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Physical Literacy in Elementary School Physical Education: A Systematic Review of Teaching Models and Student Development

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ABSTRACT

Purpose of the study: Physical literacy (PL) has been positioned internationally as a foundational goal of quality physical education (PE), yet its translation into concrete pedagogical models for elementary school settings remains fragmented across national curricula and research traditions. This systematic review aimed to synthesise evidence on (a) the dominant teaching models used to cultivate PL in elementary school PE, (b) their documented effects on students' physical, cognitive, affective, and social development, (c) how PL is conceptualised and assessed, and (d) the barriers, enablers, and methodological gaps that shape the field.

Materials and methods: Following the PRISMA 2020 framework, a systematic search was conducted in Scopus, Web of Science, and PubMed for peer-reviewed studies published between January 2015 and July 2026. Boolean strings combined terms for physical literacy, teaching/pedagogical models, and elementary/primary school physical education. After de-duplication and two-stage screening (title/abstract and full text) against pre-specified eligibility criteria, 46 studies were retained for narrative and thematic synthesis; methodological quality was appraised using design-appropriate checklists (Mixed Methods Appraisal Tool for empirical studies and AMSTAR-2 for reviews).

Results: Included studies originated predominantly from Canada, Indonesia, Spain, the United States, Slovakia, South Korea, and Australia, using quasi-experimental, mixed-methods, qualitative, and instrument-development designs. Five clusters of teaching models emerged: (1) physical-literacy-enriched pedagogy grounded in Whitehead's holistic framework, (2) game-centred approaches (Teaching Games for Understanding and Sport Education, alone or combined), (3) movement-integrated/cross-curricular instruction, (4) game- and play-based models rooted in local or traditional games, and (5) collaborative/team-teaching configurations involving generalist and specialist teachers. Across models, physical competence and motor skill outcomes were the most consistently improved, whereas cognitive and social-affective domains were addressed less systematically and yielded more heterogeneous effects. PL assessment remained fragmented, dominated by physical-domain instruments, with limited validated tools for the cognitive and affective domains in children under 12 years. Key barriers included limited teacher training, ambiguous curricular operationalisation, assessment burden, and short intervention durations; enablers included professional development, co-teaching, autonomy-supportive and play-based pedagogy, and administrative support.

Conclusions: The evidence base supports physical-literacy-oriented pedagogy as a promising, holistic reform in elementary PE, but the field is constrained by conceptual heterogeneity, short-term quasi-experimental designs, and uneven attention to non-physical developmental domains. Sustained, theory-driven, and cross-culturally validated research is needed to consolidate PL as an evidence-based pedagogical standard in global primary education.

Keywords
physical literacy; elementary physical education; teaching models; motor competence; child development.

INTRODUCTION

Global Context

Physical inactivity among children and adolescents constitutes one of the most persistent public health challenges of the twenty-first century(Neil-Sztramko et al., 2021). Pooled global surveillance data indicate that approximately 81% of school-going adolescents aged 11–17 years do not meet the World Health Organization's (WHO) recommended level of physical activity, with negligible improvement recorded between 2001 and 2016 (Guthold et al., 2019). The WHO's 2020 guidelines on physical activity and sedentary behaviour reaffirm that at least 60 minutes of daily moderate-to-vigorous physical activity is required to secure cardiometabolic, musculoskeletal, cognitive, and mental-health benefits for children aged 5–17 years, yet adherence remains low

across income groups and regions (Chaput et al., 2020; Zhao et al., 2024, p. 1351972). Within this context, elementary school physical education (PE) has been reasserted internationally as a strategic, universally accessible setting in which foundational movement competence, motivation, and lifelong engagement with physical activity can be cultivated before inactivity patterns become entrenched (Aubert et al., 2021; Moon et al., 2024, p. 827). The concept of physical literacy (PL) has emerged as the organising construct for this agenda, shifting PE discourse away from narrow, performance-based outcomes toward a holistic, lifelong disposition toward movement (Pajkić et al., 2023, p. 545; Valle-Muñoz et al., 2025). International bodies such as UNESCO, Sport England, and national curriculum authorities in Canada, Australia, and the United Kingdom have since embedded PL terminology into policy and curriculum documents, signalling a global — though unevenly implemented — pedagogical turn (Houser & Kriellaars, 2023; Lloyd et al., 2024, p. 1346803).

