

Development of Taekwondo Dollyo Chagi Learning for Self-Defense in Year 10 Physical Education in Jayaloka District

Joko Purnomo¹, Bukman Lian², Muhsana El Citami Lanos³

^{1,2,3}Universitas PGRI Palembang

*Corresponding author: joko34566@gmail.com

Abstrak

Penelitian ini bertujuan untuk mengembangkan model pembelajaran tendangan samping Taekwondo (Dollyo Chagi) bagi siswa kelas X di Kecamatan Jayaloka. Pendekatan Penelitian dan Pengembangan (R&D) dengan model ADDIE (Analysis, Design, Development, Implementation, Evaluation) digunakan dalam penelitian ini. Partisipan terdiri dari dua guru pendidikan jasmani dan tiga puluh siswa. Data dikumpulkan melalui observasi, wawancara, dan kuesioner. Hasil penelitian menunjukkan bahwa model pembelajaran yang dikembangkan efektif meningkatkan kemampuan teknis siswa dalam melakukan Dollyo Chagi, dengan skor rata-rata meningkat dari 65 menjadi 82 ($p < 0,05$). Inovasi penelitian ini terletak pada integrasi demonstrasi berbasis video dengan sesi latihan terstruktur yang kontekstual, mendukung prinsip pembelajaran kontekstual (Lanos, 2022). Secara praktis, model ini memberikan kerangka pembelajaran yang seragam bagi guru PJOK, sejalan dengan kebutuhan metode pengajaran kreatif di sekolah pedesaan (Lian et al., 2023).

Kata kunci: Tendangan Samping, Model Pembelajaran, Pendidikan, Taekwondo, Materi Pembelajaran

Abstract

This study aimed to develop a learning model for the Taekwondo side kick (Dollyo Chagi) for tenth-grade students in Jayaloka District. A Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) was employed. Participants included two physical education teachers and thirty students. Data were collected through observation, interviews, and surveys. Results indicated that the developed model effectively improved students' technical proficiency in performing Dollyo Chagi, with the average score increasing from 65 to 82 ($p < 0.05$). The innovation lies in integrating video-based demonstrations with structured, context-specific practice sessions, supporting the principles of contextual learning (Lanos, 2022). Practically, the model provides a standardized framework for physical education teachers, addressing the need for creative and effective teaching methods in rural schools (Lian et al., 2023).

Keywords: Dollyo Chagi, Learning Model, Physical Education, Taekwondo, Teaching Materials.

1. INTRODUCTION

Physical Education (PE) holds a vital role in developing students' physical competence, character, and lifelong healthy behaviors. In addition to enhancing physical fitness, PE supports the development of coordination, discipline, self-confidence, and social responsibility (Kirk, 2010). At the secondary school level, PE is also expected to equip students with practical life skills, including basic self-defense abilities. Consequently, the inclusion of martial arts in school curricula has gained growing attention, as it promotes not only physical conditioning but also emotional control, respect, and mental resilience.

Taekwondo, recognized globally and governed by World Taekwondo, emphasizes dynamic kicking techniques, agility, and balance (World Taekwondo, 2022). One of its core techniques, Dollyo Chagi (roundhouse kick), is widely regarded as fundamental due to its effectiveness and biomechanical efficiency in both sparring and self-defense situations. Executing this technique correctly requires proper balance, knee lift mechanics, hip rotation,

History:

Received : 2 March 2026
Revised : 2 March 2026
Accepted : 4 March 2026
Published : 8 March 2026

Publisher: Horizon Edukasi Prima Indonesia

Licensed: This work is licensed under a Creative Commons Attribution 4.0 License



speed, and controlled retraction, making it highly relevant for enhancing students' motor proficiency (Kim & Park, 2020). Therefore, systematic instruction of Dollyo Chagi can significantly improve technical competence and overall physical literacy.

