

LETTER OF ACCEPTANCE (LoA)

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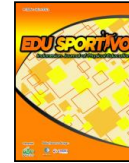
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Pekanbaru, November 28, 2023

Editor In Chief



Dr. Mohd Izwan bin Shahril



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

Anonymous

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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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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection



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 (Musthofa, 2016).

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

Comment [A1]: I have helped improve the title, abstract, introduction, methods, and results of your manuscript. However, your discussion section is still not written as suggested. Please improve the **discussion section!** Many sentences in the discussion section are ambiguous.

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 et al., 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 (Muslihudin, 2019). 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 (Puspitasari, 2018). Performed research by Ulhusna 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 (Nasution; Mardiah Kalsum., 2019), 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 by Purohman (2018). PTK 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 using 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: 1) collaborate effectively in a team; 2) show respect for ideas, suggestions, and input from colleagues; 3) demonstrate perspective-taking skills; 4) adhere to assigned roles or tasks; and 5) 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.

RESULTS AND DISCUSSION

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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 .

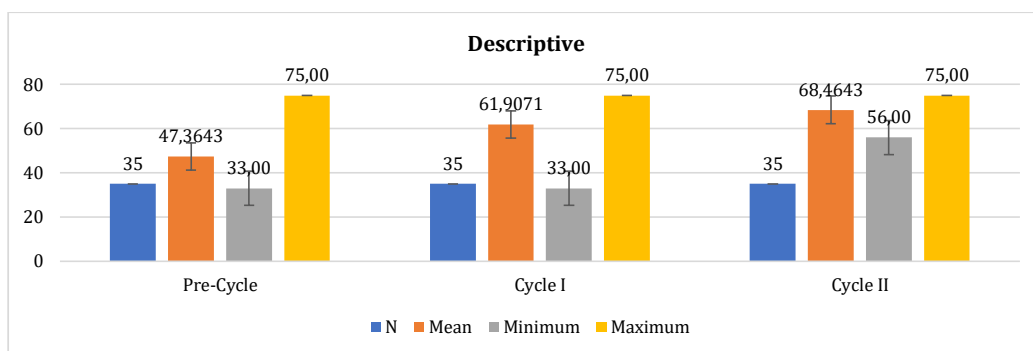


Figure 1. Descriptive Results of Collaboration Skills

Our research aimed to evaluate the impact of a problem-based learning model on students' collaborative abilities. The research yielded significant findings, showing that the problem-based learning model effectively operated over two cycles. The improvement in collaborative skills was evident between Cycle I and Cycle II. Furthermore, the results of the ANOVA test also indicated a significant difference between the pre-cycle, Cycle I, and Cycle II. This is reflected in the students' appreciation for the quality of teamwork, facilitated group work, and opportunities for action and thinking. Real-life tasks were included, and students were given ample time to solve problems and develop projects (Saldo & Walag, 2020). Hence, the uniqueness and novelty of this study lie in the fact that the problem-based learning model has been proven to enhance students' collaborative skills in the subject of physical education and health, specifically in the material on rhythmic movement.

The findings of this research are consistent with previous studies, such as Nurhayati et al.'s (2019), which showed that the use of problem-based learning materials can enhance students' communication and teamwork skills. This research's findings are relevant, but what sets it apart is the testing of problem-based learning materials with direct integration into the lesson plan. This is also in line with previous research that highlights the relevance of integrating useful feedback (Mauri et al., 2016) because it can be used to enhance learning and student engagement. Nair et al. (2020) further emphasised this by stating that problem-based learning techniques shift the classroom towards interactive learning and move teaching practices from traditional classroom settings to a much more contemporary and engaging environment.

Further research also supports that efforts to implement the PBL model in delivering learning in physical education lessons only improve volleyball learning outcomes (Priyadi, 2021), efforts to improve candle and kayang attitudes in elementary school students (Zahra et al., 2023), and to improve critical thinking skills in physical education (Dupri et al., 2019). Research also shows that attempts to implement PBL models in the delivery of learning in higher education have failed (Nair et al., 2013). Previous research also shows that efforts to apply the PBL model in delivering learning in physical education lessons have only improved volleyball learning outcomes (Priyadi, 2021), efforts to improve candle and kayang attitudes in elementary school students (Zahra et al., 2023), and to improve critical thinking skills in physical education (Dupri et al., 2019). Research has also shown that attempts to implement PBL models in the delivery of learning in higher education have failed (Jamkar et al., 2007; Khaki et al., 2007; Nair et al., 2013).

Previous research also shows that efforts to apply the PBL model in delivering learning in new physical education lessons on improving volleyball learning outcomes (Priyadi, 2021), efforts to improve candle and kayang attitudes in elementary school students (Zahra et al., 2023) and to improve critical thinking skills in physical education (Dupri et al., 2019). The application of a combined teaching method between problem-based learning and case-based learning in codecteran tudent discussions showed that both methods were effective in improving conversations related to public health (Ginzburg et al., 2019). Another research employed problem-based learning and case-based learning strategies to develop students' leadership qualities without requiring curricular practice or learning time (Ginzburg et al., 2018). Furthermore, Hu et al., (2019) integrated flipped classroom with problem-based learning in a course, which resulted in higher performance, but at the expense of a larger effort for students

The problem-based learning concept has consequences for student performance in learning (Hasanah et al., 2021). Based on the findings of the two studies mentioned above, it is clear that using the problem-based learning paradigm improves student learning outcomes and accomplishment. Furthermore, implementing learning in line with the syntax of the problem-based learning model encourages students to be active participants in their learning. Problem-based learning has been shown to be a teaching method that encourages active learning (Choden & Kijkuakul, 2020), encourages students to think critically, and improves problem-solving skills and knowledge in everyday life (Aydogdu & Kesan, 2014). Therefore, students' involvement in teamwork, their ability to express ideas, various ideas, and knowledge, and their willingness to help each other, will increase and indirectly improve students' communication skills (Huang et al., 2010). Problem-based learning gives a realistic picture of the problem and encourages students to take subjective initiative to shift from the paradigm of "what I have learned" to "what I want to learn." (Zhao et al., 2020).

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The problem-based learning methodology is feasible and readable, and it may help students develop their communication and teamwork abilities (Nurhayati et al., 2019). In addition, the planned learning activity stage is divided into 3 stages: the introductory, core, and closing stages. This lesson plan is tailored to the issue-based learning model's syntax, which includes 1) alerting students to the problem, 2) arranging students to learn, 3) directing investigations, 4) presenting outcomes, and 5) assessing the problem-solving process (Masruroh & Arif, 2021; Sukmawati, 2021). Students who employ problem-based learning models build individual and group accountability, interpersonal, small group, and group processing abilities, which are among the five essential characteristics of collaborative learning (Laal & Laal, 2012). The present study's findings are also consistent with past studies in which students make crucial decisions based on group consensus, take on important responsibilities, and collaborate to solve tasks or issues (Safarini, 2019). In addition, the problem-based learning model improves learning and learning motivation by applying more student-centered learning principles (Kolmos, 2009). Other studies have found that using social skills appropriately might have a favorable influence on teamwork (Johnson & Johnson, 2009).

Collaboration abilities are fundamental talents that students must acquire, particularly in order to build knowledge in learning (Tan et al., 2015). Collaboration is a mode of social relations that involves working together so that the planned goals can be realized. Leeuwen et al., (2015) students are challenged to share ideas, express their opinions, and engage in conversations when they collaborate or work in groups to achieve projects. Through collaborative completion of task implementation in groups, they are expected to achieve goals (Priyambudi et al., 2019). Students' collaboration abilities will develop an innate awareness and character in the form of cognitive and socio-emotional awareness (Näykki et al., 2021), boost student group work competency (Liu, 2021), and spark the birth of originality and creativity, shaping students' talents in collaborative critical thinking to address challenges encountered in real life (Wilkerson & Trellevik, 2021), as well as academic achievement (Omodan & Tsotetsi, 2018).