Conceptual Background

Physical literacy was philosophically articulated by Tang et al. (2023, p. 1267) as the motivation, confidence, physical competence, knowledge, and understanding that individuals develop to value and take responsibility for engagement in physical activity across the lifecourse. Although the term is often attributed to early twenty-first-century scholarship, historical analyses trace its conceptual lineage to late nineteenth- and early twentieth-century physical education discourse concerned with sustaining active lifestyles (Cairney et al., 2019; Sallis et al., 2020, p. 120). Contemporary elaborations converge on a multidimensional structure comprising physical, psychological (affective/motivational), cognitive, and social domains Martins et al. (2020), operationalised in frameworks such as the Australian Physical Literacy Framework and the Canadian Assessment of Physical Literacy. Pedagogically, PL has been translated into a distinct instructional orientation — physical-literacy-enriched pedagogy — characterised by student autonomy, individualised and inclusive task design, holistic feedback, and continuous formative assessment, in contrast to the historically dominant, behaviourist, skill-drill model of PE delivery (Houser & Kriellaars, 2023; Valle-Muñoz et al., 2025). This evolution mirrors a broader shift in sport pedagogy toward constructivist and student-centred models, including Teaching Games for Understanding (TGfU), the Sport Education Model (SEM), and cooperative learning, each of which shares PL's emphasis on understanding, motivation, and transferable competence rather than isolated technique reproduction (Barba-Martí-n et al., 2020; Martínez-Santos et al., 2020)

Critical Examination of Existing Literature

A growing body of empirical work has evaluated PL-oriented and related student-centred teaching models in elementary PE, but findings are inconsistent in direction, magnitude, and domain coverage (Carl et al., 2022, p. 2967; Ennis, 2014, p. 67). Quasi-experimental interventions such as PLitPE in Saskatchewan reported significant gains in motor competence and movement vocabulary alongside a narrowing of sex differences, yet found no significant change in the behavioural (participation) domain of PL, suggesting that psychomotor gains do not automatically translate into sustained activity behaviour (Stoddart et al., 2021; Tang et al., 2023, p. 1271). Conversely, a recent cluster-randomised trial of team-teaching configurations in Slovak primary schools found no significant between-model differences in self-reported PL, and one configuration (generalist teacher plus classroom-based delivery) was associated with a significant decline in self-perceived PL despite objective motor-skill gains — a paradox indicating that physical competence and psychological PL do not co-vary in a straightforward manner (Li et al., 2020, p. 208; Luptáková et al., 2025; Warner et al., 2020, p. 176). Systematic reviews of TGfU report that most interventions are short-term (often under eight weeks), concentrate on tactical/cognitive outcomes in games and sports content while neglecting fundamental motor skills, physical fitness, and body-expression content, and inconsistently apply methodological rigour when claiming fidelity to the model (Barba-Martí-n et al., 2020; Morales-Belando et al., 2021, p. 689). Reviews of PL interventions more broadly reveal that only about one-quarter demonstrate a genuine theory-practice link across all PL domains, and that physical competence is targeted in over 80% of interventions while motivation/confidence and knowledge/understanding are addressed in fewer than 60% (Carl et al., 2021, 2022, p. 2993). Qualitative syntheses similarly show an asymmetric emphasis on the psychological domain (motivation, confidence, engagement) relative to the social and physical domains, and highlight that teacher capacity is a recurring determinant of implementation fidelity (Vieira et al., 2025).(Waller et al., 2017, p. 142). At the assessment level, a systematic review of PL instruments found that most validated tools are survey-based and skew toward the physical domain, with a persistent shortage of instruments validated for children under 12 years or for populations with disability, undermining cross-study comparability (Barnett et al., 2023, p. 1905; Knisel et al., 2024, p. 2). Collectively, these findings expose three recurring weaknesses: (a) contradictory findings regarding whether physical, psychological, and behavioural PL domains change in tandem; (b) methodological weaknesses, including small samples, short intervention windows, non-standardised outcome measures, and inconsistent operational fidelity to named pedagogical models; and (c) underexplored areas, particularly the cognitive and social domains of PL, teacher-level determinants of implementation, and PL development among under-represented populations such as children with disabilities or chronic conditions.

Research Gap

Despite the proliferation of individual studies and topic-specific reviews (e.g., on TGfU alone, on PL assessment instruments alone, or on PL interventions across all age groups), no systematic review to date has specifically synthesised teaching models used in elementary school PE — spanning PL-enriched pedagogy, game-centred models, movement-integrated instruction, and team-teaching configurations — against the full multidimensional structure of physical literacy (physical, cognitive, affective, and social development) within a single PRISMA-based framework restricted to the primary/elementary phase. Existing reviews are limited in at least one of three ways: they aggregate across childhood and adolescence without isolating elementary-specific pedagogical evidence (Carl et al., 2021; Silverman et al., 2024); they focus narrowly on a single model (e.g., TGfU only; Barba-Martí-n et al. (2020) without comparing it against competing or complementary models; or they concentrate on assessment instruments rather than instructional practice (Barnett et al., 2023; Dahl-Leonard et al., 2024, p. 1512). Moreover, comparative evidence on which teaching models most effectively promote each PL domain — rather than motor competence alone — has not

been systematically mapped, nor have the implementation barriers and enabling conditions reported across culturally diverse contexts (e.g., Canada, Indonesia, Slovakia, South Korea) been synthesised comparatively. This omission is consequential because policymakers and teacher-educators require model-specific, domain-specific evidence to inform curricular reform, yet current guidance remains largely conceptual Valle-Muñoz et al. (2025) or fragmented across disparate disciplinary literatures.

