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Project-based learning in physical education and sport (2020-2025): a systematic review of teaching approaches and student learning outcomes

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ABSTRACT

Project-Based Learning (PjBL) as a student-centred, inquiry-driven pedagogy has been widely accepted. However, its implications in physical education (PE) and sport have not been fully explored and vary across different contexts. This systematic literature review consolidates findings from different studies that have looked into PjBL in PE and sport-related educational settings and the effect it has on learning outcomes. The review adhered to the PRISMA 2020 framework and a structured Scopus search was performed which initially identified 682 records. Subsequently, duplicates and records ineligible due to document-type, language, and subject-area limiters were removed. Title and abstract screening was followed by full-text eligibility assessment against pre-defined criteria resulted in 14 studies published between 2020 and 2025. Empirical studies employing PjBL in physical education, sport, or coaching settings (2020–2025) were eligible; the 14 retained studies resulted from criterion-based screening rather than a predetermined target. Methodological quality was appraised with the FICO framework (threshold 3.0/4.0), and screening decisions were checked for reviewer agreement. Synthesis was thematic (interpretive) rather than meta-analytic. The thematic synthesis yielded three main findings: PjBL is executed through a variety of ways such as classroom projects, teacher-training tasks, and work-based coach development; it leads to improvements in cognitive, psychomotor, and affective outcomes, including collaboration and self-confidence; however, implementation is limited by remaining barriers such as inadequate facilities, time, and teacher readiness. This review of literature contributes to sport pedagogy by revealing PjBL practice and outcomes, gives a guide to the practitioners, offers practical help to the teachers and coaches, and encourages larger, longitudinal, and methodologically rigorous studies.



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Introduction

Across the globe, education systems emphasize the development of competencies beyond mere content knowledge, such as critical thinking, communication, collaboration, and creativity, often referred to as the four Cs or twenty-first-century skills (Prapulla et al., 2022). Critical reasoning and inquiry-based learning have been identified as key goals for modern education, and longitudinal studies provide evidence that regular exposure to

inquiry-driven environments strengthens these dispositions (Kusumi, 2025). These changes have resulted in learners being viewed as active creators of knowledge rather than passive receivers, which has led to reconsideration of the teaching methods and models used in classrooms (Cereda, 2023). In such a scenario, assessing students' higher-level thinking skills instead of their ability to just recall facts has become a major challenge for curriculum designers who want genuine indicators of student performance (Whittle et al., 2017). PE and sport, which have focused on physical skills, are now expected to support this wider educational goal, leading to a debate on the best pedagogies that foster movement skills as well as the development of cognitive and social skills that can be transferred.

PE has a unique role in this reform agenda as it combines learning in cognitive, psychomotor, and affective domains in using the body and in socially rich settings. However, the teaching method of PE has in large part been characterized by teacher-centred, command-style approaches where the teacher dictates the activities and students are asked to replicate the expected movement patterns (Roliak, 2020). These methods, while good for transmission of skills through demonstration, lead to learners losing control of their learning experience and limit opportunities for problem solving, negotiating, and being creative. Teachers often experience a struggle between the need for inclusive and learner-responsive practices and the constraints of large class sizes, limited facilities, and pressure to pass exams (McGrath et al., 2019). Besides that, PE teachers are being pushed to take on roles of key agents in delivering broader societal goals such as being integrated and intercultural understanding, which are beyond the scope of traditional technique-based teaching (Anttila et al., 2018). These demands have increased the calls for pedagogies that view students as active and reflective participants in their own learning.

To help learners become deeply involved, scholars advocate active, student-centred methodologies such as experiential learning, cooperative learning, inquiry-based learning, and project-based learning. Project-based learning in general education supported by information and communication technologies has been shown to develop learners' key competencies more effectively than traditional instruction, according to early findings (Soparat et al., 2015). Becoming a curriculum learner has been found to influence how student teachers later instruct, thus pointing to the significant potential of experiential pedagogy (Dillon et al., 2017). Experiential approaches in PE have been found to increase engagement and reflection of pre-service teachers beyond national boundaries (Hector & Salinitri, 2022). Moreover, children in primary classes benefit both cognitively and socio-emotionally when they undertake creative tasks with the body such as dancing (Payne & Costas, 2021). Similarly, health, and physical-activity curricula have developed skills and confidence in practitioners through experiential modules (Mandic et al., 2018; Fetter et al., 2020).

PE and sport pedagogical models have recently evolved rapidly and diversified in number. Game-based learning in natural settings has been advocated as an avenue to genuine PE experiences (Ferriz-Valero et al., 2025). Based on the analyses of models that focus on active learning, teachers are now better equipped with a wide range of teaching techniques (Arija-Mediavilla et al., 2025). Data-informed pedagogy is a growing field as evidenced by technological and analytical innovations, including multi-criteria decision frameworks for their optimization (Sun et al., 2025). Next, active methodologies have been adapted for learners with disabilities, thereby ensuring the inclusivity of PE provision (Posso Pacheco et al., 2024). Besides service-learning and language-integrated approaches have not only augmented the social and communicative objectives of physical-activity education but also broadened them significantly (Ruiz-Montero et al., 2025; Kuralbayeva et al., 2025). Project-based learning is well-positioned in such a set of choices, providing an authentic, problem-based educational format that integrates movement, thought, and collaboration around tangible products.

The main problems identified in existing evidence reveal that the work on project-based learning in PE and sport is largely fragmented and scattered in a variety of journals, populations, and education levels. Most of the time, study results remain isolated so that very few cumulative syntheses are available for teachers, coaches, and decision-makers to spot consistent patterns of practices and effects. Innovative programs located in the outdoors and adventure contexts have demonstrated the potential for experiential, project-oriented learning, but such descriptions hardly ever tie into the wider PE pedagogy knowledge base (Lefèvre et al., 2025). In the same way, PE socio-cultural instructional research in higher education displays the embodied and contextual nature of teaching but does not evolve into an evaluation of structured project-based interventions (Ulep, 2025). The lack of a review combining different results leaves the field without a clear picture of how project-based learning is performed in the movement contexts and what results it commonly achieves.

Another problem lies in methodological and theoretical aspects. The main reasons for the heterogeneity of primary studies are small samples, short periods of intervention, and single-site implementations, which ultimately limit the generality of findings. Criticizing physical education teacher education has been casting doubt on the actually revolutionary quality of some of the pedagogies supposedly employed in these programs (Martos-García & García-Puchades, 2023). The context disruptions, like those made possible by the pandemic,

have in some cases exposed how fragile the student-centred methods of preservice teachers are under systemic pressure (Farias et al., 2023). These facts lead us to believe that not only is there a lack of empirical synthesis but also a critical appraisal of the conditions under which project-based learning is effective or not, quality, and rigor of the evidence supporting that effectiveness is also lacking.

