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REVIEW

Evaluating the Effectiveness of Flipped Lesson Models in Physical Education: A Systematic Review of Student Engagement and Learning Outcomes

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Abstract

Flipped learning relocates direct instruction to pre-class activities and uses class time for guided practice, feedback, and collaboration. Its effectiveness in physical education (PE), where learning spans cognitive, psychomotor, and social domains, remains unclear. This systematic review was registered in PROSPERO (CRD42024543676) and reported in accordance with PRISMA 2020. Five bibliographic databases and Google Scholar were searched for peer-reviewed intervention studies published from January 2018 to January 2024. Ten studies met the eligibility criteria, and their findings were synthesised thematically. Across secondary and tertiary PE settings, flipped lessons were generally associated with higher motivation, participation, self-efficacy, collaboration, conceptual understanding, and skill performance. Outcomes varied according to the quality and alignment of pre-class materials, students' completion of preparatory work, teacher readiness, and contextual factors. Most interventions were short and geographically concentrated, and heterogeneity in study designs and measures precluded strong causal or long-term conclusions. Flipped lessons are a promising approach to active learning in PE, but benefits are not automatic. Effective implementation requires accessible, well-designed pre-class resources, purposeful in-class activities, teacher training, and support for students who struggle with self-directed preparation. Longer, more diverse, and methodologically robust studies are needed.

Introduction

Physical activity (PA) is a major determinant of health and well-being, yet participation remains inadequate worldwide. In 2024, 31% of adults and 80% of adolescents did not meet recommended activity levels (World Health Organization [WHO], 2024). This is particularly concerning because childhood and adolescence are formative periods for establishing lifelong patterns of PA (Bailey et al., 2013, 2016). Physical education (PE) is therefore a key setting for

developing the knowledge, skills, motivation, and confidence needed for sustained participation. However, conventional teacher-centred approaches do not consistently engage all learners, particularly in higher education (Yao et al., 2023).

The flipped classroom has emerged as one response to this challenge. It relocates direct instruction to pre-class study and uses class time for active application, feedback, and collaboration. Although flipped approaches have improved engagement in science, technology, engineering, mathematics, and medical education, their effectiveness in PE is less clearly established. A focused synthesis is therefore needed to examine their effects on student engagement, learning, and skill development.

The flipped classroom aligns closely with constructivist and active-learning perspectives (Bergmann & Sams, 2023; Bishop & Verleger, 2013). Constructivism proposes that learners build knowledge by connecting new information with prior experience (Moore & Piaget, 1971; Vygotsky, 1978), whereas active learning emphasises engagement, collaboration, and experience in the learning process (Bonwell & Eison, 1991). In a flipped design, students study foundational content independently before applying it through collaborative and practical activities. This sequence may support deeper understanding, retention, critical thinking, and self-directed learning (Lage et al., 2000; Tucker, 2012). However, conceptual clarity is essential because studies sometimes blur the distinction between genuinely flipped designs and broader forms of blended or active learning (Capella-Peris et al., 2023; Jensen et al., 2015).

Evidence from PE suggests that flipped lessons may improve motivation, participation, collaboration, and conceptual understanding (Botella et al., 2021; Østerlie, 2016; Østerlie et al., 2022). Their effectiveness nevertheless appears to depend on the quality and accessibility of pre-class materials, teacher preparation, student completion of preparatory work, and the alignment of pre-class and in-class activities (Chiang et al., 2018; Hsia et al., 2019). A review focused specifically on PE is therefore warranted to synthesise studies published since 2018 using a clear operational definition of the flipped model. The present review evaluates the effects of flipped lessons on student engagement and learning outcomes and considers their potential implications for lifelong physical activity.

Terminology: Flipped Classroom, Flipped Learning, and Flipped Lessons

The terms ‘flipped classroom’, ‘flipped learning’, and ‘flipped lesson’ describe related but distinct aspects of the same pedagogical approach. The flipped classroom refers to the organisation of the learning environment, flipped learning refers to the pedagogical principles that guide it, and a flipped lesson is the unit-level enactment of those principles. Distinguishing these terms clarifies the scope of the review and reduces conceptual overlap.

