

Implementation of PBL Assisted by Audio-Visual Media to Improve Rhythmic Gymnastics Learning Outcomes among Tenth-Grade Students of SMKN 7 Semarang

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Abstract

This study aimed to improve students' learning outcomes in rhythmic gymnastics through the implementation of the Problem-Based Learning (PBL) model assisted by audio-visual media in Physical Education, Sports, and Health (PJOK) learning. The study was motivated by the low achievement of students who had not met the established learning mastery criteria. This Classroom Action Research employed the Kemmis and McTaggart model, consisting of planning, action, observation, and reflection stages conducted in two cycles. The participants were 35 students of Class X TE 1 at SMK Negeri 7 Semarang during the 2025/2026 academic year. Data were collected through learning outcome assessments covering cognitive, affective, and psychomotor domains, supported by observation and documentation. The results showed a consistent improvement in learning outcomes. The mean score increased from 67.4 in the pre-cycle stage to 75.8 in Cycle I and 84.6 in Cycle II, while learning mastery improved from 42.9% to 71.4% and reached 91.4% in Cycle II. These findings demonstrate that PBL assisted by audio-visual media effectively enhances students' understanding and performance in rhythmic gymnastics. Therefore, this approach can be recommended as an effective instructional strategy in PJOK learning.

Keywords: Problem-based learning; audio-visual media; learning outcomes; rhythmic gymnastics; physical education sports and health; classroom action research.

1. Introduction

Physical Education, Sports, and Health (PJOK) is one of the subjects that plays an important role in the development of students' physical abilities, motor skills, attitudes, and knowledge. This is in line with the view of (Khilman, 2024), who stated that students' physical, mental, and social development is strongly influenced by physical education, sports, and health learning. Through PJOK learning activities, students are expected to improve their physical fitness, develop motor skills, enhance critical thinking abilities, and build positive character traits that are beneficial in their daily lives.

One of the learning materials taught in Physical Education, Sports, and Health at the vocational high school level is rhythmic gymnastics. Rhythmic gymnastics is a form of structured physical activity that combines body movements with music or a particular rhythm. This material is designed to improve coordination, flexibility, balance, movement accuracy, and students' ability to perform harmonious and synchronized movements. In line with the findings of (Yuliantika, Suherman, & Safari, 2024), rhythmic activities constitute one of the learning components of physical education in schools, involving the coordination of body movements with musical

rhythms or songs to help students develop motor skills, physical fitness, and social skills through group collaboration. Physical education provides an important context for developing students' motor competence through structured and curriculum-based physical activity (Lorås, 2020).

Based on preliminary observations conducted in Class X TE 1 of SMK Negeri 7 Semarang, students' learning outcomes in rhythmic gymnastics were found to be relatively low. Out of 35 students, only 15 achieved the required mastery criterion, resulting in a learning mastery percentage of 42.9%, while the remaining 20 students failed to meet the predetermined standard. This low achievement was reflected in students' limited ability to perform rhythmic gymnastics movement sequences and their inadequate understanding of the movement concepts being taught. Several factors contributed to this problem, including the use of conventional teaching approaches, low levels of student participation during the learning process, and the limited use of instructional media capable of providing clear movement visualizations. Consequently, students experienced difficulties in understanding proper movement techniques, which ultimately affected their learning outcomes.

One effort to address these problems is the implementation of the Problem-Based Learning (PBL) model supported by audio-visual media. According to (Putri, Maya, Hanatul, & Susilo, 2024), students' problem-solving abilities can be developed through the use of the Problem-Based Learning model because it actively engages learners in a learning environment that promotes critical thinking, the application of knowledge in real-life contexts, and the development of problem-solving skills. Problem-Based Learning is a student-centered instructional model that encourages learners to acquire knowledge through problem-solving activities related to the learning material. Problem-Based Learning provides opportunities for students to actively engage in problem-solving activities and has been shown to improve skill development and learning motivation in physical education settings (Luo, 2019). Through this approach, students are encouraged to develop critical thinking skills, collaborate with peers, actively participate in discussions, and formulate solutions to the problems they encounter. Furthermore, (Herlambang, Fahmi, & Zhannisa, 2025) argued that developments in modern sports science and technology have introduced various innovations to support sports facilities through the integration of multifunctional spaces. Along with these developments, the use of instructional media in school physical education has also evolved, and audio-visual media has become one of the innovative forms of learning media that can be effectively implemented in the educational process. The integration of educational technologies within problem-based learning can provide additional opportunities for students to engage with learning materials and collaborative problem-solving activities (Dermentzi et al., 2022).