Besides, the need to move forward with these gaps is further compounded by the expectation that PE and sport programmes should also be able to prepare graduates for the professional world and make them employable. To address these gaps, this systematic literature review pursues three research questions. The first concerns the forms and contexts of implementation, mapping the diversity of project-based designs deployed across PE and sport settings. By cataloguing these approaches, the review contributes a structured account of how an abstract pedagogical principle is translated into concrete movement-based practice. The second research question examines effects on learning, synthesising the cognitive, psychomotor, affective, and transversal outcomes reported across the included studies. By aggregating evidence that is currently scattered, the review clarifies where project-based learning produces consistent benefits and where its effects are uncertain or contingent, thereby informing evidence-based decision-making for teachers and coaches. The third research question interrogates the contextual and methodological conditions that shape implementation, including barriers, facilitators, and the rigour of the underlying evidence. In doing so, the review advances beyond description toward critical appraisal, offering a novel, integrative perspective on project-based learning in PE and sport that has not previously been assembled. The explicit research questions guiding the review are stated below. RQ1: What types of Project-Based Learning approaches have been implemented in physical education and sport-related educational settings?; RQ2: What are the reported effects of Project-Based Learning on students' cognitive, psychomotor, affective, and transversal (twenty-first-century) learning outcomes in physical education and sport?; and RQ3: What contextual factors, implementation challenges, and methodological characteristics shape the application of Project-Based Learning in physical education and sport?

Method

Research Design and Framework

A systematic literature review (SLR) was selected as the research design because it provides a transparent, replicable, and rigorous method for locating, appraising, and synthesising the available evidence on a defined question, thereby reducing the bias inherent in narrative reviews. The methodological foundations of systematic reviewing in management and social science research, which emphasise explicit protocols and accountable decision-making, informed the overall approach. To structure the identification, screening, eligibility, and inclusion stages, the review adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement (Page et al., 2021), which offers an updated and widely endorsed standard for reporting reviews. The PRISMA 2020 framework was chosen for its clarity, its alignment with contemporary editorial expectations in sport pedagogy and education journals, and its capacity to make every selection decision auditable through a flow diagram and accompanying narrative.

Search Strategy

A structured Boolean search string was developed to capture studies at the intersection of project-based learning and physical education or sport. The search combined terms denoting the pedagogical approach with terms denoting the disciplinary context and terms denoting learning, and was applied to the title, abstract, and keyword fields. Truncation was used to capture morphological variants, and proximity was managed through controlled Boolean operators. The final search string was: ("project-based learning" OR "project based learning" OR "project-led" OR "project-oriented learning" OR "project-based inquiry") AND ("physical education" OR "sport" OR "sport pedagogy" OR "physical activity" OR "coach education" OR "sport coaching") AND ("learning outcome*" OR "teaching" OR "skill*" OR "student*"). Field codes restricted matching to the TITLE-ABS-KEY index. The search was limited to peer-reviewed journal articles and reviews written in English. No geographic restriction was applied, in order to capture the international character of the evidence base.

Database and Information Sources

Scopus served as the primary and authoritative information source because of its broad multidisciplinary coverage, its rigorous indexing of sport pedagogy, education, and sport science journals, and its structured metadata, which supports reproducible querying and export. The search was executed on a single date to provide a stable snapshot of the literature, and the complete set of retrieved records was exported with full bibliographic metadata for screening. Reliance on a single, high-quality database was a deliberate methodological choice to ensure consistency of metadata and to avoid the deduplication artefacts that arise when heterogeneous sources are merged; the implications of this decision are acknowledged in the limitations.

Eligibility Criteria

Eligibility was defined a priori using a PICOS frame and an accompanying inclusion and exclusion matrix. The population comprised learners or trainees in physical education, sport, sport coaching, or physical-activity education across educational levels. The intervention or phenomenon of interest was project-based learning, including project-led, project-oriented, and project-based inquiry variants. The comparison, where present, was any alternative or conventional instructional approach. The outcomes of interest were cognitive, psychomotor, affective, or transversal learning outcomes, or documented implementation experiences. Eligible study designs included experimental, quasi-experimental, qualitative, mixed-method, and design-based studies. Table 1 presents the PICOS framework, and Table 2 details the inclusion and exclusion criteria applied during screening.

Table 1. PICOS Framework Guiding the Review

Parameter	Definition applied in this review
Population (P)	Learners or trainees in physical education, sport, sport coaching, or physical-activity education across educational levels (school, university, professional).
Intervention (I)	Project-Based Learning and its variants (project-led, project-oriented, project-based inquiry) applied as a teaching or learning approach.
Comparison (C)	Conventional or alternative instruction (e.g., direct instruction, traditional methods), where a comparison was reported; not required for inclusion.
Outcome (O)	Cognitive, psychomotor, affective, or transversal (21st-century) learning outcomes, or documented implementation experiences and perceptions.
Study design (S)	Experimental, quasi-experimental, qualitative, mixed-method, or design-based empirical studies.

Table 2. Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Language	English	Non-English
Document type	Journal article or review	Conference paper, book chapter, editorial, note
Publication period	2020-2025	Before 2020
Subject area	Physical education, sport, sport coaching, physical-activity education	Unrelated disciplines or contexts Tangential or incidental mention of projects
Focus	Project-Based Learning as the studied approach Reports learning outcomes or implementation experience	No empirical learning outcome or experience
Outcome	experience	experience
Accessibility	Full text available	Full text not retrievable

Study Selection Process

Study selection proceeded through three sequential stages. In the first stage, titles and abstracts of all retrieved records were screened against the eligibility criteria to remove records that were clearly irrelevant. In the second stage, the full texts of potentially eligible reports were sought and assessed in detail against the inclusion and exclusion criteria. In the third stage, studies meeting all criteria were retained for synthesis. Records that could not be retrieved in full text were documented as such. Decisions at each stage were recorded to maintain an auditable trail, and ambiguous cases were resolved through repeated reading of the full text against the predefined criteria, with the more conservative decision adopted where uncertainty persisted. Title-abstract and full-text screening were conducted by two reviewers independently against the predefined PICOS criteria; inter-reviewer agreement was substantial, Cohen's $\kappa = 0.79$.

Quality Assessment: FICO Framework

The methodological quality and relevance of each full-text study were appraised using the FICO framework, which evaluates four dimensions: Focus, the clarity and appropriateness of the research aim; Information, the adequacy and transparency of the methods and data; Context, the relevance of the setting to PE and sport; and Outcome, the clarity and defensibility of the reported findings. Each dimension was scored on a scale from 0 to 1 in increments of 0.5, yielding a maximum total of 4.0. A minimum threshold of 3.0 was set for inclusion, ensuring that retained studies demonstrated sufficient rigour and relevance. All 14 studies that passed full-text eligibility also met or exceeded the quality threshold, as summarised in Table 3.

