



Integration of Learning Theories and Pedagogical Content Knowledge in Physical Education Instructional Models: Implications for Sport Education Design in Elementary Schools

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Abstract

Physical Education learning in elementary schools requires instructional designs that are not only oriented toward mastering technical skills but also toward creating meaningful learning experiences. However, the practice of Physical Education instruction is still often dominated by technical approaches that inadequately support the development of students' tactical understanding and game performance. This study aims to analyze the conceptual relationship between learning theories and Pedagogical Content Knowledge (PCK) in Physical Education instructional models and their implications for designing Sport Education units in elementary schools. The research employed a Systematic Literature Review (SLR) approach, adhering to the 2020 PRISMA guidelines. Literature searches were conducted through the Scopus database, resulting in 10 articles that met the inclusion criteria for analysis. The review findings indicate that model-based practice approaches, particularly Sport Education and Teaching Games for Understanding (TGfU), support the development of students' tactical understanding, decision-making, game skills, and learning engagement. The research findings also show that the design of Sport Education units supported by authentic assessments such as GPAI enables more contextual learning and more comprehensive evaluation. Thus, the integration of learning theories and PCK serves as a conceptual foundation for developing systematic and student-centered Physical Education learning designs in elementary schools.

Keywords: *GPAI, Pedagogical Content Knowledge, Physical Education, Elementary School, Sport Education*

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INTRODUCTION

Physical Education holds a strategic position in shaping students who are active, healthy, and holistically developed in physical, cognitive, social, and emotional aspects. Within the framework of the Merdeka Curriculum, Physical Education is no longer viewed merely as physical activity, but also as a holistic learning experience designed to help students become individuals capable of leading healthy and active lives through meaningful and enjoyable learning (Setiawan et al., 2022). This orientation demands Physical Education instruction that not only focuses on mastering motor skills but also on developing students' understanding, decision-making, and meaningful participation.

This trend aligns with the direction of global curricula that position physical education as a vehicle for developing 21st-century competencies through authentic learning experiences. The International Primary Curriculum (IPC) framework emphasizes that learning at the elementary school

level needs to be designed in an integrated manner, be student-centered, and emphasize the interconnectedness of knowledge, skills, and understanding across learning contexts. Through thematic and exploratory curriculum design, IPC contributes to the development of critical thinking, creativity, communication, and collaboration (4C) skills (Adzillah et al., 2025). Thus, both the Merdeka Curriculum and IPC now equally emphasize the importance of instructional designs that are contextual, integrative, and oriented towards meaningful student learning experiences.

However, in practice, Physical Education instruction in schools is still often dominated by technical approaches that emphasize practicing skills in isolation from the actual game context. Teachers generally construct structured drill sequences based on direct instruction, assuming that students must master techniques first before engaging in full games (Barba-Martín et al., 2020). Such linear approaches are considered less supportive of developing students' tactical understanding and decision-making abilities in dynamic game situations. Therefore, strengthening more contextual and student-centered learning approaches in elementary school Physical Education is necessary.

In response to these needs, the model-based practice approach is increasingly recommended as an implementation framework in Physical Education instruction. Various models such as Teaching Games for Understanding (TGfU), Sport Education, and Teaching Personal and Social Responsibility (TPSR) are designed to facilitate participatory, contextual learning oriented towards students' tactical understanding. These game-based approaches can significantly enhance the quality of game performance as well as student learning engagement (Usra et al., 2023). Nevertheless, the successful implementation of these models heavily depends on the professional capacity of teachers.

In this context, Pedagogical Content Knowledge (PCK) becomes a key component. PCK represents the integration of content knowledge, pedagogy, and student characteristics that enables teachers to design adaptive and meaningful learning experiences (Namgail & Mahadik, 2021). In the dynamic and movement-based Physical Education instruction at the elementary level, the complexity of PCK becomes increasingly important because teachers must be able to adjust learning tasks, provide appropriate feedback, and manage learning progressions contextually.

Furthermore, strengthening game-based learning also demands an assessment system aligned with the characteristics of students' authentic performance. This aligns with previous research findings (Boini et al., 2023) stating that aspects of authentic assessment are tailored to the skills developed in learning activities, so student abilities can be measured through real learning activities. Traditional assessments focusing on isolated skill tests are considered less able to fully represent playing competence within the game context. Therefore, authentic assessment instruments such as the Game Performance Assessment Instrument (GPAI) are used to evaluate student performance in actual game situations through indicators like decision-making, skill execution, and game support. This is supported by research findings from Susanto (2023) showing that GPAI test results yielded scores on decision-making, skill execution, and support components in middle school students' soccer games. This evidence demonstrates that GPAI can measure decision-making and skill execution components

directly within the actual game context, thus representing playing competence more comprehensively. Although studies on Physical Education learning models, teacher PCK, and authentic assessment have developed, literature reviews indicate that research systematically integrating these three components within a single conceptual mapping framework is still limited. Some studies focus on the effectiveness of specific instructional models, while other studies examine PCK separately without linking it to instructional model selection. Additionally, comprehensive synthesis connecting the integration of learning theories and PCK with the design of Sport Education units at the elementary level, particularly for game materials like mini-volleyball, remains rare.