The use of audio-visual media in learning is intended to strengthen the implementation of the PBL model because such media can provide authentic examples of rhythmic gymnastics movements through video presentations. The integration of technology into physical education can provide students with opportunities to observe, analyze, and evaluate movement performance. Zulkifli and Danis (2022) demonstrated that the use of a movement analysis application supported students' learning of sports skills and was perceived as an attractive and useful technological tool for improving movement feedback and learning engagement. This suggests that audiovisual technology can serve not merely as a presentation medium but also as a pedagogical tool that facilitates movement analysis and active learning in physical education. Observational learning has strong empirical support for promoting students' motor skill learning in physical education, particularly when learners are provided with opportunities to observe and reproduce movement

demonstrations (Han et al., 2022). According to (Silaban, Lolowang, Pandaleke, & Dewi, 2025), the application of audio-visual media is one of the effective ways to improve the quality of PJOK learning. Through this media, students are able to observe, analyze, and evaluate the demonstrated movements, thereby improving their understanding of the learning material. This finding is consistent with the study of (Serungke et al., 2023), which stated that audio-visual media not only serves as an engaging medium for delivering information but also provides opportunities to enhance learning effectiveness. The integration of problem-based and experiential learning can increase student engagement and support the development of critical understanding, presentation, and discussion skills in physical education (Bethell & Morgan, 2011). Video-based visual feedback can enhance motor learning in physical education by allowing students to observe and evaluate movement performance, although its implementation should consider classroom conditions, available technology, and teacher digital literacy (Möding et al., 2022).

Previous studies have shown that rhythmic activities or rhythmic gymnastics play an important role in developing students' motor skills, physical fitness, and social competence through coordinated body movements synchronized with music or rhythm (Yuliantika et al., 2024). Furthermore, the use of audio-visual media has been proven to enhance students' learning motivation, conceptual understanding, and overall learning effectiveness by presenting instructional materials in a more engaging and comprehensible manner (Serungke et al., 2023). Similarly, the Systematic Literature Review conducted by Silaban et al. (2025) concluded that audio-visual media effectively improves students' motivation, conceptual understanding, and learning skills in Physical Education. However, several limitations remain in these previous studies. Yuliantika et al. (2024) primarily emphasized the importance of rhythmic activities as part of Physical Education learning without investigating the implementation of a specific instructional model supported by digital learning media. Meanwhile, Serungke et al. (2023) focused on the general use of audio-visual media through a literature-based study, providing limited empirical evidence regarding its implementation in actual classroom practice. Likewise, Silaban et al. (2025) employed a Systematic Literature Review (SLR) approach, which synthesized existing findings on the effectiveness of audio-visual media but did not empirically examine its direct application in Physical Education learning. Although previous studies have demonstrated the effectiveness of Problem-Based Learning in physical education and the potential of video-based visual feedback for motor learning, limited empirical evidence has examined the integration of these two approaches within rhythmic gymnastics learning at the vocational high school level. Moreover, few studies have comprehensively evaluated learning outcomes across the cognitive, affective, and psychomotor domains. Therefore, this study aims to address these research gaps by implementing a Problem-Based Learning model assisted by audio-visual media in rhythmic gymnastics learning for tenth-grade students at SMK Negeri 7 Semarang, thereby providing empirical evidence of its effectiveness in improving students' learning outcomes comprehensively.

Improved learning outcomes are expected to be achieved through effective and efficient learning processes. With the support of audio-visual media, students are expected to gain a better understanding of the learning material presented, enabling them not only to recognize but also to comprehend the objectives and essential concepts of the activities they perform. Learning improvement is achieved through a series of instructional processes that can be effectively received and understood by all students. According to (Saputra, Ismet, & Andrizal, 2018), learning outcomes are the result of the learning process, reflected in behavioral changes among learners. These changes can be observed in the cognitive (knowledge), affective (attitude), and psychomotor (skill) domains, demonstrating positive development in students' competencies. Problem-Based

Learning can be adapted through technology-supported activities and other instructional strategies to promote students' critical thinking skills (Yu & Zin, 2023).