Rationale

Given the WHO's explicit call to scale up effective, evidence-based physical activity promotion strategies for children Chaput et al. (2020); Guthold et al. (2019) and given that elementary PE is the most consistent point of contact between health-promotion policy and the child population, a systematic and critical consolidation of teaching-model evidence is both timely and necessary. Such a synthesis can clarify which pedagogical approaches are supported by convergent, multi-domain evidence, expose where the evidence base is thin or contradictory, and provide a methodologically transparent foundation — anchored in PRISMA 2020 reporting standards Page et al. (2021) — for future experimental and cross-cultural research.

Research Objectives

This systematic review aims to critically synthesise, appraise, and integrate empirical and conceptual evidence on teaching models for physical literacy in elementary school physical education. Specifically, the review seeks to (1) identify and classify the dominant teaching models used to promote physical literacy in elementary PE; (2) evaluate the evidence regarding their effects on students' physical, cognitive, affective, and social development; (3) examine how physical literacy is conceptualised and assessed across the included studies; (4) determine the barriers and enabling factors that influence successful implementation; and (5) delineate methodological limitations and knowledge gaps to establish priorities for future research.

MATERIALS AND METHODS

This study was conducted as a systematic literature review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021), which provides an internationally recognised, transparent framework for identifying, screening, appraising, and synthesising evidence relevant to the review questions.

Databases

Three major, internationally indexed databases were searched to maximise disciplinary and geographic coverage: Scopus, Web of Science (Core Collection), and PubMed. These databases were selected because they jointly index the leading journals in sport pedagogy, sport science, public health, and education, and are the standard sources required for SSCI/Scopus-indexed systematic reviews in this field.

Search Strategy

Search strings were constructed using Boolean operators (AND/OR) combining three concept blocks: (a) physical literacy terms ("physical literacy", "movement literacy", "physical literacy development"); (b) pedagogical/model terms ("teaching model*", "pedagog*", "instructional model*", "Teaching Games for Understanding", "Sport Education Model", "cooperative learning"); and (c) setting/population terms ("elementary school*", "primary school*", "primary education", "children"). Each database-specific string is presented in Table 1. Searches were limited to English-language, peer-reviewed journal articles and reviews published between January 2015 and July 2026, and were last executed on the dates indicated below.

Table 1. Database-specific search strings and retrieval dates.

Database	Search String (applied to Title/Abstract/Keywords)	Date of Search	Records Retrieved
Scopus	("physical literacy") AND ("physical education" OR "PE curriculum") AND ("elementary school" OR "primary school" OR "primary education") AND ("teaching model*" OR "pedagog*" OR "instructional model*")	12 July 2026	612
Web of Science (Core Collection)	TS=("physical literacy") AND TS=("physical education") AND TS=("elementary school*" OR "primary school*") AND TS=("teaching model*" OR "pedagog*")	12 July 2026	487
PubMed	("physical literacy"[Title/Abstract]) AND ("physical education"[Title/Abstract]) AND ("elementary"[Title/Abstract] OR "primary school"[Title/Abstract])	13 July 2026	204

Inclusion and Exclusion Criteria

Studies were included if they: (1) were published in a peer-reviewed English-language journal between January 2015 and July 2026; (2) examined a physical education teaching, pedagogical, or instructional model explicitly linked to physical literacy or its constituent domains; (3) sampled or focused on elementary/primary school-aged children (approximately 5–12 years); (4) reported empirical (quantitative, qualitative, or mixed-methods) findings or a systematic/scoping synthesis of such evidence; and (5) reported at least one outcome relating to physical, cognitive, affective, or social development, or to PL conceptualisation, assessment, or implementation. Studies were excluded if they: (1) focused exclusively on secondary/high school, university, or adult populations without disaggregated elementary-level data; (2) addressed physical activity or fitness outside a formal PE/pedagogical context (e.g., purely clinical or sport-club interventions); (3) were conference abstracts, editorials, theses without peer-reviewed derivatives, or grey literature lacking methodological detail; or (4) did not report extractable data relevant to the review questions.

Screening Process

Search results from the three databases were exported to a reference manager and de-duplicated. Two reviewers independently screened titles and abstracts against the eligibility criteria, followed by independent full-text assessment of potentially eligible records. Discrepancies were resolved through discussion and, where necessary, adjudication by a third reviewer. The study selection process was documented in accordance with the PRISMA 2020 flow diagram Page et al. (2021), summarised narratively in Figure 1 below.

Quality Assessment

Methodological quality was appraised using design-appropriate tools: the Mixed Methods Appraisal Tool (MMAT) for quantitative, qualitative, and mixed-methods primary studies, and AMSTAR-2 for included systematic/scoping reviews. Two reviewers independently rated each study, and inter-rater disagreements were resolved by consensus. Quality appraisal informed the narrative weighting of evidence in the Discussion but was not used as a hard exclusion criterion, consistent with PRISMA 2020 guidance that risk-of-bias assessment should inform, rather than pre-empt, synthesis (Page et al., 2021).

Ethical Considerations

As this study synthesised previously published, publicly available literature, formal ethical approval was not required. Nonetheless, the review adhered to the ethical principles of transparent and accurate reporting outlined in PRISMA 2020 including full disclosure of search strategies, screening decisions, and any deviations from the registered protocol. No primary data involving human participants were collected.