The teacher's position as an educator leads to students' active participation and readiness to collaborate during the learning process (Harianto et al., 2023; Lynch et al., 2021). As a result, a teacher is deemed to be successful in educating and applying learning if there is a positive change in student behavior (Bachtiar et al., 2021; Rahayu, 2020). Learning approaches are critical to student progress (Hardinata et al., 2023; Nasution; Mardiah Kalsum., 2019). As a result, selecting the appropriate approach has a significant impact on the attainment of learning objectives (Suryadi, 2022). The capacity of instructors to use learning models must be strengthened in order to improve the quality of physical education, sports, and health education (Trimantara, 2021). The disadvantage of this problem-based strategy is that it necessitates a significant amount of time for learning exercises (Choden & Kijkuakul, 2020). So that it requires the ability of educators to manage time so that learning activities can run well and smoothly.

CONCLUSION

Based on the findings of the research, I can infer that the problem-based learning paradigm can help students enhance their teamwork abilities. The findings revealed an increase in the average value of collaborative skills in physical education sessions in cycles I and II, particularly in the content of constructing systematic rhythmic movement activity activities. After conducting a classroom action research using a problem-based learning model that lasted for two cycles, it can be concluded that this model is effective to improve students' collaboration skills. However, there are some limitations in that the number of participants involved was limited and focused on one

Comment [A4]: In the discussion section, do not just do quotations. But you must interpret the research results in depth. Why are the results important? What are the implications of the results for your research topic? Interpret your findings as far as possible.

Do your results support or refute previous findings? Explain the differences and similarities.

Don't forget to list the weaknesses and limitations of your research. How did the weaknesses affect the results? This section should reflect critical thinking about your research.

If there are multiple ways to interpret your results, consider listing alternative interpretations. This will show the depth of your analysis.

End the discussion by making suggestions for future research. How can your results help future research? Indicate directions that future research might take.

Comment [A5]: You still haven't improved this discussion much.

class and school only in Banjarbaru City (Indonesia). Therefore, it is recommended for future research to involve more participants and cover several high schools in Indonesia. This study contributes to providing information and guidance for physical education teachers in implementing learning with a variety and variety of models, so that in the future students can always learn well until they get the desired achievement.

ACKNOWLEDGEMENTS

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CONFLICT OF INTEREST

Not conflicts of interest related to the reported research.

REFERENCES

- Ahwan, M. T. R., Basuki, S., & Mashud. (2023). Meningkatkan Keterampilan Kolaborasi Siswa melalui Aktivitas Kebugaran Jasmani Menggunakan Model Project Based Learning (PjBL) SMA Negeri 3 Banjarbaru. *Jurnal Pendidikan Kesehatan Rekreasi*, 9 (1), 106–119. <https://doi.org/10.5281/zenodo.7592832>
- Alexandra, D. F., & Barton, S. M. (2017). Collaboration of General and Special Education Teachers: Perspectives and Strategies. *Intervention in School and Clinic*, 1–8. <https://doi.org/10.1177/1053451217693370>
- Aydogdu, M. Z., & Kesan, C. (2014). A Research on Geometry Problem Solving Strategies Used by Elementary Mathematics Teacher Candidates. *Journal of Educational and Instructional Studies in the World*, 4(1), 53–62.
- Bachtiar, B., Putri, A. P., & Maulana, F. (2021). Survei Hasil Belajar Pendidikan Jasmani Olahraga dan Kesehatan Melalui E-Learning Siswa Smk Negeri Kota Sukabumi. *Jendela Olahraga*, 6(1), 17–27. <https://doi.org/10.26877/jo.v6i1.6293>
- Baek, K. W., Lee, M. C., Jeon, T. B., Yoo, J. Il, Park, J. S., Moon, H. Y., & Kim, J. S. (2020). Effects of exercise on physical fitness and strength according to the frailty level of female elderly with hypertension. *Exercise Science*, 29(4), 368–376. <https://doi.org/10.15857/ksep.2020.29.4.368>
- Choden, T., & Kijkuakul, S. (2020). Blending problem based learning with scientific argumentation to enhance students' understanding of basic genetics. *International Journal of Instruction*, 13(1), 445–462. <https://doi.org/10.29333/iji.2020.13129a>
- Davis, K., & Bos, J. (2018). Playing in the Virtual Sandbox: Students' Collaborative Practices in Minecraft. *International Journal of Game-Based Learning*, 8(3), 56–76. <https://doi.org/10.4018/IJGBL.2018070104>
- Dooley, K., & Sexton-Finck, L. (2017). A focus on collaboration: Fostering Australian screen production students' teamwork skills. *Journal of Teaching and Learning for Graduate Employability*, 8(1), 74–105. <https://doi.org/10.3316/informit.157888556477449>
- Dupri, Nazirun, N., & Risma, N. (2019). Penerapan Model Problem Based Learning Untuk Meningkatkan Keterampilan Berpikir Kritis Pada Pendidikan Jasmani. *Journal Sport Area*, 4(2), 318–326. [https://doi.org/10.25299/sportarea.2019.vol4\(2\).3760](https://doi.org/10.25299/sportarea.2019.vol4(2).3760)
- Fitrah, A., Yantoro, Y., & Hayati, S. (2022). Strategi Guru dalam Pembelajaran Aktif

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2. Year
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4. Volume
5. Number/Issue
6. Page
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Melalui Pendekatan Saintifik dalam Mewujudkan Pembelajaran Abad 21. *Jurnal Basicedu*, 6 (2), 2943–2952. <https://doi.org/10.31004/basicedu.v6i2.2511>

Ginja, T. G., & Chen, X. (2020). Teacher educators' perspectives and experiences towards differentiated instruction. *International Journal of Instruction*, 13(4), 781–798. <https://doi.org/10.29333/iji.2020.13448a>

Ginzburg, S., Schwartz, J., Deutsch, S., Elkowitz, D., Lucito, R., & Hirsch, J. (2019). Using a problem/case-based learning program to increase first and second year medical Students' discussions of health care cost topics. *Med Educ Curric Dev*, 6, 2382120519891178.

Ginzburg, S., Susan, D., Jaclyn, B., Elkowitz, D., Stern, J., & Robert, L. (2018). Integration of leadership training into a problem/case-based learning program for firststand second-year medical students. *Adv Med Educ Pract.*, 99, 221–226.

González-Fernández, F. T., Sixto González-Víllora, Salvador Baena-Morales, Pastor-Vicedo, J. C., Clemente, F. M., Badicu, G., & Murawska-Ciałowicz, E. (2021). Effect of Physical Exercise Program Based on Active Breaks on Physical Fitness and Vigilance Performance. *Biology*, 10(11), 1151. <https://doi.org/10.3390/biology10111151>

Handayani, Rima, & Wulandari, D. (2021). Modern Assessment dalam Menyongsong Pembelajaran Abad 21 dan Hambatan di Negara Berkembang. *Jurnal Pendidikan Edutama*, 8(1), 13. <https://doi.org/10.30734/jpe.v8i1.1363>.

Hanief, Y. N., Subekti, T. B. A., & Mashuri, H. (2018). Meningkatkan Hasil Belajar Passing Bawah Bolavoli melalui Permainan 3 on 3 pada Siswa Sekolah Dasar. *Jurnal Pendidikan Jasmani Dan Olahraga*, 3(2). <https://doi.org/10.17509/jpjo.v3i2.12414>

Hardinata, R., Fakhruddin Fakhruddin, Syarif, A., Ahwan, M. T. R., Abidin, M. Z., Alamsyah, A., Abdulrahman, D., Shukla, M., Malek, N. F. A., & Sa'adah, S. P. (2023). The use of audio-visual media: how does it affect rhythmic movement skills? *Tanjungpura Journal of Coaching Research*, 1(2), 38–47. <https://doi.org/10.26418/tajor.v1i2.66586>

Hardinata, R., Gustian, U., & Perdana, R. P. (2021). The Effectiveness of the Triangle Run Exercise Method in Improving Aerobic Resistance Soccer Player. *JUARA : Jurnal Olahraga*, 6(1), 115–124. <https://doi.org/10.33222/juara.v6i1.1180>

Hariato, E., Gustian, U., Supriatna, E., Shalaby, M. N., & Taiar, R. (2023). Stimulating game performance skills in students: experimental studies using net games. *Tanjungpura Journal of Coaching Research*, 1(2), 63–70. <https://doi.org/10.26418/tajor.v1i2.65009>

Hasanah, U., Sarjono, S., & Hariyadi, A. (2021). Pengaruh Model Problem Based Learning Terhadap Prestasi Belajar IPS SMP Taruna Kedung Adem. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 7(1), 43. <https://doi.org/10.37905/aksara.7.1.43-52.2021>

Hidayat, T., & Kosasih, A. (2019). Analisis peraturan menteri pendidikan dan kebudayaan republik indonesia nomor 22 tahun 2016 tentang standar proses pendidikan dasar dan menengah serta implikasinya dalam pembelajaran pai di sekolah. *Muróbbi: Jurnal Ilmu Pendidikan*, 3(1), 45–69. <https://doi.org/10.52431/murobbi.v3i1.172>

Hu, X., Zhang, H., Song, Y., Wu, C., Yang, Q., Shi, Z., Zhang, X., & Chen, W. (2019). Implementation of flipped classroom combined with problem-based learning: an approach to promote learning about hyperthyroidism in the endocrinology internship. *BMC Med Educ*, 19(1), 290.