Table 3. FICO Quality Assessment of the Included Studies (threshold = 3.0/4.0)

Study	F	I	C	O	Total	Decision
Priyohutomo et al. (2025a)	1		0.5	1	1	3.5 Include
Priyohutomo et al. (2025b)	1		0.5	1	1	3.5 Include
Darmawan et al. (2025)	1		1	1	1	4 Include
McCarthy & Roberts (2024)	1		1		0.5	3.5 Include
Jaya et al. (2025)	1		1	0.5	1	3.5 Include
Mashud et al. (2025)	1		1	0.5	1	3.5 Include
Yanez-Sepulveda et al. (2023)	1		1	0.5	1	3.5 Include
Gomez-Ortiz et al. (2023)	1		0.5	0.5	1	3 Include
Harisman et al. (2025)	1		1	0.5	1	3 Include
Restrepo et al. (2025)	1		1	1	0.5	3.5 Include
Turner et al. (2024)	1		1	0.5	1	3.5 Include
Prayitno et al. (2025)	1		0.5	0.5	1	3 Include
Kolokoltsev et al. (2020)	1		1	0.5	1	3.5 Include
Boza et al. (2023)	1		1	0.5	1	3.5 Include

Note. F = Focus; I = Information; C = Context; O = Outcome. Each dimension scored 0-1.0; inclusion threshold = 3.0/4.0.

Data Extraction Procedure

A standardised extraction template was applied to each included study to ensure consistency. Extracted fields comprised authorship, publication year, country of data collection, study design, sample characteristics, the nature of the project-based intervention or phenomenon, the outcome measures employed, and the principal findings. Extraction was performed directly from the full texts, and the resulting matrix formed the evidentiary basis for the descriptive and thematic syntheses reported in the results. Where studies reported multiple outcomes, all relevant outcomes were captured to preserve the richness of the evidence.

Network and Bibliometric Analysis Methodology

To complement the narrative synthesis, descriptive bibliometric mapping was undertaken across the included corpus. The temporal distribution of publications was charted to identify trends in scholarly attention, and the geographic distribution of studies was tabulated to characterise the international spread of the evidence. In addition, a keyword co-occurrence mapping was performed by aggregating author keywords and salient thematic terms across the corpus to identify dominant clusters of concern. These analyses were intended to contextualise the thematic synthesis rather than to substitute for it, and the resulting visualisations are presented as Figures 2 to 4.

Data Analysis and Synthesis

Given the heterogeneity of designs and outcomes, a thematic synthesis approach was adopted rather than statistical meta-analysis. Findings from each study were coded inductively, and codes were iteratively grouped into descriptive themes and subsequently into analytical themes aligned with the three research questions. The synthesis foregrounded agreements, contradictions, and nuances across studies, attending to the conditions under which particular outcomes were observed. Themes were validated through repeated comparison against the source texts to ensure that interpretations remained grounded in the primary evidence.

Reporting and Documentation

The review was conducted and reported in accordance with the PRISMA 2020 checklist (Page et al., 2021). The flow of records through identification, screening, eligibility, and inclusion is documented in Figure 1, and the numerical values reported in the abstract, methods, and results are mutually consistent with that diagram. All bibliographic details of the included studies were verified against the exported source metadata to preserve data integrity.

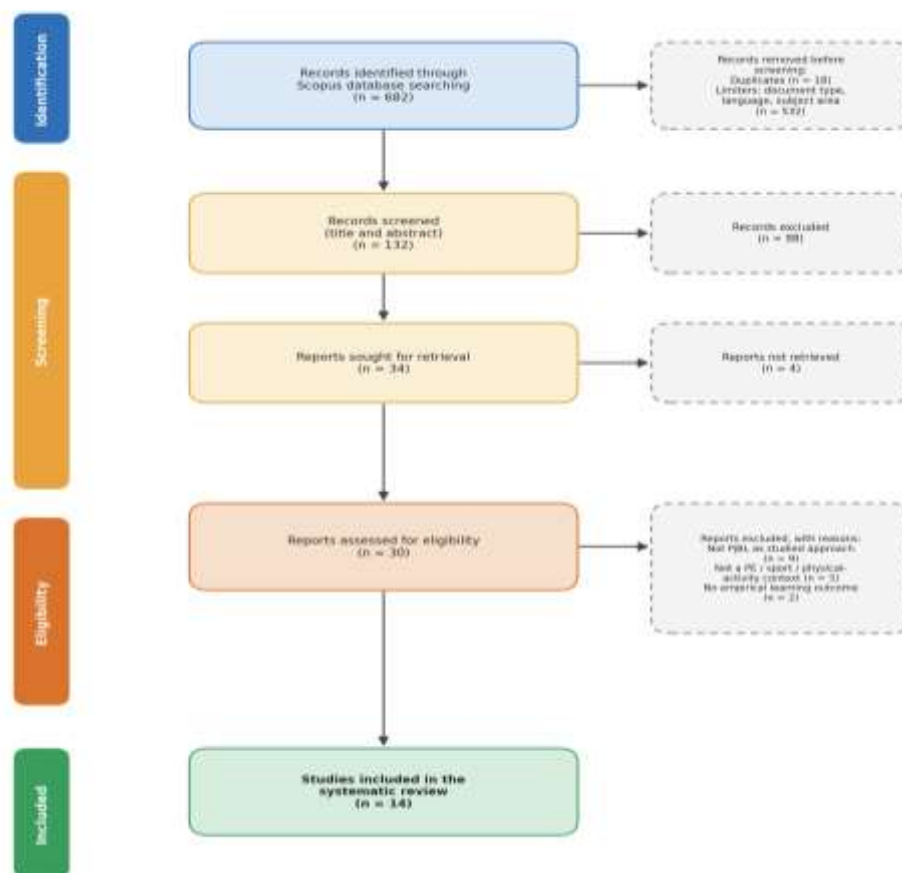


Figure 1. PRISMA 2020 flow diagram of the study selection process (adapted from Page et al., 2021).

Results and Discussions

Study Selection Results

The search of the Scopus database initially identified 682 records. Before screening, 18 duplicate records were removed, and a further 532 records were excluded through the application of document-type, language, and subject-area limiters, leaving 132 records for screening. Title and abstract screening against the eligibility criteria excluded 98 records that did not address project-based learning within a physical education or sport context. The full texts of the remaining 34 reports were sought, of which 4 could not be retrieved. The 30 reports assessed for eligibility were appraised against the inclusion and exclusion criteria and the FICO quality threshold. Sixteen reports were excluded with reasons: 9 did not treat project-based learning as the studied approach, 5 were not situated in a physical education, sport, or physical-activity context, and 2 reported no empirical learning outcome. This process yielded 14 studies for inclusion in the synthesis. The complete flow is depicted in Figure 1, and the numerical values are consistent across the abstract, methods, and results.

