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Enhancing 21st century collaboration skills in physical education through the problem-based learning model

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ABSTRACT

Collaboration skills are pivotal for students, offering avenues to enhance knowledge, social interaction, self-confidence, and motivation. This study aims to enhance collaboration skills among students in physical education, particularly in the design of systematic rhythmic movement activities using the problem-based learning model. Conducted as classroom action research, the participants were 35 Class XI students from Public Senior High School 3 Banjarbaru. The research utilised a collaborative observation sheet and employed both descriptive and quantitative analysis methods. The results revealed a discernible improvement in collaboration skills between the initial and subsequent cycles. ANOVA tests demonstrated a significant increase after two cycles of learning. This research directly influences the development of collaborative abilities in learners, recognising collaboration skills as crucial in 21st-century education. The collaborative problem-solving approach not only enhances cooperation but also contributes to improved learning outcomes, preparing students for success in both community and work environments. The study sheds light on the efficacy of problem-based learning models, underscoring their vital role in learner development and education. Future research should explore the impact of problem-based learning models using mixed-methods research.

Keywords: Learning model; problem-based learning; collaboration skills

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INTRODUCTION

Physical education is one of the subjects that must be taught starting from elementary school to high school (Hasrion et al., 2020; Suryadi, 2022; Umar et al., 2023). In this learning process, there is an educational interaction between teachers and students which aims to enable students to learn actively and gain experiences that have a positive impact on their development (Angga et al., 2022). In this context, teachers have an important role in helping students acquire knowledge, shape attitudes, develop skills,

character, and student confidence (Fitrah et al., 2022). The learning process of physical education sports and health at school includes affective, cognitive and psychomotor aspects (Hanief et al., 2018). However, the main learning of physical education is in the psychomotor domain, namely in the activity of movement skills.

To enhance the quality of a healthy life through the principles of physical education (Wardana et al., 2020), sports education plays a crucial role. It utilises physical activity as a means to attain educational objectives, with activities contributing to overall fitness (Hardinata et al., 2021). Learning activities often incorporate play-based methods to promote both physical well-being and enhanced fitness levels (Syafriadi et al., 2021). According to studies like those by Baek et al. (2020) and González-Fernández et al. (2021), the culmination of these efforts results in a healthy body and improved fitness. Consequently, the selection of an appropriate learning model becomes pivotal in determining the success of students' academic endeavours.

Learning can take place if it is carried out in two directions: either through educators with students or students with other students (Mashud et al., 2023). The development of learning models adapted to 21st century learning is very important to provide learning experiences to students (Rosnaeni, 2021). The model used must also increase students' involvement in learning (Handayani & Wulandari, 2021). One that can be applied is a problem-based learning model, more commonly called problem-based learning (PBL). Problem-based learning is a learning method that encourages students to think critically and improve problem-solving skills and knowledge related to problems in everyday life. Through contextualised learning, ability, independence, and confidence will increase (Choden & Kijkuakul, 2020).

Based on the characteristics of each skill and the learning content, 21st century learning employs student-centred models and methodologies (Fitrah et al., 2022). It may be advantageous to adopt learning models, one of which is dependent on student characteristics (Safithri et al., 2021). Therefore, before determining the learning model, first observe the problems, needs, and characteristics of the students. In the 21st century, the skills that every learner needs to have are creative thinking, problem solving, communication, and collaboration (Pramono et al., 2021). In addition, the current learning model that is needed and good to do is student-centred, interactive critical thinking, and being able to improve collaboration.

Collaboration, as studied by Alexandra and Barton (2017) and Davis and Bos (2018), involves individuals sharing responsibilities, trusting one another, and assuming specific roles to collectively understand and solve problems. In the context of 21st-century career success, Tracy and Xu (2018) emphasise the necessity of learners possessing collaboration skills. These skills manifest in the dynamic interaction among students, where they jointly shoulder responsibilities, trust one another, and assume distinct roles to achieve a mutual understanding of issues and solutions (Davis & Bos, 2018). The importance of collaboration skills in learning activities lies in their ability to facilitate the sharing and expansion of knowledge, enabling students to attain their learning objectives. Collaborative efforts not only lead to a wealth of knowledge but also foster extensive social interaction among students. This concept is supported by the findings of Dooley and Sexton-Finck (2017), which highlight that students engaged in collaborative work tend to acquire abundant knowledge and develop strong social connections.

The application of collaboration to students can implement student-centered learning, the division of tasks, taking responsibility for assigned tasks, and using social skills well. Performed research by Uhusna et al. (2020) shows that collaboration has implications for student learning and knowledge retention. Furthermore, the benefits of learning with the ultimate goal of collaboration include practicing effective division of labor, increasing

the character of responsibility, and bringing together information from diverse sources of knowledge, perspectives of experience, creativity, and quality stimulated by the ideas of members in each group (Dooley & Sexton-Finck, 2017). The problem that still often occurs today is the gap between expectations and reality that students' collaboration skills are still low and indirectly affect learning outcomes (Ulhusna et al., 2020).