Through the Classroom Action Research conducted using audio-visual media as an instructional tool for delivering rhythmic gymnastics material, it is expected that students' learning outcomes will improve as reflected in their cognitive, affective, and psychomotor achievements throughout the learning process. Based on the problems described above, the researcher conducted a Classroom Action Research entitled "The Implementation of the Problem-Based Learning Model Assisted by Audio-Visual Media to Improve Rhythmic Gymnastics Learning Outcomes among Tenth-Grade Students of SMK Negeri 7 Semarang."

2. Method

This study employed a Classroom Action Research (CAR) design based on the Kemmis and McTaggart model, consisting of planning, action, observation, and reflection stages (Nugroho et al., 2025). The research was conducted during the second semester of the 2025/2026 academic year at SMK Negeri 7 Semarang. The study was implemented in two cycles, with each cycle consisting of two learning sessions. Classroom Action Research originated from the concept of action research and was further developed into a cyclical model aimed at addressing practical problems encountered in educational settings (Nugroho et al., 2025).

The participants were 35 students of Class X TE 1 selected through total sampling. The study focused on improving students' learning outcomes in rhythmic gymnastics through the implementation of the Problem-Based Learning (PBL) model assisted by audio-visual media. The instructional activities followed the PBL stages, including problem orientation, organizing students for learning, group investigation, presentation of findings, and evaluation.

Data were collected using several research instruments to comprehensively evaluate students' learning outcomes throughout the Classroom Action Research. Cognitive learning outcomes were measured using a written achievement test consisting of 20 multiple-choice questions covering the concepts, movement principles, and procedures of rhythmic gymnastics. The test was administered at the end of each cycle to evaluate students' conceptual understanding.

Affective learning outcomes were assessed using a structured observation sheet completed collaboratively by the researcher and the collaborating Physical Education teacher during the learning process. The observation instrument consisted of five indicators: discipline, responsibility, cooperation, active participation, and self-confidence. Each indicator was assessed using a four-point Likert scale ranging from 1 (poor) to 4 (excellent).

Psychomotor learning outcomes were evaluated through a performance assessment rubric based on students' ability to perform rhythmic gymnastics movements correctly. The assessment included five indicators: movement accuracy, body coordination, rhythm synchronization, flexibility, and movement fluency. Each indicator was scored using a four-point performance scale adapted from the Physical Education assessment guidelines. The use of self-controlled video feedback in physical education can support motor learning while also contributing to students' self-efficacy during skill practice (Kok et al., 2020).

In addition, classroom observations, documentation, and field notes were employed to record students' participation, learning behaviors, and classroom situations throughout the implementation of the instructional intervention. Prior to implementation, all research instruments were reviewed through expert judgment by two university lecturers in Physical Education and one experienced PJOK teacher to ensure content validity.

The data were analyzed using descriptive quantitative and qualitative techniques. Quantitative analysis was used to determine the mean scores and learning mastery levels achieved in each cycle, while qualitative analysis was applied to observation records and field notes to describe changes in student engagement and learning activities. The data were analyzed using descriptive quantitative and qualitative techniques. Quantitative analysis was used to determine the mean scores and learning mastery levels achieved in each cycle, while qualitative analysis was applied to observation records and field notes to describe changes in student engagement and learning activities.

The study was considered successful when the predetermined success indicators were achieved in all learning domains. In the cognitive domain, at least 85% of students were required to achieve the Minimum Learning Mastery Criterion (KKTP) score of 75 on the written achievement test. In the affective domain, students were expected to demonstrate positive learning attitudes, including discipline, responsibility, cooperation, active participation, and self-confidence, with a minimum category of "Good" based on the observation rubric. In the psychomotor domain, at least 85% of students were expected to obtain performance scores of 75 or above by demonstrating correct rhythmic gymnastics techniques, body coordination, rhythm synchronization, flexibility, and movement fluency according to the performance assessment rubric. The integration of Problem-Based Learning with digital learning materials can significantly improve students' critical thinking skills and learning gains (Pitorini et al., 2024). Overall, the Classroom Action Research was regarded as successful when continuous improvement occurred across the cognitive, affective, and psychomotor domains and at least 85% of the students achieved learning mastery.