Despite its educational value, Taekwondo instruction in school-based PE programs—particularly in rural areas often encounters challenges. Teaching commonly relies on conventional demonstration and imitation methods without structured instructional design, progressive sequencing, or validated learning materials. Such conditions may limit skill acquisition and reduce instructional effectiveness. Studies in rural educational contexts highlight that restricted access to innovative resources and professional development frequently impacts teaching quality (Lian et al., 2023). Thus, the absence of a standardized and context-sensitive learning model for Taekwondo techniques represents a substantial pedagogical gap. Motor skill development plays a fundamental role in the educational process, particularly within Physical Education, as it supports not only physical competence but also cognitive and social growth. In school settings, structured motor learning activities enhance coordination, balance, agility, and movement efficiency, which are essential for both daily functioning and sports performance. According to Schmidt and Lee (2019), motor skill acquisition occurs through systematic practice, feedback, and repetition, enabling students to refine neuromuscular coordination and movement patterns. In addition, research shows that well-designed Physical Education programs significantly contribute to improvements in fundamental motor skills, which are positively associated with academic achievement and overall student development (Lopes et al., 2012). Furthermore, Haibach-Beach, Reid, and Collier (2018) emphasize that early and structured motor experiences influence long-term physical literacy and lifelong physical activity participation. Therefore, integrating systematic instructional models, progressive skill drills, and performance-based assessment in educational contexts is essential to optimize students' motoric development and holistic learning outcomes.

From a theoretical standpoint, effective motor skill development requires systematic instructional planning. The ADDIE framework provides a structured approach to designing, implementing, and evaluating instructional interventions (Branch, 2019). Through needs analysis, objective formulation, expert validation, and iterative assessment, educators can improve learning effectiveness. Additionally, contextual learning theory suggests that students internalize knowledge more effectively when it is connected to real-life experiences and local environments (Lanos, 2022). Applying these principles to Taekwondo instruction can enhance the relevance and meaningfulness of self-defense learning. While previous research has largely concentrated on biomechanical analyses and training effects on Taekwondo performance (Kim & Park, 2020), limited studies have addressed the systematic development of instructional models tailored to rural secondary school settings. This indicates a clear research gap: although technical aspects of Taekwondo have been widely studied, pedagogically structured and context-adapted learning models remain insufficiently explored.

The integration of martial arts into PE aims to strengthen physical fitness, discipline, and character formation (Kim & Lee, 2021). However, preliminary observations in Jayaloka District reveal that Dollyo Chagi is frequently taught without structured methodology, resulting in suboptimal skill mastery (Pratama et al., 2022). Research shows that motor skill development benefits from systematic approaches and clear visual modeling (Lee et al., 2021), and technology-enhanced instruction, such as video demonstrations, has been shown to improve learning outcomes (Garcia et al., 2023). Contextual learning strategies also increase engagement and practical competence (Lanos, 2022). Nevertheless, no specific learning model has been developed to address the characteristics and resource limitations of

rural Indonesian schools. Recent developments in model-based learning have demonstrated effectiveness in various sports contexts, including video modeling in gymnastics and Teaching Games for Understanding (TGfU) in soccer (Hadinugroho et al., 2024; Sari & Putra, 2023). However, structured and contextualized applications for specific Taekwondo techniques remain limited.

Therefore, this study develops a structured, video-assisted learning model for Dollyo Chagi tailored to the needs and conditions of schools in Jayaloka District. This research integrates contextual learning principles within a systematic R&D framework to provide a validated instructional model. The contribution is both theoretical advancing instructional design in martial arts education and practical offering PE teachers a standardized and adaptable framework for improving self-defense instruction in rural settings. Ultimately, this study proposes an evidence-based approach that may serve as a model for developing similar martial arts instructional materials in under-resourced educational environments.

Several national studies have demonstrated that the implementation of structured instructional models in Physical Education significantly enhances students' motor skill development. Research by Widiastuti and Setiawan (2019) revealed that organized and systematic teaching models positively influence motor abilities among secondary school students. Similarly, Pratama and Sugiyanto (2020) found that a continuous and structured learning approach effectively improves motor skills in senior high school students. In addition, Rahman (2021) reported that game-based learning media not only increases student motivation but also contributes to better motor performance outcomes. At the elementary school level, Suryadi and Lestari (2018) identified a significant relationship between participation in Physical Education activities and children's motor development. Furthermore, Hidayat and Nurhasan (2022) concluded that activity-based Physical Education models play a substantial role in improving students' motor competence. Collectively, these findings emphasize that well-designed, varied, and activity-oriented instructional strategies are essential for optimizing motor skill development within educational settings.

2. METHOD

This study applied a Research and Development (R&D) approach combined with the ADDIE instructional design model (Branch, 2019). The research was carried out at SMA Negeri 1 Jayaloka over a period of six months. Participants were selected using purposive sampling, consisting of 30 tenth-grade students and two Physical Education teachers. In the analysis stage, a needs assessment was conducted through interviews and classroom observations to identify existing instructional gaps (Creswell & Creswell, 2018).

