinking performance before and after the inquiry-based learning intervention.

RESULTS AND DISCUSSION

Research Findings

The present study examined changes in students' critical thinking performance following the implementation of an inquiry-based instructional approach in catch-and-throw game activities. Data were collected from 30 fifth- and sixth-grade students at SDN Pualam Sari 3 through pre-intervention and post-intervention assessments.

Table 1. Descriptive Statistics of Pretest Scores

Variabel	N	Minimum	Maksimum	Mean	Std. Deviation
Pretest	30	53	65	59,33	3,585

The baseline assessment indicated that students entered the study with relatively modest levels of critical thinking performance. As presented in Table 1, scores ranged from 53 to 65, yielding a mean score of 59.33 (SD = 3.585). The relatively small standard deviation suggests limited variability among participants at the beginning of the intervention.

Table 2. Descriptive Statistics of Posttest Scores

Variabel	N	Minimum	Maksimum	Mean	Std. Deviation
Posttest	30	81	100	91,00	7,320

Following the instructional treatment, a substantial improvement was observed in students' performance. Posttest scores ranged from 81 to 100, with an average score of 91.00 (SD = 7.320). When compared with the baseline measurement, the mean score increased by 31.67 points. This upward shift suggests that students demonstrated considerably stronger critical thinking abilities after participating in inquiry-oriented learning activities.

Normality Test

Prior to hypothesis testing, the normality of the difference scores between pretest and posttest results was examined using the Shapiro–Wilk procedure. This step was necessary because the paired-samples t-test assumes that score differences are approximately normally distributed.

Table 3. Shapiro–Wilk Normality Test

Variabel	Statistic	df	Sig.
Selisih Skor (Posttest–Pretest)	0,957	30	0,262

The analysis produced a Shapiro–Wilk statistic of 0.957 with a significance value of 0.262. Since the obtained probability exceeded the established threshold of 0.05, the distribution of difference scores was considered normal. Therefore, the data satisfied the assumptions necessary for subsequent parametric testing.

Hypothesis Testing

To determine whether students' critical thinking skills changed significantly following the intervention, a paired-samples t-test was conducted.

Table 4. Paired-Samples t-Test Results

Mean Difference	Std. Deviation	t	df	Sig. (2-tailed)
-31,667	6,189	-28,027	29	< 0,001

To evaluate whether the observed improvement was statistically meaningful, a paired-samples t-test was conducted. The analysis revealed a mean difference of -31.667 points with a standard deviation of 6.189 . The test produced a value of $t(29) = -28.027$, with a probability level below $.001$. These findings indicate that the post-intervention scores differed significantly from the baseline scores. Therefore, the null hypothesis was rejected, providing evidence that students exhibited higher levels of critical thinking after participating in the inquiry-based learning program.

Beyond statistical significance, the magnitude of change was assessed using Cohen's d for paired observations. The resulting effect size was 5.12 , which is substantially above the threshold commonly interpreted as a large effect. This outcome suggests that the observed improvement was not only statistically detectable but also educationally meaningful.

From a practical perspective, the magnitude of gain indicates that inquiry-oriented learning may create conditions that encourage students to engage more actively in reasoning, analysis, and decision-making processes during physical education activities. The learning experience appears to have extended beyond the execution of motor skills by requiring students to interpret game situations, justify their choices, and evaluate alternative actions.

Nevertheless, the posttest mean approaching the upper limit of the scoring scale may indicate the presence of a ceiling effect. Several participants achieved scores close to the maximum obtainable score, reducing the amount of measurable improvement that could occur in subsequent assessments. Future investigations may therefore benefit from employing instruments with a broader range of difficulty levels and incorporating comparison groups to strengthen the internal validity of the findings.

Discussion

The findings of this study indicate a substantial improvement in students' critical thinking performance following the implementation of inquiry-based learning within catch-and-throw game activities. This pattern is reflected in the increase in the average score from 59.33 before the intervention to 91.00 after the intervention, representing a gain of 31.67 points. Statistical analysis further demonstrated that the difference between the two measurements was highly significant, $t(29) = -28.027$, $p < .001$. Although these results suggest that students displayed stronger critical thinking skills after participating in inquiry-oriented instruction, the absence of a comparison group requires caution when interpreting the findings. Consequently, the observed improvement should be viewed as an outcome associated with the intervention rather than definitive evidence of a direct causal relationship.

A possible explanation for this improvement lies in the fundamental principles of inquiry learning, which position learners as active participants in the construction of knowledge. Rather than receiving information passively, students are encouraged to investigate situations, formulate questions, test assumptions, and draw conclusions from their own experiences. Within the context of catch-and-throw games, learners were repeatedly exposed to situations requiring observation, interpretation, and strategic thinking. Such experiences may have encouraged deeper cognitive engagement, allowing students to move beyond simple task execution toward analytical and reflective thinking processes. As suggested by Sanjaya (2016, p. 201), inquiry-oriented instruction promotes intellectual engagement by involving students directly in the exploration and resolution of learning problems.