3. Result

This study was conducted to improve students' learning outcomes in rhythmic gymnastics through the implementation of the Problem-Based Learning (PBL) model assisted by audio-visual media. The research involved 35 students of class X TE 1 at SMK Negeri 7 Semarang and was carried out in two action cycles. Learning outcomes were assessed through cognitive, affective, and psychomotor domains.

Learning Outcomes

The results indicated a continuous improvement in students' learning outcomes throughout the implementation of the action research. In the pre-cycle stage, the average learning outcome score was 67.4, with 15 students (42.9%) achieving the minimum mastery criterion (KKTP). After the implementation of the Problem-Based Learning model assisted by audio-visual media in Cycle I, the average score increased to 75.8, with 25 students (71.4%) achieving mastery. In Cycle II, the average score further increased to 84.6, while the number of students achieving mastery reached 32 students (91.4%).

Table 1. Summary of students' learning outcomes

Stage	Mean score	Number of students achieving mastery	Learning mastery (%)
Pre-Cycle	67.4	15	42.9
Cycle I	75.8	25	71.4
Cycle II	84.6	32	91.4

Based on Table 1, students' learning outcomes improved progressively in each cycle. The mean score increased by 8.4 points from the pre-cycle stage to Cycle I and by 8.8 points from Cycle I to Cycle II. Overall, the mean score improved by 17.2 points from the beginning to the end of the study.

Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to provide an overview of the distribution of students' learning outcome scores at each stage of the study. The analysis included the minimum score, maximum score, mean score, and standard deviation.

Table 2. Descriptive statistics of learning outcomes

Variable	N	Minimum	Maximum	Mean	Std. deviation
Pre-Cycle Score	35	63	80	71.71	4.956
Cycle I Score	35	70	85	76.77	3.719
Cycle II Score	35	72	93	84.11	4.837
Valid N (listwise)	35				

Table 2 shows an increase in the mean learning outcome score across all stages of the study. The highest mean score was obtained in Cycle II, indicating improved student performance after the implementation of the instructional intervention.

Normality Test

A normality test was conducted using the Shapiro–Wilk test to determine whether the data were normally distributed.

Table 3. Results of the normality test

Variable	Shapiro-wilk statistic	df	Sig.
Pre-Cycle	0.941	35	0.059
Cycle I	0.980	35	0.761
Cycle II	0.951	35	0.118

The significance values obtained for all datasets were greater than 0.05, indicating that the data were normally distributed.

Homogeneity Test

A homogeneity test was performed using Levene's Test to determine the equality of variances among the datasets.

Table 4. Results of the homogeneity test

Levene statistic	df1	df2	Sig.
2.506	2	102	0.087

The significance value exceeded 0.05, indicating that the variances among the datasets were homogeneous.

Paired Sample t-Test

A Paired Sample t-Test was conducted to examine whether there was a significant difference in students' learning outcomes after the implementation of the instructional intervention.

Table 5. Results of the paired sample t-test

Comparison	Mean difference	T	Df	Sig. (2-tailed)
Cycle I – Cycle II	-7.343	-18.191	34	0.000

The significance value of 0.000 indicated a statistically significant improvement in students' learning outcomes following the implementation of the PBL model assisted by audio-visual media.

N-Gain Analysis

The N-Gain analysis was conducted to determine the effectiveness of the instructional intervention in improving students' learning outcomes.

Table 6. N-gain score

Mean pre-test	Mean post-test	N-gain	Category
67.4	84.6	0.53	Moderate

The N-Gain score of 0.53 was categorized as moderate, indicating that the implementation of the PBL model assisted by audio-visual media was moderately effective in improving students' learning outcomes.