Furthermore, the exam results show that pupils are unable to execute the assigned assignment in a complete and proper manner. With the problem of difficulty in describing the thinking process and lack of collaboration with friends (Siagian et al., 2019). This is in line with research conducted by Ulhusna et al. (2020), the problem that still often occurs today is the gap between expectations and reality that students' collaboration skills are still low and indirectly affect learning outcomes. Therefore, the right learning method is needed for successful learning (Mashud et al., 2023; Perdana et al., 2023). Addressing these challenges requires a strategic approach that fosters effective collaboration and enhances students' ability to articulate their thought processes, ultimately improving overall learning outcomes.

In the exploration of enhancing the quality of physical education, this research adopts problem-based learning methods, particularly focusing on the design of systematic rhythmic movement activities. Teachers, acknowledged as pivotal influencers in their students' performance (Ginja & Chen, 2020; Hidayat & Kosasih, 2019; Suryadi et al., 2023), gauge their success as educators by the positive changes observed in student behaviour (Bachtiar et al., 2021; Rahayu, 2020). Given the critical role of learning approaches in student progress, the selection of an appropriate approach significantly influences the achievement of learning goals (Suryadi, 2022). To enhance the quality of physical education, it becomes imperative to strengthen teachers' capacity to utilise effective learning models (Trimantara, 2021). This capacity not only facilitates the creation of learning content but also empowers teachers to develop multimedia and design problem-solving activities, thereby fostering improved communication and cooperation skills among students (Kwangmuang et al., 2021).

Previous research has well documented the use of problem-based learning models (Ginzburg et al., 2018; Hu et al., 2019), but there is still limited research on the effect of problem-based learning on improving collaboration skills. Further research conducted by Sugihartono (2019) regarding the application of problem-based learning models results in the effectiveness of students' time in learning physical education, sports, and health. Other studies use innovative media, namely TikTok with a project-based learning model, to improve learning outcomes in rhythmic movement activities (Indrayogi et al., 2022; Mahendra et al., 2023). This research presents new things in terms of testing the effect of problem-based learning models on improving collaboration skills through experimental studies. Therefore, the purpose of this study is to examine the effect of problem-based learning models on improving collaboration skills.

METHOD

This study used a Classroom Action Research (CAR) approach, specifically following the Kemmis and McTaggart paradigm as outlined (Kemmis et al., 2019). CAR involves four main stages: planning, implementation, observation, and reflection, as articulated. The research subjects consisted of 35 students from Class XI at Public Senior High School 3 Banjarbaru. Non-test data collection instruments in the form of observation uses student collaboration skills sheets. This instrument was developed based on indicators of collaboration skills derived from previous research by Ahwan et al. (2023) and Robbins et al. (2019). The indicators were aligned with the theory of collaborative skills, which includes the ability to: (i) collaborate effectively in a team; (ii) show respect for

ideas, suggestions, and input from colleagues; (iii) demonstrate perspective-taking skills; (iv) adhere to assigned roles or tasks; and (v) jointly assume responsibility for task outcomes. For data analysis, the researchers used descriptive quantitative methods to assess the data in each cycle. This analysis was facilitated by Microsoft Excel 2019 and SPSS 26 software.

5 RESULTS AND DISCUSSION

The results of learning observations in this class action research, which focuses on student collaboration skills, show that students' ability to work together (collaborate) with peers is still low. The achievement of pre-cycle specified indicators was used to assess data on the results of students' cooperation skills on the material of systematic exercises in rhythmic movement activities utilizing mobile learning media in the form of gadgets. The results indicated that 18% had a high category interpretation, 31% had a medium category interpretation, and 51% were still classed as low. Table 1 displays the results.

The implementation of cycle I actions was carried out in one meeting. First, the researcher instructed students to analyze a video related to the systematic exercises in rhythmic movement activities in the warm-up and core sections. The learning medium used is mobile learning in the form of gadgets. The results obtained were 48% in the high category, 23% in the medium category, and then 29% in the low category. These results have shown a change, namely 48% with a high interpretation, but these results still have not reached the success indicator of 70%. The results can be seen in the implementation of cycle I actions carried out in one meeting. First, the researcher instructs students to analyze and practice systematic exercises in rhythmic movement activities in the core and cooling sections. The results can be seen in Table 2. Furthermore, the results of Table 3 on the implementation of cycle II actions show 29% in the medium category and 70% in the high category. These results have provided information about where, in cycle II, it has reached the success indicator.