The instructional activities implemented during the intervention also provided opportunities for students to develop several dimensions of critical thinking simultaneously. During problem identification and hypothesis formulation, learners were required to examine game situations and predict effective courses of action. These activities demanded analytical reasoning and inferential thinking because students had to connect available information with possible solutions. As the learning process progressed, participants gathered evidence through gameplay experiences and evaluated the outcomes of their decisions. Such cognitive engagement likely strengthened their ability to assess information critically and make reasoned judgments in dynamic situations.

Another important aspect of inquiry learning is the emphasis placed on discussion and collaborative reflection. Throughout the learning activities, students exchanged ideas, justified their decisions, and considered alternative strategies proposed by their peers. This process may have enhanced their capacity to construct logical explanations and defend their

viewpoints using evidence. The opportunity to articulate reasoning and evaluate competing perspectives is widely recognized as a key element in the development of higher-order thinking skills. In this regard, the present findings are consistent with Mahmud (2024, p. 10), who argued that inquiry-based instruction increases student participation and promotes active knowledge construction.

Reflection activities conducted at the end of each learning session may have provided an additional mechanism through which critical thinking skills were strengthened. By reviewing their decisions and evaluating the effectiveness of selected strategies, students were encouraged to assess strengths, identify weaknesses, and consider possible improvements. This reflective process aligns closely with the evaluation and self-regulation dimensions of critical thinking described by Facione (2015, pp. 5–7). Through repeated cycles of action, observation, evaluation, and revision, learners gradually developed a more deliberate and reflective approach to problem solving.

The present findings are also supported by previous research highlighting the educational value of inquiry-based learning. Ratna Devi and Parmin (2019, p. 57) reported that inquiry-oriented instruction enhances critical thinking by engaging learners in investigation and discovery processes. Similarly, Prasetyo and Rosy (2021, p. 112) found that inquiry activities involving problem exploration, data collection, experimentation, and conclusion drawing contribute positively to students' cognitive engagement. Comparable conclusions were reported by Mahmud (2024, p. 10), who observed improvements in higher-order thinking skills when students were actively involved in solving authentic learning problems. The consistency of these findings across different educational settings suggests that inquiry learning provides a productive environment for fostering critical thinking development.

One noteworthy contribution of the present study concerns its application of inquiry learning within elementary school physical education, particularly through catch-and-throw game activities. Physical education has traditionally emphasized physical performance and motor skill acquisition, whereas cognitive outcomes often receive less attention. The results of this study suggest that game-based activities can also function as meaningful contexts for developing higher-order thinking abilities. Through the analysis of game situations, strategic decision making, problem solving, and reflective evaluation, students were able to engage cognitive processes alongside motor performance. This finding supports a broader view of physical education as a learning domain capable of promoting intellectual as well as physical development.

Despite these promising outcomes, several limitations should be acknowledged. Because the study employed a one-group pretest–posttest design, alternative explanations for the observed improvement cannot be completely excluded. Factors such as repeated exposure to the assessment, increased familiarity with HOTS-oriented questions, learning experiences occurring outside the intervention, or natural developmental progression may also have contributed to the improvement in scores. Furthermore, the high posttest average and the presence of scores approaching the maximum possible value suggest a potential ceiling effect, which may have restricted the measurement of additional gains among higher-performing students. Future studies would therefore benefit from incorporating control groups, larger samples, and assessment instruments with a broader range of difficulty levels.

Overall, the findings provide evidence that inquiry-based learning implemented through catch-and-throw game activities was associated with enhanced critical thinking performance among elementary school students. These results reinforce the perspective that physical education can serve not only as a vehicle for motor development but also as a meaningful context for nurturing higher-order cognitive skills through active, reflective, and student-centered learning experiences (Suherman, 2007, p. 12).

CONCLUSION

The findings of this study indicate that the implementation of inquiry-based learning in catch-and-throw game activities was associated with improved critical thinking performance among students at SDN Pualam Sari 3. This improvement was reflected in the increase in the mean score from 59.33 on the pretest to 91.00 on the posttest, representing an average gain of 31.67 points. Statistical analysis further supported this result. The paired-samples *t*-test revealed a significant difference between pre-intervention and post-intervention scores, $t(29)$

$= -28.027, p < .001$. These findings suggest that students demonstrated substantially stronger critical thinking abilities following their participation in inquiry-oriented learning activities.

Nevertheless, the interpretation of these results should consider the methodological limitations of the study. Since a one-group pretest–posttest design was employed without a control group, the observed improvement cannot be attributed exclusively to the inquiry learning intervention. Other factors may have contributed to the changes in performance. Therefore, the findings are more appropriately interpreted as evidence of improvement occurring after the implementation of inquiry-based learning rather than conclusive proof of a direct causal effect.

RECOMMENDATIONS

The results of this study provide several implications for educational practice and future research. For physical education teachers, inquiry-based learning may serve as a valuable instructional approach for encouraging active student participation while fostering critical thinking through activities that require analysis, decision-making, and reflection.

For schools, the findings highlight the potential of physical education to support not only motor skill development but also higher-order cognitive competencies. Catch-and-throw games, in particular, may be utilized as meaningful learning contexts that integrate physical engagement with intellectual development.