4. Discussion

The findings of this study indicate that the implementation of the Problem-Based Learning (PBL) model assisted by audio-visual media effectively improved students' learning outcomes in rhythmic gymnastics. The achievement of the predetermined success indicator, in which more than 85% of students attained the minimum mastery criterion, demonstrates that the instructional intervention successfully addressed the learning difficulties identified during the preliminary observation. These findings suggest that integrating problem-solving activities with audio-visual learning resources can create a more engaging and meaningful learning environment, thereby improving students' overall achievement in Physical Education, Sports, and Health learning. The findings also reflect the practical value of Classroom Action Research. According to (Nugroho et al., 2025), Classroom Action Research is designed to address real problems encountered by teachers during the learning process and to generate solutions that provide direct practical benefits. In the present study, the implementation of PBL assisted by audio-visual media successfully addressed students' difficulties in understanding rhythmic gymnastics movements and improved learning mastery beyond the predetermined success criterion.

The improvement in students' cognitive learning outcomes can be attributed to the characteristics of the Problem-Based Learning model, which encourages learners to actively construct knowledge through investigation and problem-solving activities. During the learning process, students were required to identify problems, analyze movement techniques, discuss possible solutions, and present the results of their group investigations. Such activities enabled students to become active participants rather than passive recipients of information. This finding supports the view of (Putri et al., 2024), who stated that Problem-Based Learning promotes critical thinking, contextual application of knowledge, and the development of problem-solving skills. Consequently, students gained a deeper understanding of rhythmic gymnastics concepts and movement principles.

The implementation of PBL also contributed to improvements in the affective domain. Throughout the learning activities, students were encouraged to collaborate, communicate, and share responsibilities within their groups. These experiences fostered positive learning attitudes, increased participation, and enhanced students' motivation to engage in classroom activities. The student-centered nature of PBL provided opportunities for learners to express opinions, appreciate different perspectives, and develop social skills that are essential for collaborative learning. Problem-based learning creates a collaborative learning environment in which students negotiate learning tasks, group interaction, and the use of technological resources (Otto et al., 2025). Therefore, the improvement in affective learning outcomes can be explained by the increased interaction and active involvement facilitated by the learning model.

The enhancement of psychomotor performance was strongly supported by the use of audio-visual media. This finding is consistent with Zhou et al. (2021), who reported strong evidence that feedback interventions can improve motor skill learning during physical education lessons. The audiovisual demonstrations used in the present study may therefore have functioned as an additional source of visual information that helped students understand and refine the required movement patterns. The instructional videos enabled students to observe rhythmic gymnastics movements repeatedly, allowing them to analyze body positions, movement sequences, coordination patterns, and synchronization with musical rhythms. As a result, students were able to imitate and practice the movements more accurately. This finding is consistent with (Silaban et al., 2025), who reported that the use of audio-visual media improves the quality of Physical Education learning by providing clearer demonstrations and increasing student engagement. The visual representation of movement techniques helped students reduce performance errors and improved their confidence during practice activities. The timing and manner of video presentation can influence learning outcomes in physical education, with video provided before practical activities showing beneficial effects on students' learning (Priyambada et al., 2024).

The present findings are further supported by Mayer's Multimedia Learning Theory, which explains that learning becomes more effective when information is delivered through both visual and auditory channels. The combination of images, motion demonstrations, narration, and music enables learners to process information more efficiently and develop stronger conceptual understanding. In the context of rhythmic gymnastics learning, audio-visual media facilitated students' comprehension of complex movement patterns and contributed to better retention of learning materials. Similar conclusions were reported by (Serungke et al., 2023), who emphasized that audio-visual media not only enhances student interest but also improves instructional effectiveness and learning outcomes.

The findings of this study are generally consistent with previous research that reported positive effects of Problem-Based Learning and audio-visual media on student achievement. However, this study specifically demonstrates the effectiveness of combining both approaches in rhythmic gymnastics instruction at the vocational high school level. While many previous studies have examined PBL or audio-visual media separately, the integration of these two instructional components provides a more comprehensive learning experience that simultaneously supports cognitive, affective, and psychomotor development. This finding contributes to the growing body of evidence regarding innovative teaching strategies in Physical Education.