- Huang, D., Seth, L., Cheri, H., Debora, L. ., Nora, O., & Gwendelyn, R. (2010). *Preparing Students for The 21st Century: Exploring The Effect of Afterschool Participation on Students' Collaboration Skills, Oral Communication Skills, and Self-Efficacy*. Cress Report (CR) of The National Center for Research on Evaluation, Standards, and Student Testing. University of California: Los Angeles, CR 777.
- Indrayogi, I., Nurhayati, M., & Fauzi, R. S. (2022). Project-Based Learning Model to Improve Student's Hands and Feet Motor Skills in Rhythmic Gymnastics. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran) Kajian Dan Riset Dalam Teknologi Pembelajaran*, 9(3), 240. <https://doi.org/10.17977/um031v9i32022p240>
- Jamkar, A., Burdick, W., Morahan, P., Yemul, V., Sarmukadum, & Singh, G. (2007). PProposed model of case based learning for training undergraduate medical student in surgery. *Indian J Surg*, 69(5), 176-183.
- Johnson, D. W., & Johnson, R. T. (2009). "An educational psychology success story: Social interdependence theory and cooperative learning." *Educ. Res*, 38(5), pp 365-379.
- Khaki, A., Tubbs, R., Zarrintan, S., Khamnei, H., Shoja, M., Sadeghi, H., Ahmadi, M., & M. (2007). The first year medical students' perception of and satisfaction from problem based learning compared to traditional teaching in gross anatomy: introducing problem based anatomy into a traditional curriculum in Iran. *Int J Health Sci*, 1(1), 113.
- Kolmos, A. (2009). "Problem Based Learning and Project Based Learning," in Skovsmose O., Valero P., Christensen O.R. *University Science and Mathematics Education in Transition*, Springer, pp 261-280.
- Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. *Heliyon*, 7(6), e07309. <https://doi.org/10.1016/j.heliyon.2021.e07309>
- Laal, M., & Laal, M. (2012). "Collaborative learning: What is it?," *Procedia - Soc. Behav. Sci*, 31, 491-495.
- Leeuwen, A. van, Janssen, J., Erkens, G., & Brekelmans, M. (2015). Teacher regulation of cognitive activities during student collaboration: Effects of learning analytics. *Computers & Education*, 90, 80-94. <https://doi.org/10.1016/j.compedu.2015.09.006>
- Liu, H. Y. (2021). Effect of interdisciplinary teaching on collaborative interactions among nursing student teams in Taiwan: A quasi-experimental study. *Nurse Education Today*, 106, 105083. <https://doi.org/10.1016/j.nedt.2021.105083>
- Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2021). Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process. *Technological Forecasting and Social Change*, 164(June 2), 119689. <https://doi.org/10.1016/j.techfore.2019.06.015>
- Mahendra, M. Y., Ridwan, M., & Juheri. (2023). Improving Learning Outcomes of Rhythmic Movement Activity Learning through Utilization of the TikTok Media Model Project Based Learning. *Jurnal Pendidikan Jasmani*, 4(1), 145-155. <https://doi.org/10.55081/jpj.v4i1.1030>
- Mashud, Arifin, S., Kristiyandaru, A., Samodra, Y. T. J., Santika, I. G. P. N. A., & Suryadi, D. (2023). Integration of project based learning models with interactive multimedia:

Innovative efforts to improve student breaststroke swimming skills. *Physical Education of Students*, 27(3), 118–125.
<https://doi.org/10.15561/20755279.2023.0304>

Masrurroh, L., & Arif, S. (2021). Efektivitas Model Problem Based Learning Melalui Pendekatan Science Education for Sustainability dalam Meningkatkan Kemampuan Kolaborasi. *Jurnal Tadris IPA Indonesia*, 1(2), 179–188.
<https://doi.org/10.21154/jtii.v1i2.171>

Mauri, T., Ginesta, A., & Rochera, M. J. (2016). “The use of feedback systems to improve collaborative text writing: a proposal for the higher education context,.” *Innovations in Education and Teaching International*, 53(16), 411–423.
<https://doi.org/10.1080/14703297.2014.961503>

Muslihudin, A. (2019). Penerapan Model Problem Based Learning Dalam Meningkatkan Kemampuan Berpikir Kritis Siswa Sekolah Dasar [Universitas Pendidikan Indonesia.]. In *Jurnal Elementaria Edukasia* (Vol. 2, Issue 2).
<https://doi.org/10.31949/jee.v2i2.1515>

Musthofa, B. (2016). Implementasi Pendekatan Bermain Dalam Pembelajaran Aktivitas Berlari. *Jurnal Pendidikan Jasmani Dan Olahraga*, 1(1), 48.
<https://doi.org/10.17509/jpjo.v1i1.3663>

Nair, S. S., Smritika, S. ., & Thomas, K. A. (2020). Revitalizing Education through Problem based Learning Practices. *Shanlax International Journal of Education*, 9(1), 109–117. <https://doi.org/10.34293/education.v9i1.3436>

Nasution; Mardiah Kalsum. (2019). Penggunaan Metode Pembelajaran dalam Peningkatan Hasil Belajar Siswa. *Jurnal Ilmiah Bidang Pendidikan*, 1(9), 9–16.

Näykki, P., Isohäätä, J., & Järvelä, S. (2021). “You really brought all your feelings out” – Scaffolding students to identify the socio-emotional and socio-cognitive challenges in collaborative learning. *Learning, Culture and Social Interaction*, 30(April 2). <https://doi.org/10.1016/j.lcsi.2021.100536>

Nurhayati, D. I., Yulianti, D., & Mindyarto, B. N. (2019). Bahan Ajar Berbasis Problem Based Learning pada Materi Gerak Lurus untuk Meningkatkan Kemampuan Komunikasi dan Kolaborasi Siswa. *Unnes Physics Education Journal*, 8(2), 218.
<https://doi.org/10.15294/upej.v8i2.33333>

Omodan, B. I., & Tsotetsi, C. T. (2018). Student-teacher relationships as a panacea for students’ academic performance in Nigeria secondary schools: An attachment perspective. *Journal of Social Studies Education Research*, 9(4), 82–101.
<https://doi.org/10.17499/jsser.19219>

Perdana, R. P., Supriatna, E., Yanti, N., & Suryadi, D. (2023). Team Game Tournament (TGT)-type cooperative learning model: How does it affect the learning outcomes of football shooting? *Edu Sportivo: Indonesian Journal of Physical Education*, 4(1), 86–96. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).12130](https://doi.org/10.25299/es:ijope.2023.vol4(1).12130)

Pillai Nair, S., Shah, T., Seth, S., Pandit, N., & Shah, G. V. (2013). Case based learning: A method for better understanding of biochemistry in medical students. *Journal of Clinical and Diagnostic Research*, 7(8), 1576–1578.
<https://doi.org/10.7860/JCDR/2013/5795.3212>

Pramono, A., Pujiyanto, Puspasari, B. D., & Dhanti, N. S. (2021). Character Thematic Education Game “Ak@R” Of Society Themes For Children With Malang-Indonesian Visualize. *International Journal Of Instruction*, 14(2), 179–196.