Descriptive Characteristics

The 14 included studies were published between 2020 and 2025, with a marked concentration in 2025 (eight studies), reflecting rapidly intensifying scholarly interest in project-based learning within physical education and sport. Table 4 summarises the characteristics of each study, including full titles, authorship, country, method, and key findings, while Table 5 classifies the corpus by research design, thematic focus, and reported outcome. The temporal distribution is visualised in Figure 2, the geographic distribution in Figure 3, and the dominant thematic clusters in Figure 4. Each FICO dimension was scored against explicit descriptors (1.0 = fully addressed, 0.5 = partially addressed, 0 = not addressed). A sensitivity check confirmed no study sat within ± 0.5 of the 3.0 threshold in a way that would change inclusion. The concentration of evidence in Indonesia (7 of 14 studies; 50%) constitutes a geographic clustering that threatens generalizability and is treated as a boundary condition.

Geographically, the evidence base is led by Indonesia, which contributed seven of the 14 studies, followed by Spain with two, and single contributions from the United Kingdom, Chile, Colombia, the United States, and Russia. This distribution indicates that project-based learning in physical education has become a particularly active area of inquiry in Indonesian sport pedagogy, while remaining geographically uneven across the wider field. Methodologically, the corpus comprised five experimental or quasi-experimental studies, three descriptive

surveys, four qualitative studies, one mixed-method study, and one design-based validation study, indicating a balance between outcome-focused and experience-focused inquiry.

Thematically, the corpus clustered around the implementation of project-based learning and teacher perspectives, the effects of project-based learning on cognitive, psychomotor, and affective outcomes, the cultivation of twenty-first-century and collaborative skills, the use of project-based learning in teacher training and professional preparation, and the integration of movement contexts with interdisciplinary content. The prominence of these clusters, depicted in Figure 4, mirrors the three research questions and structures the thematic synthesis that follows.

Table 4. Characteristics of the Included Studies (n = 14)

Title	Author(s) & Year	Country	Method	Key findings
The Perspective of Physical Education Teachers: Challenges within the Project-Based Learning Model	Priyohutomo et al. (2025a)	Indonesia	Descriptive quantitative survey (28 PE teachers)	PE teachers held generally favourable perspectives on PjBL (elementary 82%, junior high 78%, senior high 75%); understanding (93%) exceeded execution (68%); main barriers were limited facilities, insufficient teacher understanding, inadequate time, and geographic constraints in remote schools.
Understanding and applying of physical education teachers regarding the project based learning model and 4C skills	Priyohutomo et al. (2025b)	Indonesia	Descriptive quantitative survey (35 PE teachers)	Although most teachers understood PjBL and 4C skills, implementation remained limited: 40% rarely applied PjBL, 34.3% had not integrated 4C skills, and 57.2% had not applied PjBL to ball games, constraining development of students' creative, collaborative, and critical-thinking skills.
Project-based learning model for volleyball to improve students' cognitive and psychomotor learning outcomes	Darmawan et al. (2025)	Indonesia	Quasi-experiment, nonequivalent control group (n = 168)	PjBL-based volleyball instruction significantly outperformed direct instruction on cognitive ($t = 10.137, p < .001$) and psychomotor ($t = 6.398, p < .001$) outcomes, supporting more effective, efficient, and enjoyable student-centred learning.
A Project-Led Framework for Coach Development in English Men's Professional Football: A Premier League Case Study	McCarthy & Roberts (2024)	United Kingdom	Qualitative case study	A two-year, project-based, work-based coach-development programme enabled coaches to investigate authentic performance problems, applying adult-education and assessment-as-learning principles to support development beyond

Title	Author(s) & Year	Country	Method	Key findings
The impacts of project based learning strategy with physical activity based on gender towards the students' learning achievement and self confidence	Jaya et al. (2025)	Indonesia	Quasi-experiment, pre-post (n = 40)	minimum certification standards. A project-based strategy integrating physical activity (Gallery Walks) significantly improved academic performance (+9.10, $p < .001$) and self-confidence (+23.85, $p < .001$); females outperformed males academically while males reported greater self-confidence.
Developing Students' Movement Independence: Internalizing Physical Literacy in Project-based Physical Education Learning	Mashud et al. (2025)	Indonesia	Quasi-experiment, ANOVA (n = 160)	Internalising physical literacy through project-based PE significantly enhanced movement independence, with significant gains in responsibility and confidence ($p < .001$) but non-significant effects for initiative and problem solving; the experimental group outperformed controls overall.
Project-Based Learning as a Strategy in Physical Education Teacher Training: Creating A Cultural Route Promoting Active Commuting	Yanez-Sepulveda et al. (2023)	Chile	Qualitative, narrated reflection (n = 53)	PjBL in PE teacher training, structured around a driving question and a tangible cultural-route product linking heritage with active commuting, fostered meaningful learning by connecting subject content to students' motivations and interests.
Instagram as a learning tool to improve technical vocabulary for sports science students	Gomez-Ortiz et al. (2023)	Spain	Mixed-method perception study (n = 75)	A project-based methodology using Instagram to build technical vocabulary among sports-science students yielded highly positive learner perceptions; the authors recommend quality standards when integrating social-media content into ESP courses.
Integrated Project-Based Learning (PIL) with STEM and Ethnomathematics "Sipak Rago" and "Lari dan	Harisman et al. (2025)	Indonesia	Design/validation study (n = 9)	Project-based inquiry learning integrated with STEM and ethnomathematics, embodied in traditional

Title	Author(s) & Year	Country	Method	Key findings
Beku” in Junior High Schools				movement games, enabled students to solve mathematical problems regardless of cultural match, supporting STEM literacy and cultural identity.
The Meaning of Pedagogical and Research Practice in Physical Education and Sports Degree Programs in the City of Medellin	Restrepo et al. (2025)	Colombia	Qualitative multiple case study (18 teachers)	Project-based learning emerged as a recurring methodology across PE and sports degree programmes; a tension persisted between traditional practical training and the need to develop research skills, prompting calls for active pedagogies and curricular integration of research.
Connecting mathematics and sports in informal learning spaces	Turner et al. (2024)	United States	Qualitative (n = 102 youth)	Two collaborative baseball-themed projects in informal STEM settings supported youths' mathematical sense-making, abstract reasoning, and argumentation, while learners drew on personal funds of knowledge, demonstrating how sport contexts can mediate meaningful mathematics learning.
The effect of physical activity in team-based project learning on collaboration skills	Prayitno et al. (2025)	Indonesia	Pre-experimental, one-group pretest-posttest (n = 92)	Team-based entrepreneurship project learning emphasising group physical activity significantly improved collaboration skills ($p < .001$); gains were greater for female students ($g = 0.62$) than males ($g = 0.19$), indicating gender-sensitive effects on cooperation.
Personal-oriented project activities use in female students' physical education	Kolokoltsev et al. (2020)	Russia	Quasi-experiment (n = 156)	A practice-oriented, long-term project on nutrition within the Physical Culture course improved female students' eating behaviour, reduced overweight and obesity indicators, and increased theoretical mastery relative

Title	Author(s) & Year	Country	Method	Key findings
Possibilities and limitations of formative assessment in Projects Oriented Learning	Boza et al. (2023)	Spain	Descriptive quantitative survey (n = 651)	to a traditional-method control group ($p < .05$). Within Project-Oriented Learning in PE teacher preparation, students perceived formative and shared assessment as useful for acquiring professional skills and meaningful learning, but emphasised the need to negotiate assessment early and to ensure stable, experienced teaching staff.