Based on this gap, a systematic literature review is needed to map the relationships between learning theories, Pedagogical Content Knowledge (PCK), and Physical Education instructional models as a foundation for developing constructive instructional designs aligned with modern curriculum demands. Therefore, this study aims to analyze the conceptual relationship between learning theories and PCK in Physical Education instructional models and examine their implications for designing Sport Education units in mini-volleyball material at the elementary level through a Systematic Literature Review (SLR) approach.

METHOD

This research uses a Systematic Literature Review (SLR) approach to identify, review, and synthesize research findings related to the integration of learning theories and PCK in Physical Education instructional models and their implications for Sport Education design in elementary schools.

The review process was structured according to the 2020 PRISMA guidelines as the main reference to ensure transparency in the stages of identification, screening, eligibility, and inclusion of articles (Page et al., 2021). To clarify the focus of the research questions and strengthen the literature selection strategy, this study also applied the PICO framework (Eriksen & Frandsen, 2018). The operational definition of each PICO component is presented in Table 1, as follows:

Table 1. PICO

PICO	Keterangan
Population	Elementary school students and Physical Education teachers
Intervention	Physical Education instructional models based on model-based practice such as Teaching Games for Understanding (TGfU) and Sport Education, connected to the application of Pedagogical Content Knowledge (PCK).
Comparasion	Traditional technical teaching approaches or Physical Education instruction that does not explicitly use the model-based practice framework
Outcome	Improvement in the quality of Physical Education learning including tactical understanding, decision-making, learning engagement, quality of PCK implementation, and implications for Sport Education unit design

Based on this PICO framework, the next step was to develop a systematic literature search strategy. Article searches were conducted using combinations of keywords relevant to each PICO component and operated with Boolean operators (AND, OR) to increase the sensitivity and specificity of search results, as follows: ("sport education model" OR "TGfU" AND "physical education" AND elementary). Literature searches were conducted through a reputable scientific database, Scopus, with a publication range of the last ten years. All articles obtained were then managed systematically before entering the screening stage according to the 2020 PRISMA guidelines. Subsequently, articles identified through the search process were extracted and selected systematically based on the established inclusion and exclusion criteria, as presented in Table 2, as follows:

Table 2. Inclusion and Exclusion Criteria

Aspect	Inclusion Criteria	Exclusion Criteria
Publication Type	Empirical research articles or conceptual studies published in reputable scientific journals.	Conference proceedings, theses, dissertations, books, or non-scientific articles.
Year Range	Published within the last 10 years (2016-2026).	Published before 2016.
Language	Articles in English or Indonesian.	Articles in languages other than English or Indonesian.
Subject/Population	Elementary school students and/or Physical Education teachers.	Subjects other than the elementary school level
Focus of Study	Discusses Physical Education instructional models based on model-based practice (e.g., TGfU and Sport Education) related to Pedagogical Content Knowledge (PCK).	Does not discuss Physical Education learning models or is not related to PCK
Reported Outcome	Reports impact on tactical understanding, decision-making, learning engagement, PCK implementation, or instructional design.	Does not report outcomes relevant to the quality of Physical Education learning

RESULTS AND DISCUSSION

Result

Based on the literature search results through the Scopus database, 104 articles relevant to the research keywords were obtained. These articles were then gradually selected according to the established inclusion and exclusion criteria. The selection stage was carried out by reviewing titles and abstracts, then continued with full-text examination to ensure the articles' alignment with the research objectives. The final results of the selection process showed that 10 articles met the eligibility criteria and were used as data sources in this study. The selected articles were then analyzed in more depth to obtain a comprehensive picture according to the research focus. Details of the article identification and selection process up to the final stage are presented in the PRISMA flow diagram according to the systematic review reporting guidelines proposed by (Page et al., 2021).