<https://doi.org/10.29333/Iji.2021.14211a>

Priyadi, B. (2021). Efektivitas Penerapan Model Problem Based Learning Terhadap Peningkatan Hasil Belajar Bola Voli. *Physical Activity Journal*, 3(1), 41. <https://doi.org/10.20884/1.paju.2021.3.1.4774>

Priyambudi, B., Basaroh, A. S., Safitri, D., & Susilo, H. (2019). Implementasi Model Discovery Learning Menggunakan Lesson Study Untuk Meningkatkan Kemampuan Komunikasi Dan. *In Prosiding Seminar Nasional Dan Workshop Biologi-IPA Dan Pembelajarannya, September*, Vol. 4, 629.

Purohman, P. S. (2018). *Penelitian Tindakan Kelas Kegiatan Penelitian Alternatif untuk Guru*. Prof. Dr. Hamka.

Puspitasari, N. (2018). Peningkatan collaboration skill siswa sebagai kecakapan abad 21 melalui pembelajaran model cooperative learning. *Basic Education*, 38(7), 2767-3780. <https://journal.student.uny.ac.id/index.php/pgsd/article/view/14023>

Rahayu, Y. P. (2020). Menggunakan Metode Sokratis untuk Meningkatkan Pengetahuan NAPZA Mata Pelajaran PJOK. *SOSIOHUMANIORA: Jurnal Ilmiah Ilmu Sosial Dan Humaniora*, 6(1), 19-25. <https://doi.org/10.30738/sosio.v6i1.6388>

Robbins, S., Gilbert, K., Chumney, F., & Green, K. (2019). The Effects of Immersive Simulation on Targeted Collaboration Skills among Undergraduates in Special Education. *Teaching & Learning Inquiry*, 7(2). <https://doi.org/10.20343/teachlearninqu>

Rosnaeni, R. (2021). Karakteristik dan Asesmen Pembelajaran Abad 21. *Jurnal Basicedu*, 5(5), 4334-4339. <https://doi.org/10.31004/basicedu.v5i5.1548>

Safarini, T. L. S. D. (2019). "Developing students' collaboration skills through project-based learning in statistics.". *J. Phys. Conf. Ser*, 1265(1).

Safithri, R., Syaiful, S., & Huda, N. (2021). Pengaruh Penerapan Problem Based Learning (PBL) dan Project Based Learning (PjBL) Terhadap Kemampuan Pemecahan Masalah Berdasarkan Self Efficacy Siswa. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(1), 335-346. <https://doi.org/10.31004/cendekia.v5i1.539>

Saldo, I. J. P., & Walag, A. M. P. (2020). Utilizing Problem-Based and Project-Based Learning in Developing Students' Communication and Collaboration Skills in Physics. *American Journal of Educational Research*, 8(5), 232-237. <https://doi.org/10.12691/education-8-5-1>

Siagian, M. V., Saragih, S., & Sinaga, B. (2019). Development of Learning Materials Oriented on Problem-Based Learning Model to Improve Students' Mathematical Problem Solving Ability and Metacognition Ability. *International Electronic Journal of Mathematics Education*, 14(2), 331-340. <https://doi.org/10.29333/iejme/5717>

Sugihartono, T. (2019). Model Problem Based Learning Meningkatkan Keterampilan Senam Irama Pada Pembelajaran Penjasorkes. *Altius: Jurnal Ilmu Olahraga Dan Kesehatan*, 8(1). <https://doi.org/10.36706/altius.v8i1.8274>

Sukmawati, R. (2021). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar Matematika Kelas II SDN Wonorejo 01. *Glosains: Jurnal Sains Global Indonesia*, 2(2), 49-59. <https://doi.org/10.36418/glosains.v2i2.21>

Suryadi, D. (2022). Peningkatan Kemampuan Shooting Permainan Sepak Bola Melalui Latihan Kekuatan Otot Tungkai. *Jurnal Pendidikan Kesehatan Rekreasi*, 8(2), 237-

246. <https://doi.org/10.5281/zenodo.6684431>

- Suryadi, D., Samodra, Y. T. J., Gustian, U., Yosika, G. F., B, P. S., Dewintha, R., & Saputra, E. (2023). Problem-based learning model: Can it improve learning outcomes for long serve in badminton. *Edu Sportivo: Indonesian Journal of Physical Education*, 4(1), 29–36. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).10987](https://doi.org/10.25299/es:ijope.2023.vol4(1).10987)
- Syafriadi, S., Kusuma, L. S. W., & Yusuf, R. (2021). Integrasi Permainan Tradisional Dalam Metode Pembelajaran Praktik untuk Meningkatkan Minat Belajar PJOK. *Reflection Journal*, 1(1), 14–21. <https://doi.org/10.36312/rj.v1i1.487>
- Tan, C. P., Van der Molen, H. T., & Schmidt, H. G. (2015). To What does the Problem Based Learning Contribute to Students' Professional Identity Development? *Singapore. Elsevier LT*.
- Tracy, G. S., & Xu, Y. (2018). Scaffolded Academic conversations: Access to 21st-Century Collaboration and Communication Skills. *Intervention in School and Clinic*, 54(2), 22–30. <https://doi.org/10.1177/1053451218762478>
- Trimantara, I. K. B. B. (2021). Implementasi Model Pembelajaran TAI Untuk Meningkatkan Hasil Belajar PJOK pada Siswa Kelas V Sekolah Dasar. *Jurnal Ilmu Keolahragaan Undiksha*, 8(1), 16–23. <https://doi.org/10.23887/jiku.v8i1.29620>
- Ulhusna, M., Putri, S. D., & Zakirman, Z. (2020). Permainan Ludo untuk Meningkatkan Keterampilan Kolaborasi Siswa dalam Pembelajaran Matematika. *International Journal of Elementary Education*, 4(2), 130. <https://doi.org/10.23887/ijee.v4i2.23050>
- Wardana, M. K. K., Adi, I. P. P., & Suwiwa, I. G. (2020). Pengaruh Model Pembelajaran Kooperatif Tipe Team Games Tournament (Tgt) Terhadap Hasil Belajar Passing Control Sepakbola. *Jurnal Penjakora*, 7(2), 126. <https://doi.org/10.23887/penjakora.v7i2.26403>
- Wilkerson, B., & Trellevik, L. K. L. (2021). Sustainability-oriented innovation: Improving problem definition through combined design thinking and systems mapping approaches. *Thinking Skills and Creativity*, 42(May), 100932. <https://doi.org/10.1016/j.tsc.2021.100932>
- Zahra, H., Maulana, F., & Nugraheni, W. (2023). Teknik Dasar Senam Lantai: Bagaimana Model Problem Based Learning Dapat Meningkatkan Sikap Lilin dan Kayang Siswa Sekolah Dasar. *Jurnal Educatio FKIP UNMA*, 9(3), 1236–1244. <https://doi.org/10.31949/educatio.v9i3.5395>
- Zhao, W., He, L., Deng, W., Zhu, J., Su, A., & Zhang, Y. (2020). The effectiveness of the combined problem-based learning (PBL) and case-based learning (CBL) teaching method in the clinical practical teaching of thyroid disease. *BMC Medical Education*, 20(1), 1–10. <https://doi.org/10.1186/s12909-020-02306-y>

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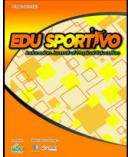
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Model of problem-based learning towards improving 21st century collaborative skills: Studies in physical education

Anonymous

Received XX January 202X; Accepted XX April 202X; Published XX August 202X



ABSTRACT

Collaboration skills are very important for every student to be able to increase knowledge, interact socially, and increase self-confidence and motivation. Low student collaboration skills will have an impact on learning outcomes and the ability to socialize well. The purpose of this study was to improve students' collaboration skills in physical education subjects, especially in the material of designing systematic rhythmic movement activity exercises using the problem-based learning model. This type of research is called classroom action research. The research subjects were students of class XI MIPA 3 SMA Negeri 3 Banjarbaru, totaling 35 students. The research instrument used a collaboration observation sheet. Data analysis used descriptive, quantitative, and qualitative methods. The results showed the value of collaboration skills in cycle I there were 17 students with high interpretation with a percentage of 48%, 8 students with moderate interpretation with a percentage of 23%, and 10 students with low interpretation with a percentage of 29%. While the value of collaboration skills in cycle II students had a high interpretation of 71% percentage, there were 25 students and 10 students with a moderate interpretation of 29% percentage. The results also show the ANOVA test with a significance value of $0.000 < 0.05$, which means that there is a significant difference between the pre-cycle with cycle I and Cycle II. These results provide evidence that the problem-based learning model can improve 21st century collaboration skills in learning physical education rhythmic motion material.