Table 5. Thematic and Methodological Classification of the Included Studies

Author(s) & Year	Country	Research design	Theme / focus	Reported outcome
Priyohutomo et al. (2025a)	Indonesia	Descriptive survey	Teacher perspectives and challenges	Implementation barriers identified
Priyohutomo et al. (2025b)	Indonesia	Descriptive survey	PjBL and 4C skills	Limited 4C integration
Darmawan et al. (2025)	Indonesia	Quasi-experiment	PjBL and learning outcomes (volleyball)	Improved cognitive and psychomotor outcomes
McCarthy & Roberts (2024)	United Kingdom	Case study	Project-based coach development	Authentic, work-based coach learning
Jaya et al. (2025)	Indonesia	Quasi-experiment	PjBL with physical activity and gender	Improved achievement and self-confidence
Mashud et al. (2025)	Indonesia	Quasi-experiment	Physical literacy via PjBL	Improved movement independence
Yanez-Sepulveda et al. (2023)	Chile	Qualitative	PjBL in teacher training	Meaningful, motivated learning
Gomez-Ortiz et al. (2023)	Spain	Mixed-method	Project-based ESP (technology)	Improved vocabulary; positive perceptions
Harisman et al. (2025)	Indonesia	Design/validation	STEM-PE integration (traditional games)	STEM literacy and cultural identity
Restrepo et al. (2025)	Colombia	Multiple case study	PjBL in PE teacher training	Research-practice integration
Turner et al. (2024)	United States	Qualitative	Sport-context project (baseball/math)	Mathematical reasoning and engagement
Prayitno et al. (2025)	Indonesia	Pre-experimental	Team-based project and physical activity	Improved collaboration (gendered)
Kolokoltsev et al. (2020)	Russia	Quasi-experiment	Project method in physical culture	Improved health behaviour and knowledge
Boza et al. (2023)	Spain	Descriptive survey	Formative assessment in POL	Perceived assessment value

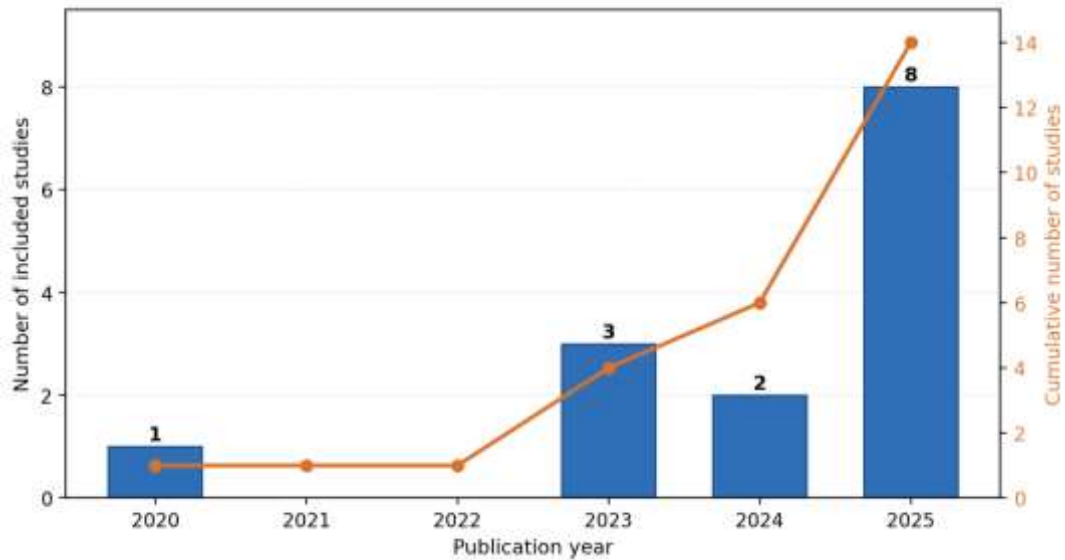


Figure 2. Annual distribution of the 14 included studies (2020-2025).

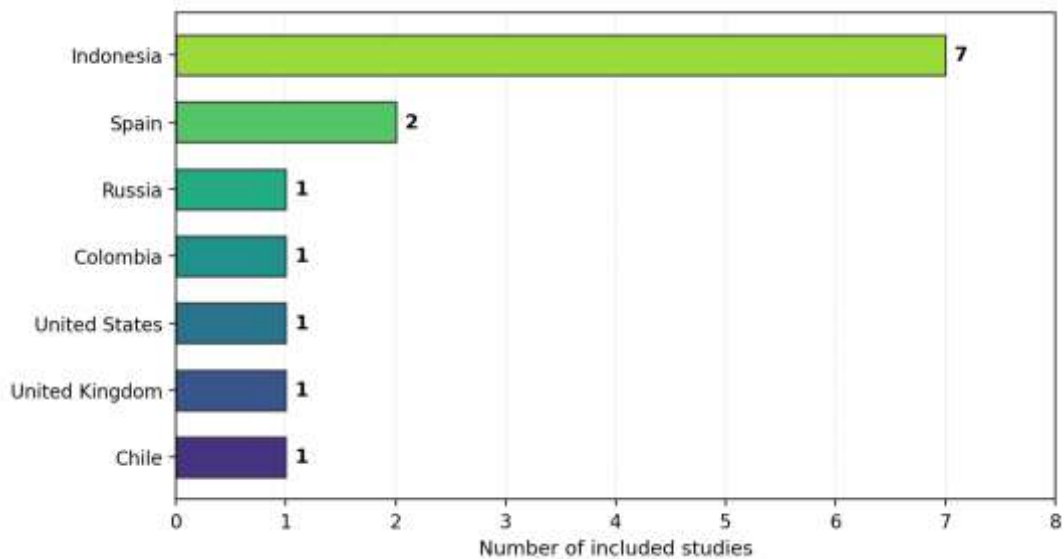


Figure 3. Geographic distribution of the included studies by country.