Flipped Classroom

The term ‘flipped classroom’ refers to a reorganisation of instruction in which content traditionally delivered during class is moved to pre-class learning, thereby freeing class time for interaction, practice, problem-solving, peer collaboration, and teacher feedback (Aidoo et al., 2022). This structural shift changes students’ role from passive recipients of information to active participants and may strengthen engagement and knowledge retention (Hsia & Hwang, 2020; Zheng et al., 2021).

Flipped Learning

Flipped learning extends beyond the physical reorganisation of class time. It is a pedagogical approach in which students acquire foundational knowledge before class and use class time for higher-order processes, including application, analysis, synthesis, discussion, and collaborative problem-solving (Bergmann & Sams, 2023; Kwon, 2021). Its emphasis on self-regulation, autonomy, and purposeful in-class activity aligns with contemporary goals for critical thinking and lifelong learning (Hsia et al., 2019; Lin & Hsia, 2019).

Flipped Lesson

A 'flipped lesson' is the practical implementation of flipped-classroom and flipped-learning principles within a specific teaching session or unit. It combines structured pre-class preparation, such as video-based instruction or theoretical review, with active in-class application. In PE, students might review rules, tactics, or movement principles before class and then use class time for guided practice, feedback, and skill execution (Baig & Yadegaridehkordi, 2023). This lesson-level perspective allows flipped approaches to be adapted to different topics, learning objectives, and student needs (Chiang et al., 2018; Sevillano-Monje et al., 2022).

Together, these concepts form a coherent learner-centred framework. The flipped classroom denotes the structural organisation, flipped learning describes the underlying pedagogy, and the flipped lesson represents its practical enactment. This hierarchy provides the conceptual basis for identifying eligible PE interventions in the present review.

Theoretical Framework

Constructivist Theory and Flipped Learning

Constructivism holds that knowledge is actively constructed rather than passively received (Moore & Piaget, 1971; Vygotsky, 1978). By allowing students to engage with foundational material at their own pace before class, flipped learning can activate prior knowledge and give learners greater control over initial comprehension (Bergmann & Sams, 2023; Bishop & Verleger, 2013). In class, students apply, question, and refine that knowledge through guided practice and interaction (Férriz-Valero et al., 2022; Hsia et al., 2019). In PE, this process is especially relevant because conceptual understanding and psychomotor performance develop through repeated links between explanation, observation, practice, and feedback.

Active Learning Theory and the Flipped Classroom

Active-learning theory emphasises students' direct involvement in learning through discussion, problem-solving, collaboration, and experience (Bonwell & Eison, 1991). Flipped classrooms support these principles by transferring much of the initial content delivery outside class and reserving class time for purposeful activity (Freeman et al., 2014). Such activities can promote deeper cognitive processing and strengthen the retention and application of knowledge (Deslauriers et al., 2019; Prince, 2004). In PE, group tasks, guided practice, peer feedback, and tactical problem-solving may connect cognitive learning with physical performance (Chiang et al., 2018; Férriz-Valero et al., 2022; Hsia et al., 2019; Sevillano-Monje et al., 2022).

Integrating the Theoretical Perspectives

Flipped learning integrates constructivist and active-learning principles by combining independent preparation with collaborative, higher-order application (Tucker, 2012). This combination may support critical thinking, problem-solving, self-efficacy, autonomy, and self-directed learning (Baepler et al., 2014; Lage et al., 2000; Zheng et al., 2021). The theoretical value of the model therefore lies not simply in moving lectures online, but in creating a deliberate sequence through which pre-class learning prepares students for meaningful in-class activity (Figure 1).

In PE, this sequence may involve reviewing rules, techniques, or tactical concepts before class and then applying them through supervised practice, feedback, and reflection (Férriz-Valero et al., 2022; Hsia et al., 2019). Constructivism explains how learners build and revise understanding across these stages, whereas active-learning theory explains the value of participation and interaction during class. Guided by this integrated framework, the review assesses the effects of flipped lessons on student engagement, learning outcomes, and the potential development of enduring physical activity habits.