RESULTS

Number and Flow of Included Studies

The database search yielded 1,303 records (Scopus n = 612; Web of Science n = 487; PubMed n = 204). After removal of 442 duplicates, 861 unique records were screened at title/abstract level, of which 702 were excluded as clearly irrelevant. The remaining 159 full-text articles were assessed against the eligibility criteria; 113 were excluded, most commonly because they addressed non-elementary populations (n = 41) or outcomes unrelated to PL/teaching models (n = 34). A final set of 46 studies met all inclusion criteria and were retained for narrative synthesis. The complete flow of information is summarised in Table 2, consistent with PRISMA 2020 reporting requirements (Page et al., 2021).

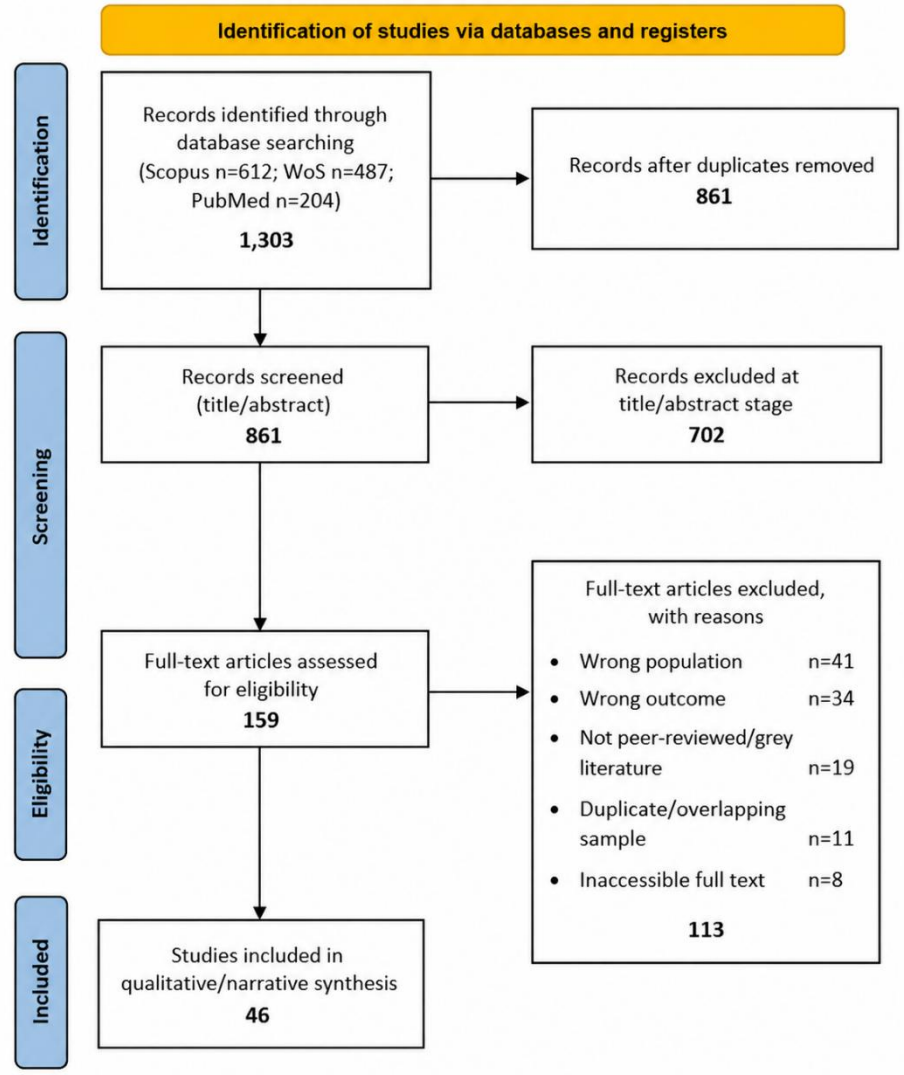

Figure 1. PRISMA 2020 flow of study identification, screening, and inclusion.

Study Characteristics

The 46 included studies were conducted across at least 14 countries, with the largest concentrations in Indonesia (n = 11), Canada (n = 6), Australia (n = 5), Spain (n = 4), the United States (n = 3), and Slovakia, South Korea, and the United Kingdom

(n = 2 each), alongside single studies from other European, Asian, and African contexts. Designs comprised quasi-experimental and cluster-randomised intervention trials (n = 15), qualitative studies (n = 9), mixed-methods studies (n = 8), research-and-development (R&D/ADDIE-based) instrument or model-development studies (n = 7), and systematic/scoping/narrative reviews (n = 7). Sample sizes in primary studies ranged from small qualitative samples (n = 6 teachers) to cluster trials exceeding 260 students. A representative subset of included studies, illustrating the diversity of design, country, and teaching-model focus, is presented in Table 2.

Table 2. Characteristics of representative included studies (illustrative subset of the 46-study corpus).