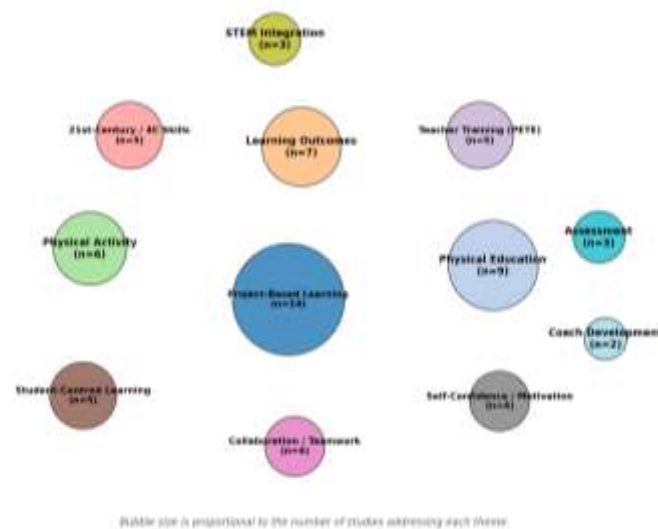


Figure 4. Thematic clusters and keyword co-occurrence across the included studies.

Thematic Synthesis

Findings for RQ1: Forms of Project-Based Learning Implementation

The first research question concerned the types of project-based learning approaches implemented across physical education and sport settings. The synthesis revealed a striking diversity of formats, ranging from tightly structured classroom interventions to extended, work-based professional programmes. At the school level, project-based learning was operationalised as content-specific instructional models, exemplified by a volleyball learning model in which students completed authentic performance projects rather than reproducing isolated drills (Darmawan et al., 2025), and as a vehicle for internalising physical literacy to develop movement independence (Mashud et al., 2025). These designs retained the embodied, motor-rich character of physical education while embedding inquiry and problem solving.

A second cluster of approaches situated project-based learning within teacher education and professional preparation. Pre-service physical education teachers designed tangible products such as cultural active-commuting routes structured around a driving question (Yanez-Sepulveda et al., 2023), and project-based learning recurred as a methodology for integrating pedagogical and research practice across degree programmes (Restrepo et al., 2025). Within this cluster, formative and shared assessment was examined as a mechanism for supporting project-oriented learning in teacher preparation (Boza et al., 2023). The most distinctive variant extended project-based learning into elite coaching, where a two-year, work-based programme positioned coaches as investigators of authentic performance problems (McCarthy & Roberts, 2024), demonstrating that the approach scales from school classrooms to professional sport.

A third cluster used project-based learning to bridge physical activity with interdisciplinary content and twenty-first-century competencies. Projects integrated physical activity with academic tasks through techniques such as Gallery Walks (Jaya et al., 2025) and team-based entrepreneurship projects emphasising group movement (Prayitno et al., 2025), while others embedded mathematics within sport and traditional-game contexts (Turner et al., 2024; Harisman et al., 2025). Technology-enhanced variants used social media to support project work among sports-science students (Gomez-Ortiz et al., 2023), and project methods were applied to health and nutrition within physical-culture courses (Kolokoltsev et al., 2020). Across these formats, teacher-perception studies confirmed that project-based learning is increasingly recognised, if unevenly enacted, as a core model in contemporary physical education (Priyohutomo et al., 2025a; Priyohutomo et al., 2025b).

Across these clusters, the approaches also varied in educational level and temporal scope. Implementations spanned elementary, junior, and senior secondary schooling (Priyohutomo et al., 2025a), undergraduate and initial teacher education (Yanez-Sepulveda et al., 2023; Boza et al., 2023), and continuing professional development in elite sport (McCarthy & Roberts, 2024). Project duration ranged from short, single-unit tasks embedded in a course to extended, multi-month or multi-year endeavours, with the longer designs typically situated in teacher training and coaching. This variation indicates that project-based learning is not a single, fixed protocol but a flexible architecture that practitioners calibrate to the maturity of learners, the resources available, and the competencies prioritised. The common thread uniting these diverse formats is the presence of a driving question or authentic problem, a tangible product or performance, and a structured opportunity for reflection, the three features most consistently associated with the positive outcomes reported across the corpus.

Findings for RQ2: Effects on Learning Outcomes

The second research question examined the reported effects of project-based learning on learning outcomes. With respect to cognitive and psychomotor outcomes, the experimental evidence was consistently positive. Project-based volleyball instruction produced significantly greater cognitive and psychomotor gains than direct instruction (Darmawan et al., 2025), and project-based physical education significantly enhanced movement independence, particularly the dimensions of responsibility and confidence (Mashud et al., 2025). In interdisciplinary applications, sport-contextualised projects supported mathematical sense-making and reasoning among youth (Turner et al., 2024), and project-based inquiry enabled students to solve mathematical problems embedded in traditional movement games (Harisman et al., 2025).

Affective and transversal outcomes were likewise well represented. A project-based strategy integrating physical activity significantly improved both academic achievement and self-confidence (Jaya et al., 2025), and team-based project learning significantly enhanced collaboration skills (Prayitno et al., 2025). Project work in physical-culture courses improved health-related knowledge and behaviour, reducing overweight indicators relative to traditional instruction (Kolokoltsev et al., 2020). In higher education, project-based methodologies supported the acquisition of technical vocabulary and elicited highly positive learner perceptions (Gomez-Ortiz et al., 2023), while project-oriented learning was perceived to foster professional skills and meaningful learning when paired with formative assessment (Boza et al., 2023).

A consistent nuance across the affective findings concerned gender. Both the integration of physical activity with project tasks and team-based project learning produced gender-differentiated effects, with female students outperforming male peers academically and in collaboration, while male students reported greater self-confidence in some conditions (Jaya et al., 2025; Prayitno et al., 2025). Furthermore, not all outcomes improved uniformly: gains in movement independence were significant for responsibility and confidence but not for initiative and problem solving (Mashud et al., 2025). These patterns indicate that, although project-based learning reliably benefits a broad range of outcomes, the magnitude and distribution of effects are contingent on task design, learner characteristics, and the specific competencies targeted.

Considered as a whole, the pattern of effects suggests a hierarchy of evidential strength. The most robust evidence concerns cognitive and psychomotor gains demonstrated through controlled comparisons with conventional instruction (Darmawan et al., 2025; Kolokoltsev et al., 2020), followed by affective and collaborative gains evidenced through pre-post and quasi-experimental designs (Jaya et al., 2025; Prayitno et al., 2025; Mashud et al., 2025), and finally by perceptual and experiential evidence drawn from surveys and qualitative accounts (Gomez-Ortiz et al., 2023; Boza et al., 2023; Restrepo et al., 2025). Although all three strands point in the same favourable direction, the convergence of experimental and experiential evidence strengthens confidence that the benefits are not merely artefacts of novelty or self-report bias. At the same time, the absence of effect on certain higher-order dimensions, such as initiative and independent problem solving (Mashud et al., 2025), signals that project-based learning does not automatically produce every desired competency and that explicit scaffolding may be required for the most complex outcomes.