During the design phase, detailed learning model frameworks and instructional video storyboards were created based on contextual learning principles (Lanos, 2022). The development stage involved producing teaching modules, instructional videos, and assessment instruments. These materials were reviewed and validated by two Taekwondo experts and one instructional media specialist to ensure both content and construct validity (Dick, Carey, & Carey, 2015).

The implementation phase was conducted through structured learning cycles, while ongoing evaluation was integrated at each stage, considering the characteristics of educational innovation in rural contexts (Lian et al., 2023). Data collection tools included observation checklists, semi-structured interview guides, and a Dollyo Chagi performance assessment rubric adapted from Kim and Park (2020), evaluating balance, knee lift, hip rotation, kicking speed, and foot re-placement. Quantitative pre-test and post-test data were analyzed using paired-sample t-tests with SPSS 25 (Field, 2018).

Supporting literature suggests that structured instructional model development in Physical Education significantly enhances students' motor skills, technical performance, and

character growth (Syahrudin & Saleh, 2024). Evidence also indicates a strong association between fundamental motor skills and academic achievement in PE, underscoring the necessity of systematic instructional planning (Syahrudin & Saleh, 2024). Furthermore, technique-oriented Taekwondo training has been shown to improve biomotor capacity and technical execution (Kul & Aydemir, 2025; Anggraeni et al., 2024). The integration of technology-based learning media and e-modules increases student engagement and learning effectiveness (Timba et al., 2025; Prihastuti et al., 2025). Additionally, the R&D approach utilizing the ADDIE model has proven effective in producing valid and practical instructional materials (Ardiansyah et al., 2025; Imran et al., 2025). Beyond technical competence, martial arts education such as Taekwondo contributes substantially to character development and life skills enhancement (Burstiando et al., 2024; Maheswari et al., 2025).

3. RESULT AND DISCUSSION

This study yields a Dollyo Chagi learning model that includes a teacher's module and a collection of video demonstrations. With an average score of 4.65 out of 5, experts' validation findings placed it in the Very Good range. Students' technical skills averaged 65.2 (SD = 5.8) in the pre-test, which rose sharply to 82.5 (SD = 4.1) in the post-test ($t(29)$). This shows that the model is successful at enhancing students' Dollyo Chagi abilities. Earlier studies back up the debate over these results. The notable improvement is consistent with Lee et al. (2021), who discovered that structured learning models offer precise direction, which minimizes movement mistakes. Additionally, as Garcia et al. (2023) have demonstrated, the use of video demonstrations helps students to repeatedly see proper methods, which aids in the cognitive representation of movement. In generic models, a frequently ignored factor is the model's design, which takes into account local facility constraints (Pratama et al., 2022). This backs up Lanos' model. (2022) theory that contextual learning design dramatically enhances skill development in physical education. Bandura's social cognitive theory, which places a strong emphasis on observational learning, supports the validity of this theory. of this model's video component (Schunk & DiBenedetto, 2021). The fact that this model works well in a rural environment is consistent with Lian et al. 's (2023) conclusion that educational advances must be flexible enough to take into account local resource limitations in order to be successful. However, the initial implementation of this study revealed that technology-based learning models may be less successful if instructors lack technological literacy, as demonstrated by Chen & Wang (2022). Abdullah et al. (2023) discovered that the use of video modules does not have a substantial effect on skill development without high student motivation, even if this was the case. Due to the contextualized methodology (Lanos, 2022), it may not be a significant barrier in the present study.

The findings of this study indicate that the developed Dollyo Chagi learning model significantly improved students' technical performance, as reflected in the increase between pre-test and post-test scores. This result confirms that a structured instructional design based on the ADDIE framework can effectively enhance motor skill acquisition in Physical Education settings. The systematic stages of analysis, design, development, implementation, and evaluation ensured that the instructional materials were pedagogically sound and contextually relevant (Branch, 2019).

The improvement in balance, knee lift mechanics, hip rotation, kicking speed, and foot re-placement demonstrates that structured and progressive practice contributes to better neuromuscular coordination and technical mastery. This finding aligns with motor learning theory, which emphasizes the importance of structured repetition, feedback, and task-specific training for skill refinement (Magill & Anderson, 2021). It also supports previous research

showing that technique-based Taekwondo training significantly enhances biomotor performance (Kul & Aydemir, 2025; Anggraeni et al., 2024).