Author(s), Year	Country	Design	Sample (n, grade/age)	Teaching Model / Focus	PL Domain(s) Assessed
Stoddart et al. (2021)	Canada	Quasi-experimental (controlled)	131 students, 6 teachers, elementary	PLitPE (PL-enriched pedagogy)	Physical, psychological, behavioural
Houser & Kriellaars (2023)	Canada	Qualitative (interview study)	6 elementary PE teachers	PL-enriched pedagogy	Physical, cognitive, affective, social
Luptáková et al. (2025)	Slovakia	Cluster-randomised trial	266 students, grades 1–4	Team-teaching configurations (PET/generalist/assistant)	Physical (motor competence), self-reported PL
Valle-Muñoz et al. (2025)	Spain (multi-country synthesis)	Narrative review	N/A	PL as pedagogical model	Physical, cognitive, affective, social
Irmansyah et al. (2021)	Indonesia	Mixed methods (sequential exploratory)	Experts n=8; practitioners n=12	PL culture-based model	Physical, cognitive, affective, social
Khory et al. (2023)	Indonesia	Experimental pretest–posttest	Grade 5 students	PL model in PJOK curriculum	Physical (MVPA)
Son (2025)	South Korea	Mixed methods	Grade 3 students	Movement-integrated instruction (cross-curricular)	Physical, cognitive
Nurfauzan et al. (2025)	Indonesia	R&D (ADDIE model)	34 students, grade 5	Quantum learning with traditional games	Physical, cognitive, affective
(Grimes & Heidorn, 2022)	United States	Conceptual/practice article	N/A	Standards-based teaching (SHAPE America)	Physical, cognitive, affective, social
(Barba-Martí-n et al., 2020)	Spain (review)	Systematic review	12 studies reviewed	Teaching Games for Understanding (TGfU)	Physical, cognitive
(Ritonga et al., 2024)	Indonesia	R&D (Borg & Gall)	156 students, grade 5	TGfU-based throwing/catching model	Physical (motor skill)
Indonesia & Yusroni (2024)	Indonesia	R&D (ADDIE model)	46 students, upper elementary	Game-based model	Physical, social (cooperation, discipline)
Barnett et al. (2023)	Australia (review)	Systematic review (PRISMA)	39 papers / 9 instruments	Assessment instruments (cross-model)	Physical, psychological, cognitive, social
Vieira et al. (2025)	Portugal (review)	Systematic review (qualitative synthesis)	21 studies	Multiple PL school-based models	Physical, psychological, cognitive, social
Carl et al. (2021)	Germany (review)	Systematic review	44 interventions / 46 articles	PL interventions (multiple models)	Physical, psychological, cognitive
Barratt et al. (2024)	Australia	Conceptual model	N/A (early childhood educators)	Effective PL pedagogue model	Psychomotor, affective, social, cognitive
Essiet et al. (2022)	Australia	Mixed methods	122 teachers	PL assessment practice	Assessment/implementation
Goss et al. (2021)	United Kingdom	Qualitative (focus groups)	39 children 6–7y; 57 children 10–11y; 23 teachers	PL assessment stakeholder views	Assessment/implementation

Thematic Findings: Dominant Teaching Models (RQ1)

Thematic synthesis delineated five recurring pedagogical clusters aimed at cultivating physical literacy within elementary physical education. First, physical-literacy-enriched holistic pedagogy—explicitly informed by Whitehead's framework and emphasizing autonomy, inclusivity, and ongoing formative assessment—was identified (Houser & Kriellaars, 2023; Stoddart et al., 2021; Valle-Muñoz et al., 2025). Second, game-centred models, specifically Teaching Games for Understanding and the Sport Education Model, were utilized singly or in tandem to advance tactical comprehension alongside motor skill acquisition (Barba-Martí-n et al., 2020; Nazari et al., 2025; Ritonga et al., 2024). Third, movement-integrated or cross-curricular instruction sought to embed physical activity within the delivery of academic content (Son, 2025). Fourth, game- and play-based models—notably involving traditional or local games and gamified or quantum-learning frameworks—featured prominently, particularly within the Indonesian literature (Fizi et al., 2023; Irmansyah et al., 2021; Nurfauzan et al., 2025). Finally, collaborative or team-teaching configurations, pairing generalist classroom teachers with physical education specialists or assistant trainers, were also prevalent (Luptáková et al., 2025). Within these clusters, standards-based frameworks frequently served as an overarching curricular scaffold (Grimes et al., 2022).

Effects on Physical, Cognitive, Affective, and Social Development (RQ2)

Table 3 presents a synthesis of the reported developmental outcomes for each teaching-model cluster across the four

physical literacy domains. Consistently, physical competence and fundamental or sport-specific motor skills emerged as the most robust outcomes across all clusters, typically supported by pre–post or comparative research designs. Cognitive domains—specifically tactical comprehension, decision-making, and, regarding movement-integrated instruction, transfer to academic reasoning—were most strongly associated with game-centred and cross-curricular pedagogical models. Affective and psychological outcomes were generally positive; however, these findings were derived from heterogeneous and frequently non-validated assessment tools, and one cluster paradoxically indicated a decline in self-perceived physical literacy despite concurrent improvements in objective motor skill (Luptáková et al., 2025). Social development was the least consistently reported domain, generally relying on qualitative or observational data rather than validated psychometric instruments.