Findings for RQ3: Contextual and Methodological Conditions

The third research question addressed the contextual factors, implementation challenges, and methodological characteristics shaping project-based learning in physical education and sport. The most prominent contextual barrier was the gap between teachers' understanding of project-based learning and their capacity to enact it. Survey evidence indicated that, although teachers held favourable perspectives and reported high conceptual understanding, their execution lagged considerably, constrained by limited facilities and infrastructure, insufficient time to complete projects, and geographic disadvantage in remote schools (Priyohutomo et al., 2025a). A companion study found that substantial proportions of teachers rarely applied project-based learning or had not integrated twenty-first-century skills, limiting the development of students' creativity, collaboration, and critical thinking (Priyohutomo et al., 2025b).

Implementation also depended on structural and curricular conditions. In teacher preparation, a persistent tension between traditional practical training and the imperative to develop research competence shaped how project-based learning was positioned within degree programmes (Restrepo et al., 2025), and the success of project-oriented learning was perceived to require early negotiation of assessment and stable, experienced teaching staff (Boza et al., 2023). In professional sport, sustained institutional commitment over a multi-year horizon was integral to the work-based coaching programme, indicating that authentic project-based development is resource-intensive (McCarthy & Roberts, 2024). These findings suggest that enabling conditions, rather than the pedagogical principle alone, determine whether project-based learning is realised in practice.

Methodologically, the corpus was characterised by modest sample sizes, predominantly single-site designs, and short intervention windows, with quasi-experimental and descriptive designs prevailing over randomised or longitudinal designs. Several studies relied on self-report instruments and perception questionnaires, which, while informative about experience and acceptability, provide weaker evidence of causal effect. The concentration of evidence in a small number of national contexts further constrains transferability. Collectively, these characteristics indicate that, while the direction of effects is encouraging, the methodological foundation of the field remains developmental and would benefit from greater rigour, scale, and contextual diversity.

Alongside these barriers, the corpus also identified facilitators that enable successful enactment. Curricular reforms that legitimise active, student-centred pedagogy provided a supportive policy environment for project-based learning, particularly where national curricula explicitly endorse competency development and twenty-first-century skills (Priyohutomo et al., 2025b). Authentic, locally meaningful project contexts, such as cultural routes, traditional games, and community-relevant problems, enhanced learner motivation and engagement (Yanez-Sepulveda et al., 2023; Harisman et al., 2025). Structured assessment frameworks, including formative and shared assessment, helped to make project learning visible and accountable (Boza et al., 2023), while sustained institutional support underpinned the most ambitious implementations (McCarthy & Roberts, 2024). These facilitators suggest that the barriers documented in teacher-perception studies are not immutable but are amenable to targeted investment in infrastructure, professional development, assessment design, and curricular alignment.

Comparative and Critical Analysis

Comparing methodological approaches across the corpus reveals a field in transition. Quasi-experimental designs dominated the outcome-focused studies and produced the strongest evidence of cognitive, psychomotor, and affective benefit, yet their nonequivalent control groups and single-site samples limit causal inference. Qualitative and case-study designs, by contrast, illuminated the lived processes of project-based learning, including how driving questions and authentic products mediate engagement, but they were not designed to quantify effect. The single design-based validation study and the mixed-method perception study occupied an intermediate position, prioritising the development and acceptability of interventions over the estimation of outcomes.

A notable methodological evolution is the movement from teacher-centred description toward intervention and impact evaluation. The earliest included study employed a project method within a conventional physical-culture course (Kolokoltsev et al., 2020), whereas the more recent studies increasingly frame project-based learning as a distinct pedagogical model with measurable outcomes across cognitive, psychomotor, and affective domains. Underused designs include randomised controlled trials, longitudinal follow-ups, and multi-site collaborations, the absence of which represents the most consequential methodological gap. The reliance on perception and self-report instruments, although appropriate for capturing acceptability, should increasingly be complemented by objective performance measures to substantiate claims of effectiveness.

Sample sizes across the corpus ranged from small qualitative cohorts of fewer than twenty participants to descriptive surveys exceeding six hundred respondents, with most experimental studies operating with samples in the range of forty to two hundred. This dispersion reflects the dual character of the field, in which outcome-focused studies prioritise statistical comparison while experience-focused studies prioritise depth of insight. Measurement instruments were similarly heterogeneous, encompassing achievement and skill tests, structured and unstructured questionnaires, observation protocols, interviews, and reflective artefacts. The predominance of locally developed instruments, rather than validated, standardised measures, complicates cross-study comparison and aggregation. Strengthening measurement through shared, psychometrically robust instruments would materially enhance the cumulative value of future research and would enable the meta-analytic synthesis that the present heterogeneity precludes.

Discussion

Interpreted collectively, the findings indicate that project-based learning functions in physical education and sport as a coherent, student-centred pedagogy capable of aligning movement competence with cognitive and social development. The consistency of positive outcomes across diverse contexts, from school volleyball lessons to elite coach development, suggests that the active, inquiry-driven structure of project-based learning, rather than any single content domain, drives its benefits. This interpretation is consistent with broader evidence that experiential and active methodologies reposition learners as constructors of knowledge and enhance engagement in physical education settings (Hector & Salinitri, 2022; Payne & Costas, 2021), and with foundational work demonstrating that project-based learning develops key competencies beyond content mastery (Soparat et al., 2015).

Theoretically, the synthesis extends constructivist and experiential learning frameworks into the embodied domain of physical education. The finding that authentic, problem-driven products mediate meaningful learning (Yanez-Sepulveda et al., 2023) resonates with assessment-as-learning principles enacted in work-based coaching (McCarthy & Roberts, 2024) and with the broader recognition that the experience of living a curriculum shapes future practice (Dillon et al., 2017). The recurrence of project-based learning as a bridge between theory and research practice in teacher education (Restrepo et al., 2025) further suggests that the approach operates not merely as an instructional technique but as an epistemological stance that integrates knowing, doing, and reflecting. These observations challenge the persistence of command-style traditions in physical education (Roliak, 2020; Anttila et al., 2018) and support a re-theorising of the discipline around active, learner-responsive pedagogy.