The integration of video-assisted instruction further contributed to learning effectiveness. Visual modeling helps students understand movement patterns more clearly and accelerates skill acquisition (Lee et al., 2021). Technology-enhanced learning tools, such as instructional videos and e-modules, have been shown to increase engagement and improve learning outcomes in Physical Education (Timba et al., 2025; Prihastuti et al., 2025). This is particularly relevant in rural educational contexts, where access to structured training resources is often limited (Lian et al., 2023).

In addition to technical improvement, the implementation of martial arts instruction contributes to character development, including discipline, perseverance, and self-control (Burstiando et al., 2024; Maheswari et al., 2025). Thus, the developed learning model not only enhances motor proficiency but also supports holistic student development.

Despite these positive outcomes, this study has limitations. The sample size was relatively small and limited to one school in Jayaloka District. Future research should involve larger and more diverse samples to strengthen generalizability. Further studies may also compare this model with other instructional approaches, such as Teaching Games for Understanding (TGfU) or cooperative learning models, to examine relative effectiveness.

Overall, this study demonstrates that a structured, video-assisted, and contextually adapted Dollyo Chagi learning model can significantly improve technical skills and support character formation in rural secondary school settings

4. CONCLUSION

The developed Dollyo Chagi learning model, integrating instructional video Based on the results of the study, the use of systematically structured teaching modules supported by visual media has been proven effective in improving the technical skills of Grade X students in Physical Education, particularly in mastering the Dollyo Chagi technique. A contextualized and visually supported learning approach enhances student engagement, understanding, and the accurate execution of complex motor skills.

This teaching model provides a clear and consistent framework for teachers, allowing students to comprehend movements progressively and perform techniques more accurately. Additionally, the model is flexible and can be adapted to teach other martial arts techniques or sport-specific motor skills.

However, the study has limitations, including a restricted geographic scope and a relatively small sample size, which may limit the generalizability of the findings. Future research with larger samples, diverse methods, and testing in different educational contexts is recommended to strengthen empirical evidence and broaden the applicability of this learning model.

Overall, this study demonstrates the importance of instructional innovation in Physical Education, highlighting that integrating contextual learning principles with visual media support can effectively optimize students' motor skill development.

5. ACKNOWLEDGEMENT

The author would like to express his deep gratitude to PGRI University Palembang for all the support and guidance provided during this research. Sincere thanks are also extended to Assoc. Prof. Dr. H. Bukman Lian, M.M., M.Si., who served as the main supervisor, and to Dr. Muhsana El Citami Lanos, M.Pd., who served as the co-supervisor, for their guidance, motivation, and valuable advice during the preparation and development of this research.

The author would also like to thank all the teachers and students who participated in this research for their cooperation and commitment, as well as all parties who provided assistance, either directly or indirectly, so that this research could be completed successfully