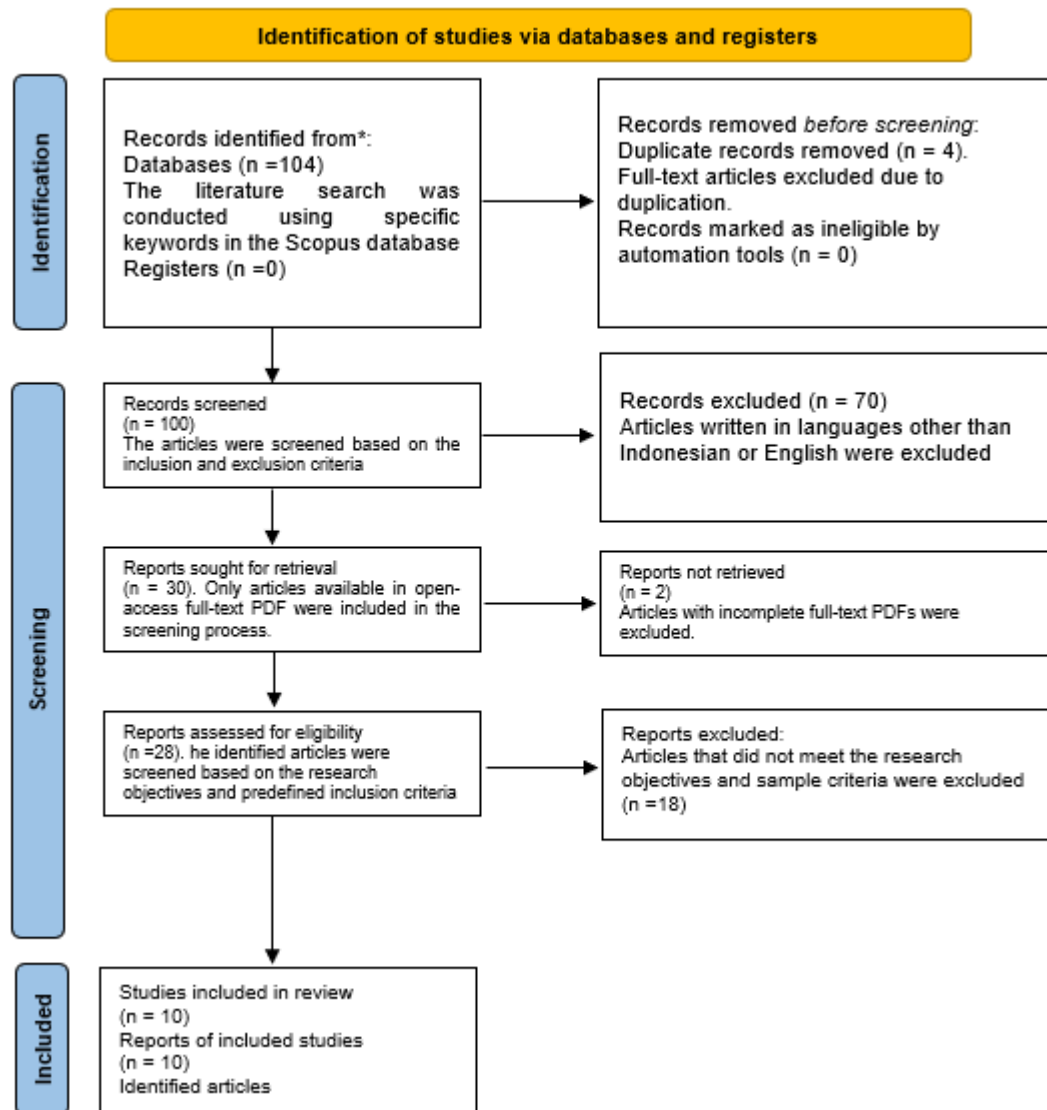


Figure 1. PRISMA Flow Diagram

Based on the results of the selection and screening process through stages referring to the previously established inclusion and exclusion methods, it was concluded that 10 articles met the criteria according to the provisions. In this review, descriptions of the 10 articles obtained are outlined in Table 3.

Table 3. Instructional Model

Model	Author & Year	Study Category	Main Characteristics	Findings	Strengths	Limitations	Implications for Elementary
<i>Sport Education</i>	Liao <i>et al.</i> , (2023)	Quantitative study with intervention approach.	1. Use of repetitive technique 2. Varied student grouping	The sports education model encourages interaction and	Improves students' technical skills and cooperation, and provides a clear	The limitations of this study include not using a randomized	Implications for elementary school are the application of the sports