Keywords: Learning Model 1; Problem-Based Learning 2; Collaboration Skills 3

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection



INTRODUCTION

The education system of a country is intended to educate individuals with the ability to think critically and to develop talents and potential in order for them to be useful to society and the state. Education is carried out with all the strength and effort necessary to create and develop the potential of every human being to have self-control, intelligence, individuality, noble character, and skills required as a community and as citizens in general (Zuriatin et al., 2021). Every human being have physical, creative, and artistic potential, which must be developed through school in order for them to function in their life path. (Sugiarta et al., 2019). Education is critical in giving opportunity for kids to develop information, skills, and other values through classroom learning (Niyarcei, 2022).

Learning is an activity in learning that is carried out in two directions, namely by educators and students and by students with their peers (Mashud et al., 2023). Learning is an educational interaction between teachers and students that allows them to actively learn and give positive experiences for pupils (Bancin & Ambarita, 2020; Masdul, 2018),

Comment [A1]: •It is better if the research results in the abstract are not the form of statistical numbers

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Comment [A3]: Everything written in this introduction should be related to physical education!

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the process of providing knowledge to students by teachers as needed (Angga et al., 2022), and teacher assistance to students in the process of acquiring knowledge, forming attitudes, skills, character, and student confidence (Fitrah et al., 2022; Ginja & Chen, 2020; Hidayat & Kosasih, 2019; Suryadi et al., 2023). Educators should be able to make changes during the learning process so that the quality of education is continually improving (Afni et al., 2021; Prayogi, 2020).

Based on the characteristics of each skill and the learning content, 21st century learning employs student-centered models and methodologies (Fitrah et al., 2022). The adoption of learning models, one of which is impacted by student attributes, can be beneficial (Safithri et al., 2021). Therefore, before determining the learning model, first observe the problems, needs, and characteristics of the students. Every student in the twenty-first century must be capable of creative thinking, problem solving, communication, and teamwork (Pramono et al., 2021). The most critical issue in school is a lack of learning process, desire in learning, and learning results, particularly **cooperative** thinking abilities (Nahar et al., 2022).

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Collaboration can be **defined** as a relationship between two or more students who share responsibility, trust, and roles to reach a common understanding of problems and solutions (Alexandra & Barton, 2017; Davis & Bos, 2018). Collaboration is one of the 21st century abilities required for student achievement and job advancement (Tracy & Xu, 2018). Collaboration skills are essential in learning activities because they allow students to share and expand their knowledge in order to attain learning objectives. Students that collaborate will get a lot of knowledge and have a lot of social contact. 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 (Puspitasari, 2018).

Performed research by Ulhusna 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). Observations and talks with sports teachers indicated that pupils continue to struggle with working together (collaborating) in learning. In terms of group-based learning methods used during learning, it can be seen that students are not actively involved in discussions, are not responsible for tasks, do not respect the ideas and opinions of friends, and when submitting results, results are not maximized. Therefore, the right learning method is needed for successful learning (Mashud et al., 2023; Perdana et al., 2023). Finally, it has an effect on the learning outcomes of students who

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fall short of the minimal completeness criterion of 70. Furthermore, learning objectives have not been completely met, and poor cooperation skills have a negative influence on learning outcomes.

Based on the explanation above about the importance of collaboration skills in today's education that is integrated into learning, the efforts that researchers make to overcome these problems are to use problem-based learning models. This study was carried out in a school that had never used a problem-based learning methodology, particularly when it came to designing systematic rhythmic movement activities. Teachers play a significant impact in their students' performance as educators (Ginja & Chen, 2020; Hidayat & Kosasih, 2019; Suryadi et al., 2023). As a result, a teacher is deemed to be successful in educating and applying learning if there is a positive change in student behavior (Bachtiar et al., 2021; Rahayu, 2020). Learning approaches are critical to student progress. (Nasution, 2017), Consequently, the choice of the appropriate approach has a significant impact on the accomplishment of learning goals (Suryadi, 2022). The capacity of teachers to use learning models must be strengthened in order to improve the quality of physical education, sports, and health education (Trimantara, 2021). It makes it easy for teachers to create learning content, create learning multimedia, and create problem-solving activities to increase communication and cooperation skills (Kwangmuang et al., 2021).

METHOD

The classroom action research approach was employed in this study. Using the Kemmis and McTaggart paradigm, specifically Classroom Action research (Purohman, 2018). Classroom action research has four stages: planning, implementation, observation, and reflection (Arikunto, 2017). The population utilized was 35 pupils from class XI MIPA 3 SMA Negeri 3 Banjarbaru in the academic year 2022-2023. Because this is a classroom action research (PTK) study, the complete population (total sampling) of 35 pupils is sampled.

Data collection instruments use non-tests in the form of observations using student collaboration skills sheets. Indicators of cooperation skills instruments link to previous research by Ahwan et al., (2023); Robbins et al., (2019) it was created based on collaborative skills in accordance with the following theory: 1) work together in teams productively; 2) respect the ideas, suggestions, and input of peers; 3) show perspective-taking skills; 4) work according to roles or tasks; and 5) be jointly responsible for the results of the tasks undertaken. The data analysis that researchers used in this study used descriptive quantitative and qualitative methods to analyze assessment data in each cycle, assisted by Microsoft Excel 2019 software and SPSS 26.

RESULTS AND DISCUSSION

This study was carried out at the Banjarbaru Senior High School in the even semester of the 2022-2023 academic year. 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

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•The urgency of research? What is the importance of this manuscript? What the contribution of this research?

Comment [A10]: I don't see your research findings using qualitative analysis

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. Uji Homogenitas

Results Group	Levene Statistic	df1	df2	Sig.
Based on Mean	43,455	2	102	0,000
Based on Median	8,396	2	102	0,000
Based on Median and with adjusted df	8,396	2	61,316	0,001
Based on 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.

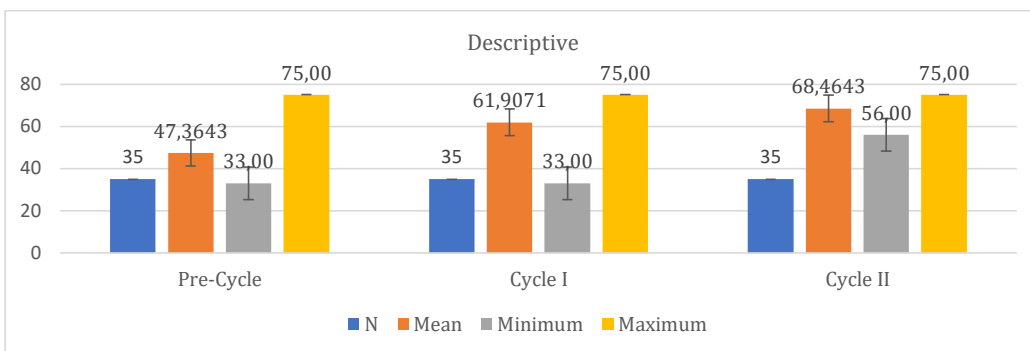


Figure 1. Descriptive Results of Collaboration Skills

The purpose of this research is to determine the impact of the problem-based learning model on students' collaborative abilities in physical education classes. The results demonstrated that using a problem-based learning strategy for two cycles worked effectively, as evidenced by an increase. This increase in collaboration skills was seen between cycle I and cycle II. In addition, the ANOVA test results also showed significant differences between pre-cycle, cycle I, and cycle II. This can be seen from students who value the quality of working relationships, facilitated group work, and opportunities to act and think (Harland, 2002). Then, real-life tasks are included, and students are given enough time to solve problems and develop projects (Saldo & Walag, 2020).