Future studies are encouraged to employ more rigorous research designs, such as quasi-experimental or true experimental approaches involving comparison groups. Such designs would allow stronger conclusions regarding the causal relationship between inquiry-based learning and the development of critical thinking skills. Expanding the sample size and applying the intervention across different physical education topics may also improve the generalizability of the findings.

In addition, subsequent investigations should consider other variables that may influence critical thinking development, including learning motivation, classroom environment, prior learning experiences, and teachers' readiness to implement inquiry-oriented instruction. The use of assessment instruments with a wider range of difficulty levels is also recommended to reduce the likelihood of ceiling effects and to provide a more accurate measurement of students' cognitive growth.

ACKNOWLEDGMENT

The author gratefully acknowledges the support and cooperation of all individuals and institutions that contributed to this study. Special appreciation is extended to the Principal of SDN Pualam Sari 3 for granting permission to conduct the research, to the Physical Education, Sports, and Health (PJOK) teacher for assistance throughout the instructional and data collection processes, and to all participating students for their active involvement and valuable contribution to the study.

REFERENCES

- Afianto, A., El Fiah, R., & Hidayah, N. (2023). Development of Higher Order Thinking Skills (HOTS)-Based Test Instruments for Physical Education, Sports, and Health (PJOK) Subjects. *Jurnal Pendidikan Dasar*, 7(2), 243–252. <https://doi.org/10.29240/jpd.v7i2.8496>
- Anggara, N. (2024). Implementation of manipulative basic movement learning model development for students aged 5–6 years. *International Journal of Disabilities Sports and Health Sciences*, 7(4), 730–740. <https://www.scopus.com/pages/publications/85199464948>
- Arisandy, R., Pascasarjana, P., & Makassar, U. N. (2019). The Implementation of Inquiry Learning to Improve Learning Outcomes in Soccer Games among Grade X TKJ 1 Students at SMK Negeri 2 Makassar. *Jurnal Pendidikan Jasmani dan Olahraga*.
- Erdani, Y., Hakim, L., & Lia, L. (2020). The Effect of Guided Inquiry Learning on Students' Scientific Literacy Skills. *Jurnal Pendidikan*, 6(1).
- Fauzan, L. A., Dirgantoro, E. W., Rahmadi, R., Rakhman, A., Perdinanto, P., Arifin, R., & Indah, E. P. (2024). Evaluation of rowing sports development in South Kalimantan.

- Stabilitas: Journal of Physical Education and Sports*, 5(1), 1–10.
<https://doi.org/10.20527/mpj.v5i1.2630>
- Fikri, M., Setiawan, M., Dzikry, M., & Al, A. (2025). Game-Based Approaches in Physical Education Learning to Enhance Students' Motivation and Learning Outcomes. *Jurnal Pendidikan Olahraga*, 15(2), 81–91.
- Fristadi, R., & Bharata, H. (2015). Enhancing Students' Critical Thinking Skills through Problem-Based Learning. In *Proceedings of the National Seminar on Physics and Its Applications* (pp. 597–602).
- Mahmud, S., Kristiyandaru, A., & Ilmu, F. (2024). Activity-Based Physical Education Learning for Improving Critical Thinking Skills. *Jurnal Pendidikan Olahraga dan Kesehatan*, 11(2).
- Marsyelina, D. (2016). The Application of the Total Physical Response (TPR) Method in Teaching Beginning-Level French Speaking Skills. *Universitas Pendidikan Indonesia*.
- Prasetyo, M. B., & Rosy, B. (2021). Inquiry Learning as a Strategy for Developing Students' Critical Thinking Skills. *Jurnal Pendidikan*, 9, 109–120.
- Pratiwi, R. E., & Arifin, Z. (2023). Promoting Students' Critical Thinking Skills through Physical Education Learning. *Indonesian Journal of Physical Education and Sport Science*, 2(2), 158–166. <https://doi.org/10.52188/ijpess.v2i2.528>
- Ratna Devi, & Parmin. (2019). Inquiry-Based Learning for Enhancing Conceptual Understanding. In *Proceedings of the National Seminar* (pp. 1–14).
- Saleh, A., Kahar, I., & Galugu, N. S. (2022). Game-Based Approaches in Physical Education for Improving Students' Motor Skills. *Jurnal Kejaora*, 7(2), 62–65.
- Stephani, M. R. (2017). Stimulating Critical Thinking Skills through Problem-Based Learning in Physical Education. *Jurnal Pendidikan Jasmani dan Olahraga*, 2(1), 16–27.
- Sugiyono. (2015). *Educational Research Methods*. Bandung: Alfabeta.
- Sugiyono. (2019). *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta.
- Suherman. (2007). *Physical Education and Health Education*. Jakarta: Depdiknas.
- Taqwim, R. I., & Winarno, M. E. (2020). The Implementation of Physical Education Learning. *Jurnal Pendidikan Olahraga*.
- Zubaidah, S. (2010). Critical Thinking: A Higher-Order Thinking Skill. In *Proceedings of the 2010 National Science Seminar* (pp. 1–14).
<https://www.researchgate.net/publication/318040409>