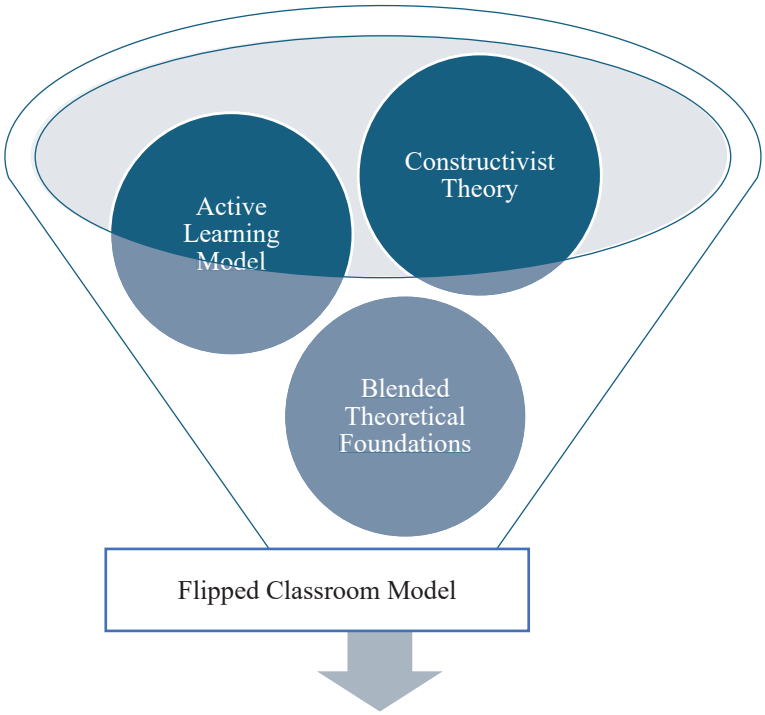

Figure 1. Flipped Classroom Theoretical Framework

Methods

This systematic review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). The protocol was registered with the International Prospective Register of Systematic Reviews on 5 May 2024 (PROSPERO: CRD42024543676).

Eligibility Criteria

Studies were eligible if they met all of the following criteria:
(a) were published in English;
(b) were peer-reviewed and published between January 2018 and January 2024;
(c) focused explicitly on flipped lessons in PE;
(d) reported an experimental or intervention study and described the flipped-lesson design;
(e) examined flipped learning wholly or primarily within PE classes; and
(f) involved students in secondary or tertiary education.

Search Strategy

Five bibliographic databases, Education Research Complete, Psychology and Behavioural Sciences Collection, Scopus, SPORTDiscus, and Web of Science, together with Google Scholar, were searched systematically. The final search was conducted on 21 April 2024. Two reviewers independently screened titles and abstracts and then assessed potentially eligible full texts against the predefined criteria. Disagreements were resolved through discussion until consensus was reached. Data from included studies were extracted independently by two reviewers to improve accuracy.

Education Research Complete (EBSCOhost): (“physical activit*” OR “physical educat*” OR sport*) AND (flip* OR blend*) AND (“secondary school” OR “high school” OR “secondary education” OR colleg* OR universit* OR “tertiary education” OR “higher education”).
Psychology and Behavioural Sciences Collection (EBSCOhost): (“physical activit*” OR “physical educat*” OR sport*) AND (flip* OR blend*) AND (“secondary school” OR “high school” OR “secondary education” OR colleg* OR universit* OR “tertiary education” OR “higher education”).
Scopus: TITLE-ABS-KEY (“physical activit*” OR “physical educat*” OR sport*) AND (flip* OR blend*) AND (“secondary school” OR “high school” OR “secondary education” OR colleg* OR universit* OR “tertiary education” OR “higher education”).
SPORTDiscus (EBSCOhost): (“physical activit*” OR “physical educat*” OR sport*) AND (flip* OR blend*) AND (“secondary school” OR “high school” OR “secondary education” OR colleg* OR universit* OR “tertiary education” OR “higher education”).
Web of Science: TI=(“physical activit*” OR “physical educat*” OR sport*) AND (flip* OR blend*) AND (“secondary school” OR “high school” OR “secondary education” OR colleg* OR universit* OR “tertiary education” OR “higher education”).
Google Scholar: at least one of the terms “flipped” or “blended”, together with the exact phrase “physical education”; the first 200 results were screened. Table 1 presents the records identified through database searching.