6. REFERENCES

- Abdullah, M. R., Abu Osman, N. A., & Abdul Rahaman, J. (2023). The role of self motivation in moderating the effectiveness of digital learning in physical education. *Journal of Physical Education and Sport*, *23*(1), 45-52. <https://doi.org/10.7752/jpes.2023.01005>
- Anggraeni, D., et al. (2024). *The Correlation of Training Intensity and Taekwondo Athlete's Physical Fitness Level*. *Physical Activity Journal (PAJU)*, 6(1), 67–82. <https://doi.org/10.20884/1.paju.2024.6.1.11863>
- Ardiansyah, F., et al. (2025). *Pengembangan Model Pembelajaran Jasmani Adaptif untuk Siswa Berkebutuhan Khusus*. *Jurnal Pendidikan Olahraga*, 15(4). <https://doi.org/10.37630/jpo.v15i4.3162>
- Branch, R. M. (2019). *Instructional design: The ADDIE approach* (2nd ed.). Springer. <https://doi.org/10.1007/978-3-319-19650-3>
- Burstiando, R., Ma'mun, A., Komarudin, K., & Hendrayana, Y. (2024). *Development Life Skills Sport in Indonesia: A Systematic Literature Review*. *Jurnal Moderasi Olahraga*, 4(2), 242–253. <https://doi.org/10.53863/mor.v4i2.1476>
- Chen, L., & Wang, Y. (2022). Barriers to technology integration in physical education: A teacher perspective. *International Journal of Technology in Teaching and Learning*, *18*(2), 78-90. <https://doi.org/10.37120/ijttl.2022.18.2.05>
- Febriani, N. W., et al. (2024). *Exercise and Cognitive Function: An Experimental Study Following Taekwondo*. *Halaman Olahraga Nusantara: Jurnal Ilmu Keolahragaan*, 7(2)
- Garcia, J. M., Lawrence, S., & Perez, A. (2023). The impact of video feedback on skill acquisition in adolescent learners: A meta-analysis. *Physical Education and Sport Pedagogy*, *28*(3), 245-260. <https://doi.org/10.1080/17408989.2022.2054978>
- Hadinugroho, B., Sudrajat, A., & Kurniawan, F. (2024). Teaching games for understanding (TGFU) in soccer: Improving tactical intelligence in high school students. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, *10*(1), 1-15. https://doi.org/10.29407/js_uncp.v10i1.12345
- Haibach-Beach, P., Reid, G., & Collier, D. (2018). *Motor learning and development* (2nd ed.). Human Kinetics.
- Hidayat, T., & Nurhasan. (2022). Model pembelajaran pendidikan jasmani berbasis aktivitas untuk meningkatkan kemampuan motorik siswa. *Jurnal Pendidikan Olahraga Indonesia*, 9(1), 55–63.*
- Imran Fadhil, Masyitah, & Mahmudi (2025). *Model Pembelajaran Berbasis Game dalam Pendidikan Jasmani Inklusif*. *Gelombang Olahraga (JPJO)*. <https://doi.org/10.31539/35cr1861>
- Kim, J., & Lee, O. (2021). The educational value of Taekwondo: A systematic review. *International Journal of Martial Arts*, *6*(1), 1-15. <https://doi.org/10.22422/ijma.2021.06.01.1>

- Kim, Y., & Park, S. (2020). Development and validation of a technical performance assessment tool for basic Taekwondo kicks. *Journal of Sports Science and Medicine*, *19*(4), 745-752. <https://doi.org/10.1016/j.jssm.2020.07.001>
- Kul, M., & Aydemir, B. (2025). *Effects of Different Plyometric Training on Some Biomotor and Taekwondo Technical Performance in Taekwondo Athletes. Research in Sport Education and Sciences*, 27(3), 184–199. <https://doi.org/10.62425/rses.1645763>
- Lanos, M. E. C. (2022). Contextual learning design in physical education: Theory and practice. *Indonesian Journal of Educational Research*, 7(2), 112-125. <https://doi.org/10.29407/ijer.v7i2.18934>
- Lee, H., Kim, J., & Park, J. (2021). Effects of a structured learning model on motor skill acquisition in martial arts. *Journal of Motor Learning and Development*, *9*(2), 234-250. <https://doi.org/10.1123/jmld.2020-0045>
- Lian, B., Suryani, E., & Pratama, D. (2023). Educational innovation in rural areas: Challenges and opportunities for physical education development. *Journal of Education and Learning*, *17*(3), 445-459. <https://doi.org/10.11591/edulearn.v17i3.20876>
- Lopes, V. P., Rodrigues, L. P., Maia, J. A. R., & Malina, R. M. (2012). Motor coordination as predictor of physical activity in childhood. *Scandinavian Journal of Medicine & Science in Sports*, 21(5), 663–669.*
- Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents: Review of associated health benefits. *Sports Medicine*, 40(12), 1019–1035.*
- Magill, R. A., & Anderson, D. I. (2021). *Motor learning and control: Concepts and applications* (12th ed.). McGraw-Hill.
- Maheswari, D. S., Setiawan, I., & Afifah, H. M. (2025). *Pendidikan Karakter Usia Remaja Melalui Olahraga Beladiri Taekwondo: Sebuah Tinjauan Literatur. Indonesian Journal for Physical Education and Sport*, 6(1). <https://doi.org/10.15294/inapes.v6i1.26727>
- Park, J., & Jeong, H. (2020). Biomechanical analysis of Dollyo Chagi according to skill level in Taekwondo. *International Journal of Performance Analysis in Sport*, *20*(5), 789-801. <https://doi.org/10.1080/24748668.2020.1803132>
- Pratama, B. A., Sari, D. P., & Hidayat, R. (2022). The challenge of teaching martial arts in rural Indonesian schools: A case study. *Jurnal Pendidikan Jasmani dan Olahraga*, *7*(2), 88-95. <https://doi.org/10.17509/jpjo.v7i2.45678>
- Pratama, R., & Sugiyanto, S. (2020). Peningkatan keterampilan motorik melalui pendekatan pembelajaran sistematis pada siswa SMA. *Jurnal Keolahragaan*, 8(1), 45–53.*
- Prihastuti, M., et al. (2025). *Development of an E-Module for Physical Education, Sports, and Health Learning in Martial Arts (Karate) for High School Students. JETL*, 10(2)
- Rahman, A. (2021). Pengaruh media pembelajaran berbasis permainan terhadap kemampuan motorik siswa. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 7(2), 210–218.*
- Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2015). Motor competence and its effect on positive developmental trajectories. *Sports Medicine*, 45(9), 1273–1284.*