The improvement in students' learning outcomes can also be explained through Constructivist Learning Theory, which emphasizes that knowledge is actively constructed through meaningful learning experiences rather than passively received from teachers. During the implementation of the Problem-Based Learning model, students identified learning problems, discussed possible solutions, practiced movement sequences collaboratively, and reflected on their performance. These activities enabled students to construct conceptual understanding while simultaneously improving movement skills through direct experience. Consequently, students became more engaged in the learning process and demonstrated greater independence in solving learning problems.

The findings are also consistent with Mayer's Cognitive Theory of Multimedia Learning, which states that learning becomes more effective when learners process information simultaneously through visual and auditory channels. The instructional videos used in this study enabled students to repeatedly observe movement demonstrations while listening to explanations of correct techniques. This dual-channel presentation reduced students' cognitive load, facilitated the organization of new information, and improved their understanding of rhythmic gymnastics concepts. As a result, students demonstrated more accurate movement execution and increased confidence during practice sessions.

The present findings support previous studies reporting the positive contribution of Problem-Based Learning and audio-visual media to student learning. Putri et al. (2024) found that the Problem-Based Learning model effectively promotes critical thinking and problem-solving abilities by encouraging students to actively participate in meaningful learning activities. Likewise, Serungke et al. (2023) emphasized that audio-visual media enhances learning effectiveness by providing engaging instructional experiences, while Silaban et al. (2025) concluded through a Systematic Literature Review that audio-visual media improves students' motivation, conceptual understanding, and learning skills in Physical Education. However, unlike these previous studies, the present research integrated both instructional approaches simultaneously within rhythmic gymnastics learning through Classroom Action Research. This integrated implementation not only improved students' conceptual understanding but also enhanced their attitudes toward learning and movement performance.

The progressive improvement observed from the pre-cycle to Cycle II indicates that the continuous reflection and instructional refinement inherent in Classroom Action Research contributed substantially to the effectiveness of the intervention. During Cycle II, students became more familiar with collaborative problem-solving procedures, demonstrated greater confidence in expressing ideas, and performed rhythmic gymnastics movements more accurately after repeatedly observing the instructional videos. The combination of student-centered learning and technology-supported instruction created a more meaningful learning environment that encouraged active

participation, independent learning, and continuous performance improvement. These findings suggest that integrating pedagogical innovation with appropriate instructional media is essential for improving learning outcomes in practical Physical Education lessons.

From a practical perspective, the results suggest that Physical Education teachers should consider integrating Problem-Based Learning with audio-visual media when teaching movement-based content. Such an approach can facilitate active participation, improve students' understanding of movement concepts, and provide clearer demonstrations of motor skills. The successful implementation of the intervention not only improved students' learning outcomes but also provided practical insights for teachers in designing more effective learning experiences. This finding supports the view reported by (Nugroho et al., 2025), citing Gao and Wang, that action research contributes to the development of academic skills among both students and teachers through continuous reflection and improvement of instructional practices. Therefore, the implementation of PBL assisted by audio-visual media can serve as an effective instructional strategy for improving learning outcomes in rhythmic gymnastics and other practical Physical Education materials.

5. Conclusion and Recommendation

The findings of this study demonstrate that the implementation of the Problem-Based Learning (PBL) model assisted by audio-visual media is an effective instructional strategy for improving students' learning outcomes in rhythmic gymnastics. The integration of problem-solving activities with audio-visual learning resources enabled students to engage more actively in the learning process, develop a deeper understanding of movement concepts, and improve their performance across cognitive, affective, and psychomotor domains. These findings provide empirical evidence that combining student-centered learning approaches with technology-supported instructional media can enhance the effectiveness of Physical Education, Sports, and Health learning, particularly in movement-based content.

The study also contributes to the growing body of knowledge on innovative teaching strategies in Physical Education by demonstrating that the integration of Problem-Based Learning and audio-visual media can simultaneously support cognitive understanding, positive learning attitudes, and motor skill development in rhythmic gymnastics learning. Therefore, Physical Education teachers are encouraged to integrate PBL and audio-visual resources into classroom practice to promote active participation and improve learning quality. Future research is recommended to examine the effectiveness of this approach in different educational contexts, learning materials, and student populations, as well as to investigate its long-term impact on students' learning motivation, movement competence, and academic achievement.

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