The results of this study are in line with various previous studies, among them Nurhayati et al., (2019) demonstrating that the usage of problem-based learning instructional materials may increase students' communication and teamwork abilities. The findings of this study are relevant, but what distinguishes it from others is the testing of problem-based learning teaching materials with direct application of the learning model and integration into the lesson plan. This is also expressed in previous research that highlights the relevance of integrating useful feedback (Mauri et al., 2016), because it may be utilized to enhance student learning and engagement. Tseng et al., (2008) add to this by stating that the problem-based learning technique shifts the classroom toward interactive learning and shifts teaching practices from the traditional classroom to a much more current and engaging atmosphere.

Previous research has also shown that efforts to apply PBL models in delivering learning in higher education have failed (Jamkar et al., 2007; Khaki et al., 2007; Nair et al., 2013). The application of a combined teaching method between problem-based learning and case-based learning in codectorean student discussions showed that both methods were effective in improving conversations related to public health (Ginzburg et al., 2019). Another research employed problem-based learning and case-based learning strategies to develop students' leadership qualities without requiring curricular practice or learning time (Ginzburg et al., 2018). Furthermore, Hu et al., (2019) integrated flipped classroom with problem-based learning in a dipertiodism course, which resulted in higher performance, but at the expense of a larger effort for students

Research conducted by (Sukmawati, 2021) the problem-based learning strategy was found to increase students' mathematics learning results. The problem-based learning concept has consequences for student performance in learning (Hasanah et al., 2021). Based on the findings of the two studies mentioned above, it is clear that using the problem-based learning paradigm improves student learning outcomes and accomplishment. Furthermore, implementing learning in line with the syntax of the problem-based learning model encourages students to be active participants in their learning. Problem-based learning has been shown to be a teaching method that encourages active learning (Choden & Kijkuakul, 2020), encourages students to think critically, and improves problem-solving skills and knowledge in everyday life (Aydogdu, 2014; Hanifah, 2020). Therefore, students' involvement in teamwork, their ability to express ideas, various ideas, and knowledge, and their willingness to help each other, will increase and indirectly improve students' communication skills (Huang et al., 2010). Problem-based learning gives a realistic picture of the problem and encourages students to take subjective initiative to shift from the paradigm of "what I have learned" to "what I want to learn." (Zhao et al., 2020).

The problem-based learning methodology is feasible and readable, and it may help students develop their communication and teamwork abilities (Nurhayati et al., 2019). In addition, the planned learning activity stage is divided into 3 stages: the introductory, core, and closing stages. This lesson plan is tailored to the issue-based learning model's syntax, which includes 1) alerting students to the problem, 2) arranging students to learn, 3) directing investigations, 4) presenting outcomes, and 5) assessing the problem-solving process (Masrurroh & Arif, 2021; Sukmawati, 2021). Students who employ problem-based learning models build individual and group accountability, interpersonal, small group, and group processing abilities, which are among the five essential characteristics of collaborative learning (Laal & Laal, 2012). The present study's findings are also consistent with past studies in which students make crucial decisions based on group consensus, take on important responsibilities, and collaborate to solve tasks or issues (Safarini, 2019). In addition, the problem-based learning model improves learning and learning motivation by applying more student-centered learning principles (Kolmos, 2009). Other studies have found that using social skills appropriately might have a favorable influence on teamwork (Johnson & Johnson, 2009).

Collaboration abilities are fundamental talents that students must acquire, particularly in order to build knowledge in learning (Tan et al., 2015). Collaboration is a mode of social relations that involves working together so that the planned goals can be realized. Leeuwen et al., (2015) students are challenged to share ideas, express their opinions, and engage in conversations when they collaborate or work in groups to achieve projects. Through collaborative completion of task implementation in groups, they are expected to achieve goals (Nathalia, 2019). Students' collaboration abilities will

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develop an innate awareness and character in the form of cognitive and socio-emotional awareness (Näykki et al., 2021), boost student group work competency (Liu, 2021), and spark the birth of originality and creativity, shaping students' talents in collaborative critical thinking to address challenges encountered in real life (Wilkerson & Trellevik, 2021), as well as academic achievement (Omodan & Tsotetsi, 2018).

The teacher's position as an educator leads to students' active participation and readiness to collaborate during the learning process (Harianto et al., 2023; Lynch et al., 2021). As a result, a teacher is deemed to be successful in educating and applying learning if there is a positive change in student behavior (Bachtiar et al., 2021; Rahayu, 2020). Learning approaches are critical to student progress (Hardinata et al., 2023; Nasution, 2017). As a result, selecting the appropriate approach has a significant impact on the attainment of learning objectives (Suryadi, 2022). The capacity of instructors to use learning models must be strengthened in order to improve the quality of physical education, sports, and health education (Trimantara, 2021). The disadvantage of this problem-based strategy is that it necessitates a significant amount of time for learning exercises (Choden & Kijkuakul, 2020). So that it requires the ability of educators to manage time so that learning activities can run well and smoothly.

CONCLUSION

Based on the findings of the research, I can infer that the problem-based learning paradigm can help students enhance their teamwork abilities. The findings revealed an increase in the average value of collaborative skills in physical education sessions in cycles I and II, particularly in the content of constructing systematic rhythmic movement activity activities. Recommendations for future study include using control classes with different learning models to assess the efficacy of each model. In addition, make a compilation related to various kinds of good models for improving collaboration skills. The more information that can be obtained, the easier it is for field practitioners to overcome learning obstacles.

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CONFLICT OF INTEREST

Not conflicts of interest related to the reported research.

REFERENCES

- Afni, N., Wahid, A., Hastati, S., Jumrah, A. M., & Mursidin, M. (2021). Pengembangan Model Pembelajaran Abad 21 di SD Negeri 126 Borong Kecamatan Herlang Kabupaten Bulukumba. *Madaniya*, 2(2), 137–142. <https://doi.org/10.53696/27214834.66>
- Ahwan, M. T. R., Basuki, S., & Mashud. (2023). Meningkatkan Keterampilan Kolaborasi Siswa melalui Aktivitas Kebugaran Jasmani Menggunakan Model Project Based Learning (PjBL) SMA Negeri 3 Banjarbaru. *Jurnal Pendidikan Kesehatan Rekreasi*, 9 (1), 106–119. <https://doi.org/10.5281/zenodo.7592832>
- Alexandra, D. F., & Barton, S. M. (2017). Collaboration of General and Special Education Teachers: Perspectives and Strategies. *Intervention in School and Clinic*, 2, 1–8. <https://doi.org/10.1177/1053451217693370>
- Angga, A., Abidin, Y., & Iskandar, S. (2022). Penerapan Pendidikan Karakter dengan Model Pembelajaran Berbasis Keterampilan Abad 21. *Jurnal Basicedu*, 6 (1), 1046–1054.

Comment [A15]: •It is important to conclude by emphasizing contribution to the body of knowledge and practice
•Add the limitations of this research!

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<https://doi.org/10.31004/basicedu.v6i1.2084>