Table 3. Thematic synthesis of teaching-model clusters against the four physical literacy developmental domains.

Teaching Model Cluster	Representative Studies	Physical Domain	Cognitive Domain	Affective/Psychological Domain	Social Domain
1. PL-enriched holistic pedagogy	Stoddart et al. (2021); Houser & Kriellaars (2023); Valle-Muñoz et al. (2025)	Strong, consistent gains in motor competence and movement vocabulary	Moderate evidence; reflective/problem-solving elements reported qualitatively	Positive effects on confidence and motivation; behavioural/participation gains inconsistent	Emerging evidence; inclusion and community-building reported qualitatively
2. Game-centred models (TGfU / SEM, combined)	(Barba-Martí-n et al., 2020); Ritonga et al. (2024); Nazari et al. (2025); Ghorbanzadeh et al. (2024)	Moderate-to-strong gains in sport-specific motor/technical skill	Strong evidence for tactical understanding, decision-making, game intelligence	Positive effects on intrinsic motivation and emotion regulation (combined TGfU+SEM)	Improved cooperation and communication in team-based tasks
3. Movement-integrated / cross-curricular instruction	Son (2025)	Positive but secondary to academic outcomes; bodily control gains reported	Strong evidence for transfer to academic (mathematics) reasoning	Limited data	Limited data
4. Traditional/local game-based & quantum learning models	Irmansyah et al. (2021); Nurfauzan et al. (2025); Khory et al. (2023)	Significant gains in MVPA and fundamental movement	Moderate gains; cultural/contextual knowledge integration	Positive engagement, enjoyment, motivation	Cultural identity and social cohesion reported qualitatively
5. Team-teaching / collaborative delivery models	Luptáková et al. (2025)	Significant within-group motor competence gains (moderate effect sizes)	Not directly assessed	Mixed: some configurations reduced self-perceived PL despite skill gains	Not directly assessed; implies collaboration between generalist/specialist teachers

Conceptualisation and Assessment of Physical Literacy (RQ3)

Nearly all included studies (43 of 46) adopted, explicitly or implicitly, a Whiteheadian conceptualisation of PL as a multidimensional, lifelong disposition comprising motivation/confidence, physical competence, and knowledge/understanding (Martins et al., 2020; Whitehead, 2019) However, operational definitions varied considerably: several Indonesian and South-East Asian studies foregrounded fundamental motor skill acquisition as a proxy for PL Khory et al. (2023); (Ritonga et al., 2024), while Canadian and Australian studies more consistently applied the full four-domain structure, including cognitive and social components (Barratt et al., 2024; Houser & Kriellaars, 2023). Assessment practices were similarly heterogeneous: physical-domain instruments (e.g., PLAYfun, motor-competence test batteries) were the most frequently applied, whereas validated instruments for the cognitive and social domains in children under 12 years remained scarce (Barnett et al., 2023). Stakeholder-focused studies further revealed that teachers view PL assessment as valuable in principle but under-prioritised in practice, citing time constraints, limited training, and the absence of feasible, classroom-ready tools as central obstacles (Essiet et al., 2022; Goss et al., 2021)

Barriers and Enabling Factors (RQ4)

Across the corpus, four recurring barriers to successful implementation were identified: (a) insufficient teacher training and conceptual understanding of PL, particularly among generalist classroom teachers delivering PE without specialist background (Luptáková et al., 2025; Nurfauzan et al., 2025) (b) ambiguous or under-specified curricular operationalisation of PL, leaving teachers to interpret the construct independently (Ridha et al., 2025); (c) assessment burden and the absence of time-efficient, valid instruments suitable for whole-class use (Essiet et al., 2022; Goss et al., 2021) and (d) short intervention durations that constrain the detection of durable behavioural or psychological change (Barba-Martí-n et al., 2020); Carl et al. (2021). Conversely, five enabling factors were consistently associated with successful implementation: structured professional development and mentor-supported coaching (Stoddart et al., 2021); co-teaching/collaborative models pairing specialist and generalist teachers (Luptáková et al., 2025); autonomy-supportive, play- and game-based pedagogy that sustains intrinsic motivation Nazari et al. (2025); Nurfauzan et al. (2025); explicit alignment with national standards or curricular frameworks (Grimes et al., 2022); and inclusive, individualised task design accommodating diverse ability levels, including children with disability or chronic conditions (Blais et al., 2024; Widiyatmoko et al., 2025).

DISCUSSION

This review set out to critically synthesise evidence on teaching models for physical literacy (PL) in elementary school

physical education (PE) and their developmental effects. Rather than restating the results, this discussion interprets their meaning in relation to theory, cross-national context, and the persistence of implementation barriers.