Table 1. Pre-Cycle Results

Collaboration Skills	Interpretation	N	Percentage	Indicators of Success
Pre-Cycle	High	6	18%	70%
	Medium	11	31%	
	Low	18	51%	

Table 2. Cycle I Results

Collaboration Skills	Interpretation	N	Percentage	Indicators of Success
Cycle I	High	17	48%	70%
	Medium	8	23%	
	Low	10	29%	

Table 3. Cycle II Results

Collaboration Skills	Interpretation	N	Percentage	Indicators Of Success
Cycle II	High	25	71%	70%
	Medium	10	29%	
	Low	0	0 %	

Table 4. Homogeneity Test

Results		Levene Statistic	df1	df2	Sig.
Group	Mean	43,455	2	102	0,000
	Median	8,396	2	102	0,000
	Median and with Adjusted df	8,396	2	61,316	0,001
	Trimmed Mean	40,521	2	102	0,000

The significance value of the homogeneity test is $p = 0.000$ 0.05 based on the findings in table 4, indicating that the data is not homogenous. In addition, the Dunnet test will be performed.

Table 5. One Way ANOVA Test (Dunnet Test)

(I) Collaboration Skills	(J) Collaboration Skills	Mean Difference (I-J)	Std. Error	Sig.
Pre-Cycle	Cycle I	-14.54286*	3,47886	0,000
	Cycle II	-21.10000*	2,90941	0,000
Cycle I	Pre-Cycle	14.54286*	3,47886	0,000
	Cycle II	-6.55714*	2,22878	0,015
Cycle II	Pre-Cycle	21.10000*	2,90941	0,000
	Cycle I	6.55714*	2,22878	0,015

The results in Table 5 examine if there is a difference in the cycle scores. We look at the ANOVA table, and the (P-value) in the Sig. column is 0.000 0.05 . As a result, the conclusion reached is that there is a considerable difference in the average value of the three action cycles.

Table 6. Descriptive Results of Collaboration Skills

Results	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Pre-Cycle	35	47,3643	16,52253	2,79282	33,00	75,00
Cycle I	35	61,9071	12,27160	2,07428	33,00	75,00
Cycle II	35	68,4643	4,82379	0,81537	56,00	75,00
Total	105	59,2452	14,98597	1,46248	33,00	75,00

Descriptive results of collaboration skills show that the mean value in cycle I and cycle II has increased. Where the results in cycle II are more dominant, namely 68.4 compared to cycle I of 61.9.

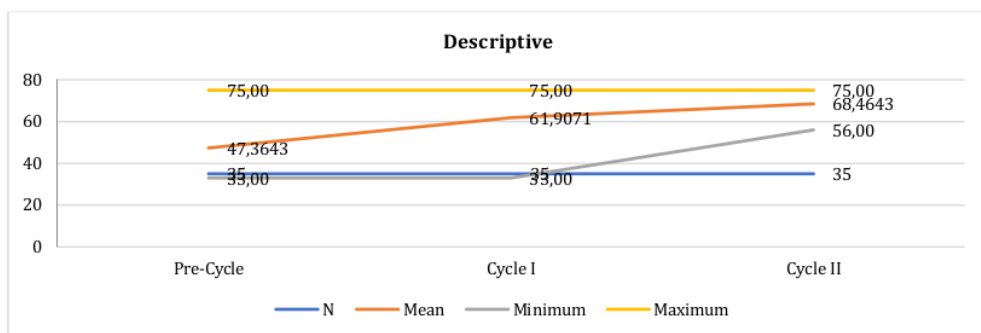


Figure 1. Descriptive Results of Collaboration Skills

This research aims to evaluate the learning process by using a problem-based learning model to assess students' collaborative abilities. The findings show that the problem-

based learning model effectively runs in two cycles. The improvement in collaborative ability is clearly seen between Cycle I and Cycle II. In addition, the ANOVA test results also showed a significant difference between pre-cycle, Cycle I, and Cycle II. This was reflected in students' appreciation of the quality of teamwork, facilitated group work, and opportunities to act and think. Real-life tasks were also included, and students were given sufficient time to solve problems and develop projects (Saldo & Walag, 2011). The uniqueness and novelty of this research lies in the fact that the problem-based learning model is proven to be able to improve students' collaborative skills in physical education and health subjects.

The findings of this study are consistent with previous studies, such as Nurhayati et al. (2019), study, which showed that the use of problem-based learning materials can improve students' communication and teamwork skills. The findings of this study are relevant, but what distinguishes it is the testing of problem-based learning materials with direct integration into the lesson plan. Another previous study highlighted the relevance of integrating useful feedback (Mauri et al., 2016) as it can be used to enhance students' learning and engagement.

Further emphasizing this by stating that problem-based learning techniques shift the classroom towards interactive learning and move teaching practices from the traditional classroom setting to a much more contemporary and engaging environment (Nair et al., 2013). Additional studies also provide evidence that the incorporation of PBL models exclusively enhances volleyball learning outcomes (Priyadi, 2021), enhances the postures for candle and kayang in elementary school students (Zahra et al., 2023), and boosts critical thinking skills in physical education (Dupri et al., 2019).