- Arikunto, S. (2017). *Prosedur Penelitian Suatu Pendekatan Praktek*. PT Rineka Cipta.
- Aydogdu. (2014). A On Geometry Research Problem Solving Strategies Used By Elementary Mathematics Teacher Candidates. *Journal of Educational and Instructional Studies in The World*, 4(1), ~~ISSN: 2146-7463~~-Vol (No), DOI?
- Bachtiar, B., Putri, A. P., & Maulana, F. (2021). Survei Hasil Belajar Pendidikan Jasmani Olahraga dan Kesehatan Melalui E-Learning Siswa Smk Negeri Kota Sukabumi. *Jendela Olahraga*, 6(1), 17–27. <https://doi.org/10.26877/jo.v6i1.6293>
- Bancin, A., & Ambarita, B. (2020). Education Model Based on Life Skill (a MetaSynthesis). *384(Aisteel)*, 319–324. <https://doi.org/10.2991/aisteel-19.2019.69>
- Choden, T., & Kijkuakul, S. (2020). Blending problem based learning with scientific argumentation to enhance students' understanding of basic genetics. *International Journal of Instruction*, 13(1), 445–462. <https://doi.org/10.29333/iji.2020.13129a>
- Davis, K., & Bos, J. (2018). Playing in the Virtual Sandbox: Students' Collaborative Practices in Minecraft. *International Journal of Game-Based Learning*, 8(3), 56–76. <https://doi.org/10.4018/IJGBL.2018070104>
- Dooley, K., & Sexton-Finck, L. (2017). A focus on collaboration: Fostering Australian screen production students' teamwork skills. *Journal of Teaching and Learning for Graduate Employability*, 8(1), 74–105. <https://doi.org/10.3316/informit.157888556477449>
- Fitrah, A., Yantoro, Y., & Hayati, S. (2022). Strategi Guru dalam Pembelajaran Aktif Melalui Pendekatan Saintifik dalam Mewujudkan Pembelajaran Abad 21. *Jurnal Basicedu*, 6 (2), 2943–2952. <https://doi.org/10.31004/basicedu.v6i2.2511>
- Ginja, T. G., & Chen, X. (2020). Teacher educators' perspectives and experiences towards differentiated instruction. *International Journal of Instruction*, 13(4), 781–798. <https://doi.org/10.29333/iji.2020.13448a>
- Ginzburg, S., Schwartz, J., Deutsch, S., Elkowitz, D., Lucito, R., & Hirsch, J. (2019). Using a problem/case-based learning program to increase first and second year medical Students' discussions of health care cost topics. *Med Educ Curric Dev*, 6, 2382120519891178.
- Ginzburg, S., Susan, D., Jaelyn, B., Elkowitz, D., Stern, J., & Robert, L. (2018). Integration of leadership training into a problem/case-based learning program for firstand second-year medical students. *Adv Med Educ Pract*, 99, 221–226. DOI?
- ~~Hanifah, N. (2020). Penerapan model problem based learning (pbl) untuk meningkatkan kemampuan berpikir kritis siswa di sekolah dasar. Universitas Pendidikan Indonesia.~~
- Hardinata, R., Fakhruddin Fakhruddin, Syarif, A., Ahwan, M. T. R., Abidin, M. Z., Alamsyah, A., Abdulrahman, D., Shukla, M., Malek, N. F. A., & Sa'adah, S. P. (2023). The use of audio-visual media: how does it affect rhythmic movement skills? *Tanjungpura Journal of Coaching Research*, 1(2), 38–47. <https://doi.org/10.26418/tajor.v1i2.66586>
- Hariato, E., Gustian, U., Supriatna, E., Shalaby, M. N., & Taiar, R. (2023). Stimulating game performance skills in students: experimental studies using net games. *Tanjungpura Journal of Coaching Research*, 1(2), 63–70. <https://doi.org/10.26418/tajor.v1i2.65009>
- Harland, T. (2002). "Zoology Students' Experiences of Collaborative Enquiry in Problem-based Learning,". *Teach. High. Educ.*, 7(1), 3–15. DOI?
- Hasanah, U., Sarjono, S., & Hariyadi, A. (2021). Pengaruh Model Problem Based Learning Terhadap Prestasi Belajar IPS SMP Taruna Kedung Adem. *Aksara: Jurnal Ilmu*

Pendidikan Nonformal, 7(1), 43. <https://doi.org/10.37905/aksara.7.1.43-52.2021>

- Hidayat, T., & Kosasih, A. (2019). Analisis peraturan menteri pendidikan dan kebudayaan republik indonesia nomor 22 tahun 2016 tentang standar proses pendidikan dasar dan menengah serta implikasinya dalam pembelajaran pai di sekolah. *Muróbbi: Jurnal Ilmu Pendidikan*, 3(1), 45–69. <https://doi.org/10.52431/murobbi.v3i1.172>
- Hu, X., Zhang, H., Song, Y., Wu, C., Yang, Q., Shi, Z., Zhang, X., & Chen, W. (2019). Implementation of flipped classroom combined with problem-based learning: an approach to promote learning about hyperthyroidism in the endocrinology internship. *BMC Med Educ*, 19(1), 290. DOI?
- Huang, D., Seth, L., Cheri, H., Debora, L. ., Nora, O., & Gwendelyn, R. (2010). *Preparing Students for The 21st Century: Exploring The Effect of Afterschool Participation on Students' Collaboration Skills, Oral Communication Skills, and Self-Efficacy*. Cress Report (CR) of The National Center for Research on Evaluation, Standards, and Student Testing. University of California: Los Angeles, CR 777.
- Jamkar, A., Burdick, W., Morahan, P., Yemul, V., Sarmukadum, & Singh, G. (2007). PRoposed model of case based learning for training undergraduate medical student in surgery. *Indian J Surg*, 69(5), 176–183. DOI?
- Johnson, D. W., & Johnson, R. T. (2009). “An educational psychology success story: Social interdependence theory and cooperative learning.” *Educ. Res*, 38(5), pp 365-379. DOI?
- Khaki, A., Tubbs, R., Zarrintan, S., Khamnei, H., Shoja, M., Sadeghi, H., Ahmadi, M., & M. (2007). The first year medical students' perception of and satisfaction from problem-based learning compared to traditional teaching in gross anatomy: introducing problem-based anatomy into a traditional curriculum in Iran. *Int J Health Sci.*, 1(1), 113. DOI?
- Kolmos, A. (2009). “Problem-Based Learning and Project-Based Learning,” in Skovsmose O., Valero P., Christensen O.R. *University Science and Mathematics Education in Transition*, Springer, pp 261-280. DOI?
- Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. *Heliyon*, 7(6), e07309. <https://doi.org/10.1016/j.heliyon.2021.e07309>
- Laal, M., & Laal, M. (2012). “Collaborative learning: What is it?,” *Procedia - Soc. Behav. Sci*, 31, 491–495.
- Leeuwen, A. van, Janssen, J., Erkens, G., & Brekelmans, M. (2015). Teacher regulation of cognitive activities during student collaboration: Effects of learning analytics. *Computers & Education*, 90, 80–94. <https://doi.org/10.1016/j.compedu.2015.09.006>
- Liu, H. Y. (2021). Effect of interdisciplinary teaching on collaborative interactions among nursing student teams in Taiwan: A quasi-experimental study. *Nurse Education Today*, 106, 105083. <https://doi.org/10.1016/j.nedt.2021.105083>
- Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2021). Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process. *Technological Forecasting and Social Change*, 164(June 2), 119689. <https://doi.org/10.1016/j.techfore.2019.06.015>
- Masdul, M. R. (2018). Komunikasi Pembelajaran. *Iqra: Jurnal Ilmu Kependidikan Dan Keislaman*, 13 (2), 1–9. <https://doi.org/10.56338/iqra.v13i2.259>
- Mashud, Arifin, S., Kristiyandaru, A., Samodra, Y. T. J., Santika, I. G. P. N. A., & Suryadi, D. (2023). Integration of project based learning models with interactive multimedia:

Innovative efforts to improve student breaststroke swimming skills. *Physical Education of Students*, 27(3), 118–125. <https://doi.org/10.15561/20755279.2023.0304>