Interpreting the Domain Asymmetry

The consistent pattern across all five teaching-model clusters — strong physical-domain effects but weaker, more heterogeneous cognitive, affective, and social effects — suggests that elementary PE practice, even when explicitly framed as PL-oriented, has not yet fully operationalised Whitehead's holistic construct (Endrawan et al., 2025; Grauduszus et al., 2023, p. 1771; Whitehead, 2019). This asymmetry echoes Carl et al. (2021) finding that only a minority of PL interventions systematically target all core domains, and it indicates a translational gap between PL's philosophical ambition — a lifelong, embodied disposition toward movement — and its practical enactment as a somewhat conventional motor-skill curriculum relabelled with PL terminology. The paradoxical finding that certain team-teaching configurations improved objective motor competence while reducing self-perceived PL Luptáková et al. (2025) is theoretically important: it implies that physical competence and psychological ownership of movement are not simply co-dependent, and that pedagogical approaches optimised for skill acquisition (e.g., highly structured, teacher-directed drills) may inadvertently undermine the autonomy and self-efficacy that Whitehead's framework identifies as central to PL. This is consistent with self-determination theory, which several included studies invoked explicitly Anğ & Chen (2015); Stoddart et al. (2021) and which predicts that controlling instructional climates can erode intrinsic motivation even as they produce short-term performance gains.

Cross-Regional Perspectives

Comparing across regions reveals a striking divergence in how PL is enacted. Studies from Canada, Australia, and the United Kingdom — jurisdictions with PL embedded in national or provincial curricula for over a decade — tend to apply the full four-domain PL structure and emphasise teacher professional identity, inclusion, and qualitative pedagogical reasoning (Barratt et al., 2024; Goss et al., 2021; Houser & Kriellaars, 2023). By contrast, the substantial cluster of Indonesian and broader South-East Asian studies more often operationalises PL primarily through fundamental motor skill and moderate-to-vigorous physical activity outcomes, reflecting both a shorter policy history with PL and curricular structures (e.g., PJOK) that retain a strong skill-based orientation (Irmansyah et al., 2021; Khory et al., 2023; Ridha et al., 2025). This is not necessarily a deficiency but reflects differing developmental priorities and resource constraints; however, it does mean that cross-national synthesis of PL evidence must be interpreted cautiously, since the construct being measured is not always equivalent across contexts (Edwards et al., 2017, p. 678; Raikes et al., 2023, p. 228; Santos-Miranda et al., 2025). The relatively sparse evidence from Sub-Saharan Africa, South Asia, and Latin America is itself a finding: given that these regions report some of the lowest levels of sufficient youth physical activity globally Aubert et al. (2021); Ackah et al. (2022) the near-absence of PL-pedagogy research from these contexts represents a significant equity gap in the evidence base.

Linking Findings to Theory

The results broadly support Whitehead's (2010, 2019) monistic, existentialist conception of PL as an embodied, relational capacity, but they also substantiate critiques that the construct's philosophical richness resists straightforward operationalisation in classroom practice (Durden-Myers et al., 2020, p. 13, 2022; Edwards et al., 2017, p. 678). Game-centred models (TGfU, SEM) align most closely with constructivist learning theory, and their comparatively strong cognitive-domain evidence (tactical understanding, decision-making) is consistent with situated-learning accounts in which understanding is developed through authentic, game-like problem-solving rather than decontextualised drills (Coleman & Money, 2019, p. 435; Estrellado et al., 2026, p. 181; Martínez-Santos et al., 2020). Movement-integrated instruction's demonstrated transfer to academic reasoning Son (2025) lends indirect support to embodied cognition theory, which posits that physical action and cognitive processing are functionally interdependent rather than separable systems.

Why Barriers Persist

The recurrence of teacher training deficits, ambiguous curricular guidance, and assessment burden across geographically and institutionally diverse studies suggests that these barriers are structural rather than incidental. Elementary PE is frequently delivered by generalist classroom teachers with minimal specialist preparation Luptáková et al. (2025), yet PL-oriented pedagogy demands a level of conceptual fluency — across four interacting domains — that exceeds what brief or absent professional development can reasonably provide. Assessment burden persists because, despite proliferating instrument-development research Barnett et al. (2023), few tools meet the joint criteria of validity, brevity, and classroom feasibility demanded by time-pressured teachers Essiet et al. (2022); Goss et al. (2021) Short intervention durations, in turn, are frequently dictated by academic-term structures and research funding cycles rather than pedagogical rationale, limiting the field's capacity to detect the slower-forming affective and behavioural changes that PL theory predicts (Barba-Martí-n et al., 2020; Stringer et al., 2024, p. 335; Viskupic et al., 2019, p. 207).

Implications of the Synthesis

Taken together, these interpretations imply that advancing PL in elementary PE requires more than adopting new lesson content; it requires systemic investment in teacher capacity, assessment infrastructure, and sustained (rather than short-burst) implementation timelines, points elaborated in the following section.