A study conducted by Ginzburg et al. (2019) explored the effectiveness of a hybrid instructional approach combining problem-based learning and case-based learning during students' discussions in the context of public health. The findings revealed that both methods were successful in enhancing conversations on public health issues. Notably, the integration of problem-based learning and case-based learning proved beneficial in cultivating students' leadership qualities without necessitating additional curricular commitments or study time. Additionally, Hu et al. (2019) incorporated a flipped classroom model with problem-based learning in a course, resulting in improved academic performance. However, this approach demanded greater effort from the students.

The application of problem-based learning has implications for students' academic performance, as suggested by research (Hasanah et al., 2021). Adhering to the syntax of the problem-based learning model in instructional delivery motivates students to actively engage in their learning process. This pedagogical approach, established as an effective teaching method (Choden & Kijkuakul, 2020), stimulates critical thinking, enhances problem-solving skills, and augments practical knowledge applicable in daily life (Dwyer, 2017). Participation in collaborative teamwork under this model not only increases students' ability to articulate ideas and share knowledge but also fosters willingness to assist one another, thereby indirectly enhancing communication skills. Problem-based learning offers a practical representation of issues, prompting students to take subjective initiative and transition from a "what I have learned" to a "what I want to learn" paradigm (Zhao et al., 2020).

The problem-based learning model, as indicated by research (Nurhayati et al., 2019), proves to be practical and easily comprehensible, fostering the development of students' communication and teamwork skills. Furthermore, the structured learning activities are organized into three stages: introduction, core, and closing stages. This lesson plan aligns with the structure of the problem-based learning model, encompassing stages such as

making students aware of the problem, organizing collaborative learning, guiding investigations, presenting findings, and assessing the problem-solving process (Masrurroh & Arif, 2021; Sukmawati, 2021). The outcomes of this study mirror previous research, showcasing that student actively engage in making critical decisions based on group consensus, assuming significant responsibilities, and collaborating to tackle tasks or issues. Additionally, the problem-based learning model amplifies learning and motivation by adhering to more student-centered learning principles. Other studies have also highlighted the positive impact of appropriately employing social skills on teamwork.

Collaboration skills represent a fundamental competency that students should possess, particularly in the knowledge-building process of learning (Tan et al., 2015). Students are tasked with sharing ideas, expressing opinions, and engaging in discussions when working collaboratively in groups to accomplish projects. Through the joint completion of tasks in groups, they are expected to achieve common objectives, fostering the development of cognitive and socio-emotional awareness as an inherent aspect of their character (Näykki et al., 2021). This collaborative approach not only enhances students' group work competence (Liu et al., 2021) but also stimulates originality and creativity, cultivating talents in collaborative critical thinking to address real-life challenges (Wilkerson & Trellevik, 2021) and influencing academic achievement positively (Omodan & Tsotetsi, 2018).

Educators aspire for students to actively participate and be ready for collaboration throughout the learning process. Consequently, the success of a teacher in education and learning implementation is measured by the positive changes observed in students' behavior (Aziz et al., 2023a; Aziz et al., 2023b; Haïdara et al., 2023; Lutfhi & Rahayu, 2022; Tanri et al., 2023; Umar et al., 2023). Given the significance of learning approaches in student progress, the selection of an appropriate approach bears a substantial impact on achieving learning objectives. While the problem-based strategy's weakness lies in the time-intensive nature of learning exercises, it necessitates educators' time management skills to ensure smooth and effective learning activities. The study's findings could serve as a basis for further research exploring additional characteristics such as gender, socioeconomic status, and family factors that may influence students' developmental progress in learning.

CONCLUSION

Drawing upon the research findings, it can be deduced that the problem-based learning paradigm plays a pivotal role in enhancing students' teamwork abilities. The study uncovered a discernible increase in the average value of collaborative skills during physical education sessions in both cycles, particularly in the construction of systematic rhythmic movement activities. Following two-cycle classroom action research utilising the problem-based learning model, it can be asserted that this model effectively improves students' collaboration skills.

However, certain limitations need acknowledgment, such as the restricted number of participants involved and focus solely on one class and school in Banjarbaru City, Indonesia. Consequently, it is recommended for future research endeavours to encompass a more extensive participant pool, incorporating multiple high schools across Indonesia. This study contributes significantly by furnishing valuable information and guidance for physical education teachers and offering insights into the implementation of diverse and varied models. This, in turn, holds the potential to ensure students consistently excel in their learning endeavours, ultimately attaining the desired educational achievements.

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CONFLICT OF INTEREST

Not conflicts of interest related to the reported research.

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