- Masruroh, L., & Arif, S. (2021). Efektivitas Model Problem Based Learning Melalui Pendekatan Science Education for Sustainability dalam Meningkatkan Kemampuan Kolaborasi. *Jurnal Tadris IPA Indonesia*, 1(2), 179–188. <https://doi.org/10.21154/jtii.v1i2.171>
- Mauri, T., Ginesta, A., & Rochera, M. J. (2016). “The use of feedback systems to improve collaborative text writing: a proposal for the higher education context.” *Innov. Educ. Teach. Int*, 53(16), 411–423.
- Nahar, S., Suhendri, Zailani, & Hardivizon. (2022). Improving Students’ Collaboration Thinking Skill under the Implementation of the Quantum Teaching Model. *International Journal of Instruction*, 15(3), 451–464. <https://doi.org/10.29333/iji.2022.15325a>
- Nair, S., Shah, T., Seth, S., Pandit, N., & Shah, G. (2013). Case based learning: a method for better understanding of biochemistry in medical students. *J Clin Diagn Res Jcdr*, 7(8), 1576–1578.
- Nasution, M. K. (2017). Penggunaan metode pembelajaran dalam peningkatan hasil belajar siswa. *STUDIA DIDAKTIKA: Jurnal Ilmiah Bidang Pendidikan*.
- Nathalia, K. S. (2019). Implementasi Model Discovery Learning Menggunakan Lesson Study untuk Meningkatkan Kemampuan Komunikasi Dan Kolaborasi. In *Prosiding Seminar Nasional Dan Workshop Biologi-IPA Dan Pembelajarannya*, Vol. 4, 629.
- Näykki, P., Isohätälä, J., & Järvelä, S. (2021). “You really brought all your feelings out” – Scaffolding students to identify the socio-emotional and socio-cognitive challenges in collaborative learning. *Learning, Culture and Social Interaction*, 30(April 2). <https://doi.org/10.1016/j.lcsi.2021.100536>
- Niyarci, N. (2022). Perkembangan Pendidikan Abad 21 Berdasarkan Teori Ki Hajar Dewantara. *Pedagogika: Jurnal Ilmu-Ilmu Kependidikan*, 2(1), 47–55. <https://doi.org/10.57251/ped.v2i1.336>
- Nurhayati, D. I., Yulianti, D., & Mindyarto, B. N. (2019). Bahan Ajar Berbasis Problem Based Learning pada Materi Gerak Lurus untuk Meningkatkan Kemampuan Komunikasi dan Kolaborasi Siswa. *Unnes Physics Education Journal*, 8(2), 218. <https://doi.org/10.15294/upej.v8i2.33333>
- Omodan, B. I., & Tsotetsi, C. T. (2018). Student-teacher relationships as a panacea for students’ academic performance in Nigeria secondary schools: An attachment perspective. *Journal of Social Studies Education Research*, 9(4), 82–101. <https://doi.org/10.17499/jsser.19219>
- Perdana, R. P., Supriatna, E., Yanti, N., & Suryadi, D. (2023). Team Game Tournament (TGT)-type cooperative learning model: How does it affect the learning outcomes of football shooting? *Edu Sportivo: Indonesian Journal of Physical Education*, 4(1), 86–96. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).12130](https://doi.org/10.25299/es:ijope.2023.vol4(1).12130)
- Pramono, A., Pujiyanto, Puspasari, B. D., & Dhanti, N. S. (2021). Character Thematic Education Game “Ak@R” Of Society Themes For Children With Malang-Indonesian Visualize. *International Journal Of Instruction*, 14(2), 179–196. <https://doi.org/10.29333/Iji.2021.14211a>
- Prayogi, R. D. (2020). Kecakapan Abad 21: Kompetensi Digital Pendidik Masa Depan. *Manajemen Pendidikan*, 14 (2). <https://doi.org/10.23917/jmp.v14i2.9486>

- Purohman, P. S. (2018). *Penelitian Tindakan Kelas Kegiatan Penelitian Alternatif untuk Guru*. Prof. Dr. Hamka.
- Puspitasari, N. (2018). Peningkatan Collaboration Skill Siswa sebagai Kecakapan Abad 21 Melalui Pembelajaran Model Cooperative Learning Tipe Team Accelerated Instruction (Tai) Mata Pelajaran Ipa Di Sd Negeri Kotagede 1. *JURNAL PENDIDIKAN GURU SEKOLAH DASAR*, 38(7), 2767–3780.
- Rahayu, Y. P. (2020). Menggunakan Metode Sokratis untuk Meningkatkan Pengetahuan NAPZA Mata Pelajaran PJOK. *SOSIOHUMANIORA: Jurnal Ilmiah Ilmu Sosial Dan Humaniora*, 6(1), 19–25. <https://doi.org/10.30738/sosio.v6i1.6388>
- Robbins, S., Gilbert, K., Chumney, F., & Green, K. (2019). The Effects of Immersive Simulation on Targeted Collaboration Skills among Undergraduates in Special Education. *Teaching & Learning Inquiry*, 7(2). <https://doi.org/10.20343/teachlearninqu>
- Safarini, T. L. S. D. (2019). “Developing students’ collaboration skills through project-based learning in statistics.”. *J. Phys. Conf. Ser.*, 1265(1).
- Safithri, R., Syaiful, S., & Huda, N. (2021). Pengaruh Penerapan Problem Based Learning (PBL) dan Project Based Learning (PjBL) Terhadap Kemampuan Pemecahan Masalah Berdasarkan Self Efficacy Siswa. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 5(1), 335-346. <https://doi.org/10.31004/cendekia.v5i1.539>
- Saldo, I. J. P., & Walag, A. M. P. (2020). Utilizing Problem-Based and Project-Based Learning in Developing Students’ Communication and Collaboration Skills in Physics. *American Journal of Educational Research*, 8(5), 232–237. <https://doi.org/10.12691/education-8-5-1>
- Siagian, M. V., Saragih, S., & Sinaga, B. (2019). Development of Learning Materials Oriented on Problem-Based Learning Model to Improve Students’ Mathematical Problem Solving Ability and Metacognition Ability. *International Electronic Journal of Mathematics Education*, 14(2), 331–340. <https://doi.org/10.29333/iejme/5717>
- Sugiarta, I. M., Mardana, I. B. P., Adiarta, A., & Artanayasa, W. (2019). Filsafat Pendidikan Ki Hajar Dewantara (Tokoh Timur). *Jurnal Filsafat Indonesia*, 2(3), 124. <https://doi.org/10.23887/jfi.v2i3.22187>
- Sukmawati, R. (2021). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar Matematika Kelas II SDN Wonorejo 01. *Glosains: Jurnal Sains Global Indonesia*, 2(2), 49–59. <https://doi.org/10.36418/glosains.v2i2.21>
- Suryadi, D. (2022). Peningkatan Kemampuan Shooting Permainan Sepak Bola Melalui Latihan Kekuatan Otot Tungkai. *Jurnal Pendidikan Kesehatan Rekreasi*, 8(2), 237–246. <https://doi.org/10.5281/zenodo.6684431>
- Suryadi, D., Samodra, Y. T. J., Gustian, U., Yosika, G. F., B, P. S., Dewintha, R., & Saputra, E. (2023). Problem-based learning model: Can it improve learning outcomes for long serve in badminton. *Edu Sportivo: Indonesian Journal of Physical Education*, 4(1), 29–36. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).10987](https://doi.org/10.25299/es:ijope.2023.vol4(1).10987)
- Tan, C. P., Van der Molen, H. T., & Schmidt, H. G. (2015). To What does the Problem Based Learning Contribute to Students’ Professional Identity Development? *Singapore. Elsevier LT*.
- Tracy, G. S., & Xu, Y. (2018). Scaffolded Academic conversations: Access to 21st-Century Collaboration and Communication Skills. *Intervention in School and Clinic*, 1(9). <https://doi.org/10.1177/1053451218762478>
- Trimantara, I. K. B. B. (2021). Implementasi Model Pembelajaran TAI Untuk Meningkatkan

Hasil Belajar PJOK pada Siswa Kelas V Sekolah Dasar. *Jurnal Ilmu Keolahragaan Undiksha*, 8(1), 16–23. <https://doi.org/10.23887/jiku.v8i1.29620>

- Tseng, K. H., Chiang, F. K., & Hsu, W. H. (2008). “Interactive processes and learning attitudes in a web-based problem-based learning (PBL) platform,.” *Comput. Human Behav*, 24(3), 940–955.
- Ulhusna, M., Putri, S. D., & Zakirman, Z. (2020). Permainan Ludo untuk Meningkatkan Keterampilan Kolaborasi Siswa dalam Pembelajaran Matematika. *International Journal of Elementary Education*, 4(2), 130. <https://doi.org/10.23887/ijee.v4i2.23050>
- Wilkerson, B., & Trellevik, L. K. L. (2021). Sustainability-oriented innovation: Improving problem definition through combined design thinking and systems mapping approaches. *Thinking Skills and Creativity*, 42(May), 100932. <https://doi.org/10.1016/j.tsc.2021.100932>
- Zhao, W., He, L., Deng, W., Zhu, J., Su, A., & Zhang, Y. (2020). The effectiveness of the combined problem-based learning (PBL) and case-based learning (CBL) teaching method in the clinical practical teaching of thyroid disease. *BMC Medical Education*, 20(1), 1–10. <https://doi.org/10.1186/s12909-020-02306-y>
- Zuriatin, Nurhasanah, & Nurlaila. (2021). Pandangan Dan Perjuangan Ki Hadjar Dewantara Dalam Memajukan Pendidikan Nasional. *Jurnal Pendidikan Ips*, 11(1), 48–56. <https://doi.org/10.37630/jpi.v11i1.442>