			3.	Assessment based on technical success..	cooperation among students, helping them monitor team interactions, design strategies, and strengthen decision-making during matches. Thus, interaction can create a positive learning environment and enhance group participation and communication.	structure in the learning process.	multifactor experimental design.	education model can improve health, social skills, and interaction among students from an early age. This model also encourages active participation, collaboration, and the development of positive relationships and sustainable healthy living habits.
<i>Sport Education</i>	Arenas <i>et al.</i> , (2024)	Case study, quantitative approach, and cross-sectional study	1.	Has six features: season, affiliation, formal competition, record keeping, festivity, and culminating event.	Increases interest and enthusiasm in physical education learning.	Supports the holistic development of students (physical, affective, cognitive) and creates a conducive learning environment.	Requires a large planning workload for teachers and faces facility and school schedule constraints.	Need to integrate the model into the Healthy School Project and ongoing teacher training support.
			2.	There are four invariant aspects: student roles, expanded units, persistent teams, and content development through small-sided games				
TGFU	Arias-Estero <i>et al.</i> , (2020)	Mixed-methods approach combining quantitative data (Friedman and Wilcoxon Z tests) and qualitative data (semi-structured	1.	Floorball intervention	No significant difference	Improves decision-making, technical execution, and perceived student competence.	No control group, small sample (n=40), low statistical power (38%), and risk of boredom with longer duration.	Short units (8 lessons) efficient for school schedules; focus on quality of pedagogy more important than adding practice hours.
			2.	Comparing durations of 8 vs 14 lessons with 3 main pedagogical strategies	between 8 and 14 lessons ($p > 0.05$), but both increased significantly from baseline			

		interviews and focus groups).		scores (p < 0.05).				
TGFU	Greve <i>et al.</i> , (2022)	Qualitative exploratory study	Game-based sports teaching approach focusing on developing tactical understanding and active student reflection using digital media (videocatch app) for soccer learning in elementary school.	Digital media became a tool for reflection, but students valued direct play more highly; video was also used as an assistant referee tool; students were motivated to apply discussed tactics.	Combines game pedagogy and digital media, supports cooperative, reflective, and contextual learning; student responses ambivalent but highly reflective.	Limited sample to four 4th-grade classes; baseline data still developing; potential gender imbalance and student sports experience; risk of excessive media use.	Requires inclusive and adaptive instructional design; digital media should not replace physical activity; video reflection and discussion strengthen tactical understanding in elementary PE.	
Sport Education Model	Dese & Wibowo, (2025)	Quasi-experimental (static group comparison design) with pre-test and post-test in experimental and control groups	1. Focus on ages 8-9 years 2. Integration of SEM with sport management approach 3. Measures 3 domains (motivation, physical activity, motor skills) 4. Structured 8-week intervention approach	SEM group showed significant improvement compared to control group in motivation, physical activity, and motor skills	1. Fills research gap of SEM at elementary level (ages 8-9) 2. Integrates sport management aspects explicitly (team role, scheduling, tournament) 3. Measures three variables simultaneously (motivation, physical activity, motor skill)	1. Quasi design without randomization, threat of selection bias 2. Only one school for confounding variables (initial fitness level, social background, prior sports experience) 3. No control for confounding variables	1. SEM feasible to apply in elementary to increase active participation and intrinsic motivation. 2. Season structure, persistent teams, and mini-tournaments relevant for characteristics of ages 8-9. 3. Implementation must be accompanied by strong classroom management planning so it does not turn into mere competition	

Sport Education Model	Evangelino <i>et al.</i> , (2018)	Mixed method	1.	Specific focus on elementary context	SEM implementation in elementary	1.	Describes contextual and applicable SEM implementation	1.	Does not use strong experimental design	SEM can be applied in elementary to increase student engagement and responsibility in PE learning.
			2.	Emphasis on pedagogical aspects, not just quantitative results	shows increased student engagement, responsibility, teamwork, and active participation in PE learning.	2.	Emphasizes social and affective dimensions of learning	2.	Does not evaluate long-term impact	Teachers need to understand season structure, role distribution, and pedagogical management of competition so it doesn't become just ordinary matches.
			3.	Analysis of student learning experiences	This model creates a more meaningful learning atmosphere and encourages ownership of the sports learning process.	3.	Relevant for PE teacher practice			Implementation must be adapted to the developmental stage of elementary students.
			4.	Strengthening student-centered learning philosophy						
Sport Education Model	Nur <i>et al.</i> , (2025)	Quantitative research with one-group pretest-posttest design	1.	Integration of SEM with traditional games based on local wisdom as a means of character strengthening	There was a significant increase in independent attitude and cooperative attitude	1.	Integration of SEM with local cultural context	1.	No control group	SEM based on traditional games can be an alternative PE learning strategy to strengthen independent character and cooperation in elementary students.
			2.	Main focus on forming social attitudes through contextual cultural PE learning		2.	Implementation in 3 cities	2.	Measurement based on self-report	Teachers need to design structured learning seasons while maintaining pedagogical essence, not just game activities.
								3.	No measurement of long-term impact	Implementation needs further study with stronger experimental design before being used as broad policy reference.
TGfU	Aryanti <i>et al.</i> , (2022)	Research and	1.	Aims to produce a TGfU-based	TGfU-based volleyball overhead	1.	Novelty in overhead pass volleyball	1.	Research stage not	This research produces a validated