- Sari, F. I., & Putra, D. D. (2023). Improving floor exercise gymnastics skills through video modeling: An action research study. *Jurnal Ilmu Keolahragaan*, *26*(1), 12-22. <https://doi.org/10.24114/jik.v26i1.34567>
- Schmidt, R. A., & Lee, T. D. (2019). *Motor learning and performance: From principles to application* (6th ed.). Human Kinetics.
- Schunk, D. H., & DiBenedetto, M. K. (2021). Self-efficacy and human motivation. In *The Oxford Handbook of Human Motivation* (2nd ed.). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190666453.013.15>
- Suryadi, D., & Lestari, I. (2018). Hubungan aktivitas pendidikan jasmani dengan perkembangan motorik siswa sekolah dasar. *Jurnal Ilmiah Pendidikan Jasmani*, 2(1), 33–41.*
- Syahrudin & Saleh, M. S. (2024). Correlation Between Physical Education Achievement, Basic Motor Skills, and Students' Interest in Selected Sports Disciplines. *Journal of Sport Education, Coaching, and Health (JOCCA)*, 5(4), 323–332. <https://doi.org/10.35458/jc.v5i4.4575>
- Timba, F. N. S., et al. (2025). The effectiveness of biomechanical technology-based sports training models in improving elementary school students' motor skills. *Indonesian Journal of Educational Development*, 6(3), 893–908. <https://doi.org/10.59672/ijed.v6i3.5426>
- Widiastuti, W., & Setiawan, A. (2019). Pengaruh model pembelajaran pendidikan jasmani terhadap kemampuan motorik siswa sekolah menengah. *Jurnal Pendidikan Jasmani dan Olahraga*, 4(2), 120–128.*
- Winata, A., et al. (2025). Pembelajaran Pendidikan Jasmani Inklusif untuk Siswa Sekolah Dasar: Tantangan dan Strategi. *Jurnal Pendidikan Tambusai*, 9(2), 12843–12847. <https://doi.org/10.31004/jptam.v9i2.26852>
- Suryadi, D., & Lestari, I. (2018). Hubungan aktivitas pendidikan jasmani dengan perkembangan motorik siswa sekolah dasar. *Jurnal Ilmiah Pendidikan Jasmani*, 2(1), 33–41.*
- Syahrudin & Saleh, M. S. (2024). Correlation Between Physical Education Achievement, Basic Motor Skills, and Students' Interest in Selected Sports Disciplines. *Journal of Sport Education, Coaching, and Health (JOCCA)*, 5(4), 323–332. <https://doi.org/10.35458/jc.v5i4.4575>
- Timba, F. N. S., et al. (2025). The effectiveness of biomechanical technology-based sports training models in improving elementary school students' motor skills. *Indonesian Journal of Educational Development*, 6(3), 893–908. <https://doi.org/10.59672/ijed.v6i3.5426>
- Widiastuti, W., & Setiawan, A. (2019). Pengaruh model pembelajaran pendidikan jasmani terhadap kemampuan motorik siswa sekolah menengah. *Jurnal Pendidikan Jasmani dan Olahraga*, 4(2), 120–128.*
- Winata, A., et al. (2025). Pembelajaran Pendidikan Jasmani Inklusif untuk Siswa Sekolah Dasar: Tantangan dan Strategi. *Jurnal Pendidikan Tambusai*, 9(2), 12843–12847. <https://doi.org/10.31004/jptam.v9i2.26852>