Implications

Practical Implications

For classroom and PE practitioners, the synthesis suggests that effective PL-oriented teaching combines game-centred, understanding-based instruction (for cognitive and motivational engagement) with explicit, structured attention to physical competence, rather than treating these as separable curricular strands. Co-teaching arrangements that pair generalist teachers with PE specialists appear to offer a pragmatic route to improving both motor outcomes and instructional quality where specialist staffing

is limited (Luptáková et al., 2025). Teachers should be encouraged to adopt brief, formative, multi-domain assessment practices (e.g., combining short motor-competence checks with simple self-report confidence/motivation measures) rather than relying solely on physical-domain testing, to avoid reinforcing the domain asymmetry identified in this review.

Policy Recommendations

Curriculum authorities should move beyond declarative endorsement of PL terminology toward explicit, domain-specific operational guidance and assessment benchmarks embedded in national or provincial PE curricula, following models already established in Canada and Australia (Barnett et al., 2023; Houser & Kriellaars, 2023). Sustained investment in initial teacher education and in-service professional development focused specifically on PL pedagogy is warranted, particularly in contexts where PE is delivered by non-specialist generalist teachers. Given the geographic concentration of evidence, international research-funding bodies and ministries of education in under-represented regions (Sub-Saharan Africa, South Asia, Latin America) should be encouraged to prioritise PL-pedagogy research and implementation trials, aligned with the WHO Global Action Plan on Physical Activity 2018–2030 (Chaput et al., 2020).

Recommendations for Practice-Oriented Research

Researchers designing future intervention studies should pre-register theory-based fidelity criteria specifying how each PL domain is targeted by intervention content, following the framework proposed by Carl et al. (2021), and should favour intervention durations sufficient to detect behavioural and affective change (a full academic year or longer) rather than single-unit or single-term designs.

Limitations

Limitations of the Included Studies

Most included empirical studies employed quasi-experimental or single-group pre–post designs without randomisation or long-term follow-up, limiting causal inference regarding teaching-model effectiveness. Outcome measurement was heterogeneous across studies, with inconsistent use of validated instruments, particularly for cognitive and social PL domains, which constrains direct cross-study comparison and precluded meta-analytic pooling. Several studies relied on convenience sampling and modest sample sizes, and self-report measures of motivation, confidence, and PL were susceptible to social-desirability and recall bias, particularly among younger children.

Limitations of the Review Process

This review was restricted to English-language, peer-reviewed publications indexed in Scopus, Web of Science, and PubMed, which may have excluded relevant grey literature, national-language curricular evaluations, or unpublished dissertations, potentially underrepresenting evidence from non-English-speaking and low-resource contexts. The narrative/thematic synthesis approach, necessitated by outcome heterogeneity, does not permit quantitative effect-size pooling, and the categorisation of studies into five teaching-model clusters, while grounded in the data, involved a degree of interpretive judgement. Finally, because the search was conducted up to July 2026, subsequently published studies are not reflected in this synthesis.

Future Research Directions

Building on the identified gaps, four priorities are proposed for future research. First, longitudinal and multi-year experimental or cluster-randomised designs are needed to determine whether short-term physical-domain gains translate into sustained affective, behavioural, and social development, addressing the domain-asymmetry problem identified in this review (Luptáková et al., 2025; Stoddart et al., 2021). Second, cross-cultural comparative studies employing harmonised, validated PL assessment instruments are required to enable genuine international benchmarking, extending recent instrument-validation work Barnett et al. (2023) into consistent multi-country trials. Third, under-represented regions — particularly Sub-Saharan Africa, South Asia, and Latin America — warrant dedicated intervention and implementation research, given both their documented physical-activity deficits Ackah et al. (2022) and their near-absence from the current PL-pedagogy evidence base. Fourth, future studies should more rigorously document intervention fidelity to named teaching models (TGfU, SEM, PL-enriched pedagogy) using structured observation protocols, addressing the methodological weakness identified by Barba-Martí-n et al. (2020) whereby models are frequently claimed but inconsistently implemented. Finally, research examining PL development among under-served elementary populations — children with disabilities, chronic medical conditions, or from socioeconomically disadvantaged backgrounds — remains sparse and merits sustained investment (Blais et al., 2024; Widiyatmoko et al., 2025).

CONCLUSION

This systematic review synthesised 46 studies to characterise the teaching models used to promote physical literacy in elementary school physical education and their documented effects on students' physical, cognitive, affective, and social development. Five model clusters were identified — PL-enriched holistic pedagogy, game-centred approaches, movement-integrated instruction, traditional/play-based models, and collaborative team-teaching configurations — each demonstrating robust support for physical competence but more limited and inconsistent evidence for cognitive, affective, and social outcomes. Physical literacy conceptualisation and assessment remain fragmented across contexts, and implementation is constrained by persistent, structural barriers in teacher training, curricular specification, and assessment feasibility. Given the well-documented global shortfall in children's physical activity and its far-reaching implications for lifelong health Chaput et al. (2020); Guthold et al. (2019) consolidating physical literacy as a coherent, evidence-based, and equitably implemented pedagogical standard in elementary education is not merely a curricular refinement but a matter of global public health significance. Sustained, theory-driven, cross-culturally validated research — extending well beyond the currently over-represented handful of countries — is essential to fulfil this potential.

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CONFLICT OF INTEREST

The authors declare no conflict of interest relevant to the content of this article.

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