Practically, the evidence offers actionable guidance for teachers, teacher educators, and coaches. For teachers, the consistent cognitive, psychomotor, and affective benefits justify investment in project-based designs, provided that facilities, time, and professional support are secured to close the documented understanding-execution gap (Priyohutomo et al., 2025a). For teacher educators, embedding project-based and experiential tasks within initial preparation appears to strengthen professional competence and employability (Folgueras et al., 2023; Dinning, 2017; Grant et al., 2024; Avalos-Ramos et al., 2025). For coaches and coach developers, the work-based model illustrates how project-based learning can support authentic, continuing professional development beyond minimum certification (Muir & North, 2024; Powell et al., 2025),

complementing wider evidence on the situated, relational nature of effective coach learning (Dehghansai et al., 2020; Cronin & Lowes, 2016).

From a motivational standpoint, the findings align with theories that emphasise autonomy, competence, and relatedness as drivers of engagement. The authentic problems and tangible products characteristic of project-based learning afford learners greater autonomy and ownership, the progressive mastery of project tasks supports perceptions of competence, and the collaborative structure cultivates relatedness among peers. This triad offers a parsimonious explanation for the consistent affective gains observed across the corpus, including improvements in self-confidence and collaboration (Jaya et al., 2025; Prayitno et al., 2025). It also clarifies why project-based learning appears effective across such varied content and contexts: the mechanism resides in the psychological conditions the pedagogy establishes rather than in any specific subject matter, a reading consistent with broader evidence on active and experiential methodologies in physical education (Hector & Salinitri, 2022; Ferriz-Valero et al., 2025).

Situating these findings relative to prior scholarship, the review corroborates analyses that map an expanding repertoire of active methodologies and pedagogical models in physical education (Arija-Mediavilla et al., 2025; Cereda, 2023) while extending them with a focused synthesis of project-based learning specifically. Whereas earlier reviews tended to treat project-based learning as one option among many, the present synthesis demonstrates its distinctive capacity to integrate movement, cognition, and collaboration around tangible outputs. It also complements evidence on adjacent innovations such as game-based learning in natural environments (Ferriz-Valero et al., 2025) and the scientific development of teaching methods in elementary physical education (Muarifin, 2022), positioning project-based learning within a broader movement toward meaningful, contextualised pedagogy.

Several contradictions and tensions in the literature warrant attention. First, the gap between teachers' positive dispositions toward project-based learning and their limited enactment (Priyohutomo et al., 2025b) contrasts with the strong outcomes reported in controlled interventions (Darmawan et al., 2025), suggesting that effectiveness under optimal conditions may not generalise to typical classrooms. Second, the gendered pattern of effects, with female learners excelling in collaboration and achievement while male learners report greater confidence (Jaya et al., 2025; Prayitno et al., 2025), complicates any uniform claim of benefit. Third, critical scholarship cautions that ostensibly innovative pedagogies may simulate rather than achieve transformation (Martos-Garcia & Garcia-Puchades, 2023), and the fragility of student-centred enactment under systemic pressure (Farias et al., 2023) tempers optimistic readings of the experimental evidence.

At least three research gaps emerge from the synthesis. First, the field lacks large-scale, longitudinal, and randomised evidence capable of establishing causal and durable effects of project-based learning on movement and learning outcomes. Second, the geographic concentration of evidence, particularly in Indonesian school settings, leaves the transferability of findings to other systems and cultures largely untested. Third, the affective and equity dimensions of project-based learning, including its differential effects across gender and ability, remain insufficiently theorised and measured, despite their evident importance for inclusive practice (Posso Pacheco et al., 2024; Ruiz-Montero et al., 2025).

For policymakers and curriculum designers, the synthesis carries a clear implication: the espousal of active pedagogy in curriculum documents must be matched by investment in the enabling conditions that allow project-based learning to function. Mandating project-based approaches without addressing facilities, time allocation, class size, and teacher preparation risks reproducing the understanding-execution gap that recurs across the teacher-perception studies (Priyohutomo et al., 2025a; Priyohutomo et al., 2025b). System-level support, including sustained professional development, accessible exemplars, and assessment frameworks that accommodate project work, is therefore a precondition for translating policy aspiration into classroom reality. The work-based coaching case demonstrates what becomes possible when such institutional commitment is present (McCarthy & Roberts, 2024), offering a transferable template for resourcing project-based development in other sectors of physical education and sport.

This review is subject to at least three limitations. First, reliance on a single database, Scopus, although chosen for metadata consistency, may have excluded relevant studies indexed elsewhere, introducing potential coverage bias. Second, the restriction to English-language journal articles and reviews may have omitted pertinent evidence published in other languages or formats, which is salient given the international and multilingual character of the field (Kuralbayeva et al., 2025). Third, the heterogeneity of designs and outcomes precluded statistical meta-analysis, so the synthesis is interpretive and cannot quantify pooled effect sizes. These limitations should be weighed when interpreting the strength of the conclusions.

Building on these gaps and limitations, three concrete directions for future research are proposed. First, researchers should conduct multi-site, longitudinal, and where ethical randomised studies that combine objective

performance measures with self-report to estimate the magnitude and durability of project-based learning effects. Second, comparative and cross-cultural studies should test the transferability of project-based designs across educational systems, levels, and contexts, including outdoor, adventure, and higher-education settings (Lefevre et al., 2025; Ulep, 2025; Alrasheed & Hamdan Alghamdi, 2023). Third, future work should integrate analytical and technological tools, including data-informed curriculum frameworks (Sun et al., 2025), to optimise project design and to investigate the equity implications of project-based learning across gender, ability, and socio-economic context.

In direct response to the research questions, the synthesis supports the following summary answers. Regarding RQ1, project-based learning is implemented in physical education and sport through three principal forms: content-specific classroom interventions, teacher-training and professional-preparation tasks, and interdisciplinary or work-based projects that bridge physical activity with academic and professional content. Regarding RQ2, project-based learning produces consistently positive cognitive, psychomotor, and affective outcomes, including achievement, movement independence, collaboration, and self-confidence, although effects vary by competency and learner characteristics, notably gender. Regarding RQ3, implementation is shaped by enabling conditions, especially facilities, time, teacher preparedness, assessment design, and institutional commitment, while the methodological base remains dominated by small-scale, single-site, quasi-experimental and descriptive designs.

Conclusions

This systematic review of 14 studies establishes that project-based learning is implemented in physical education and sport through classroom interventions, teacher-training tasks, and work-based or interdisciplinary projects, and that it consistently improves cognitive, psychomotor, and affective outcomes, including collaboration and self-confidence, even as its effects vary by competency, gender, and context. Its successful enactment depends on facilities, time, teacher preparedness, assessment design, and institutional commitment, conditions that frequently constrain practice. The review contributes the first focused synthesis of project-based learning in movement contexts, offering teachers, teacher educators, and coaches an evidence base for adopting active, inquiry-driven pedagogy. Acknowledging its reliance on a single database, English-language sources, and methodologically heterogeneous primary studies, the review calls for larger, longitudinal, cross-cultural, and methodologically rigorous research to consolidate and extend these findings.

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