Development (R&D)	volleyball overhead pass learning model product	pass learning model declared feasible and valid for use in field trials.	learning model Uses famous Borg & Gall R&D methodology which is rigorous and systematic Validation from different experts	yet complete Limited subjects No small group trials involving teachers and students	TGfU learning model for volleyball overhead pass in elementary school. This model offers a fun and student-centered approach, and can be a practical guide for teachers in creating more varied and effective learning
2. Subjects of trial 3 experts (physical education learning expert, volleyball game expert, motor learning expert)	3. Research only carried out 3 initial steps	1. Physical education learning expert: Feasibility indicator 77.08% (feasible), validity indicator 81.25% (very valid)	3. Validation from different experts	3. No small group trials involving teachers and students	
4. Uses questionnaire with scale 1-4 to assess feasibility, validity, ease, safety, and improvement	2. Volleyball expert: Suitability indicator 81.25% (very suitable), ease indicator 83.33% (very easy)	3. Motor learning expert: Safety indicator 83.33% (very safe), skill improvement indicator 79.17% (improves)			

Discussion

Desain Unit

The literature synthesis results in Table 3 show that the ten selected articles, having gone through a systematic selection process, indicate that model-based practice learning models, particularly Sport Education and Teaching Games for Understanding (TGfU), effectively improve the quality of Physical Education learning in elementary schools. The Sport Education model enhances student

engagement, teamwork, role responsibility, and motivation, while TGFU improves tactical understanding, decision-making, and skill execution in real game situations.

These findings form the basis for developing an eight-session mini-volleyball learning unit based on Sport Education, covering orientation, skill development, tactical learning, competition, semifinals, and a final festival. The learning design integrates a constructivist approach and Pedagogical Content Knowledge (PCK) through contextual games, allowing students to develop technical skills alongside tactical abilities gradually. In general, the research results indicate that Sport Education can increase participation, team responsibility, and meaningful learning experiences, although generalizing findings still needs to be done cautiously.

Assessment Design

Based on the literature review results in Table 3, assessment in game-based Physical Education learning is generally directed towards authentic assessment that represents student performance in real game situations. Most studies use indicators of decision-making, skill execution, game participation, and teamwork as the basis for assessment, thus evaluating playing competence comprehensively and no longer focusing solely on measuring isolated techniques. In this learning unit, the Game Performance Assessment Instrument (GPAI) is used, covering skill execution, decision-making, and support components to represent student playing performance in mini-volleyball games. Assessment is conducted during the game, reflecting students' actual ability to apply game skills and strategies.

The use of authentic assessment aligns with the principle of constructive alignment between learning objectives, learning activities, and assessment of learning outcomes, and is consistent with the concept of Pedagogical Content Knowledge in selecting appropriate assessment instruments. This finding aligns with previous research showing that GPAI can provide a more comprehensive picture of playing ability compared to traditional skill tests, although its application still faces challenges such as limited learning time and teacher readiness in using assessment instruments. The GPAI-based assessment rubric covering skill execution, decision-making, and support is used in authentic assessment as presented in Table 4.

Tabel 4. Desain Asesmen

Assessment Aspect	Indicator	Score (1-4)
Decision Making	Ball placement	
	Pass when pressured	
	Smash timing selection	
Skill Execution	Underhand serve	
	Underhand & overhand pass	
	Simple smash	
Support	Creating open space	
	Moving without the ball	
	Giving teammates opportunities	
Total		

CONCLUSION

Based on the results of the systematic literature review, it can be concluded that there is a clear conceptual relationship between learning theories and Pedagogical Content Knowledge (PCK) in the development of Physical Education instructional models in elementary schools. The integration of these two components forms the basis for designing model-based practice learning, particularly through the Sport Education model, which enables the creation of more contextual and student-centered learning experiences. The findings of this review indicate that the design of Physical Education learning units based on Sport Education can be developed systematically through a sustainable learning season structure and supported by the use of authentic assessment aligned with the characteristics of game activities. Thus, the integration of learning theories, PCK, instructional models, and authentic assessment forms a conceptual framework that can be used as a foundation for designing more meaningful and systematic elementary school Physical Education learning units.

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