Table 1. Records identified through database searching

Database	Results
Education Research Complete	614
Psychology and Behavioural Sciences Collection	167
Scopus	13
SPORTDiscus	27
Web of Science	75
Google Scholar	200
Total	1096

Operational Definition of a Flipped Lesson

To maintain a clear PE-specific focus, the review applied a strict operational definition during screening. Eligible interventions had to include both of the following features: first, a clear temporal sequence in which direct instruction on theoretical or procedural knowledge was delivered before class, usually through digital resources; and second, the purposeful use of class time for supervised skill practice, application, formative feedback, or other knowledge-informed physical activity. Studies described as blended or active learning were included only when they met this two-stage structure. Interventions that merely supplemented face-to-face teaching with online materials, or that used active-learning strategies without the required pre-class and in-class sequence, were excluded. This definition was intended to distinguish genuinely flipped lessons from broader technology-enhanced or student-centred approaches.

Quality Appraisal and Data Synthesis

Methodological quality was appraised independently by two reviewers using the prespecified 16-domain AMSTAR 2 framework (Shea et al., 2017), supplemented by criteria drawn from previous sport-pedagogy reviews (Araújo et al., 2014; Chu & Zhang, 2018; Hastie & Casey, 2014). Seven domains were treated as critical. In accordance with AMSTAR 2 guidance, no overall numerical score was calculated; instead, confidence was classified as high, moderate,

low, or critically low according to the number and severity of critical and non-critical weaknesses (see Table 2). Disagreements were resolved by consensus or, when necessary, by a third reviewer.

Extracted findings were synthesised thematically (Braun & Clarke, 2006; Kiger & Varpio, 2020; Lorenc et al., 2014). The reviewers familiarised themselves with the data, generated inductive codes, developed candidate themes, and refined those themes through repeated comparison across studies. The synthesis focused on intervention characteristics, student engagement, learning outcomes, implementation conditions, and any evidence concerning the development of sustained fitness habits.

An audit trail documented decisions made during study selection, quality appraisal, data extraction, and synthesis. Reflexive discussion was used throughout the analytical process to identify assumptions and reduce the risk that individual reviewer perspectives would dominate the interpretation. Conclusions integrated the thematic findings with the appraisal of methodological strengths and weaknesses. Figure 2 presents the PRISMA flowchart for the study-selection process. Meanwhile, Figure 3 shows the AMSTAR 2 appraisal process used to assess the methodological quality of the included reviews.

Table 2. Score and Criteria

AMSTAR 2 Questions	Yes	Partial yes (PY)	No	No meta-analysis conducted (NMA)
Q1* Did the research questions and inclusion criteria for the review include the components of PICO?				
Q2 Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?				
Q3 Did the review authors explain their selection of the study designs for inclusion in the review?				
Q4* Did the review authors use a comprehensive literature search strategy?				
Q5 Did the review authors perform study selection in duplicate?				
Q6 Did the review authors perform data extraction in duplicate?				
Q7* Did the review authors provide a list of excluded studies and justify the exclusions?				
Q8 Did the review authors describe the included studies in adequate detail?				
Q9* Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?				
Q10 Did the review authors report on the sources of funding for the studies included in the review?				
Q11* If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?				
Q12 If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?				
Q13* Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?				
Q14 Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?				
Q15* If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?				
Q16 Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?				

*Note. PY = partial yes; NMA = no meta-analysis conducted. * Critical domain.*

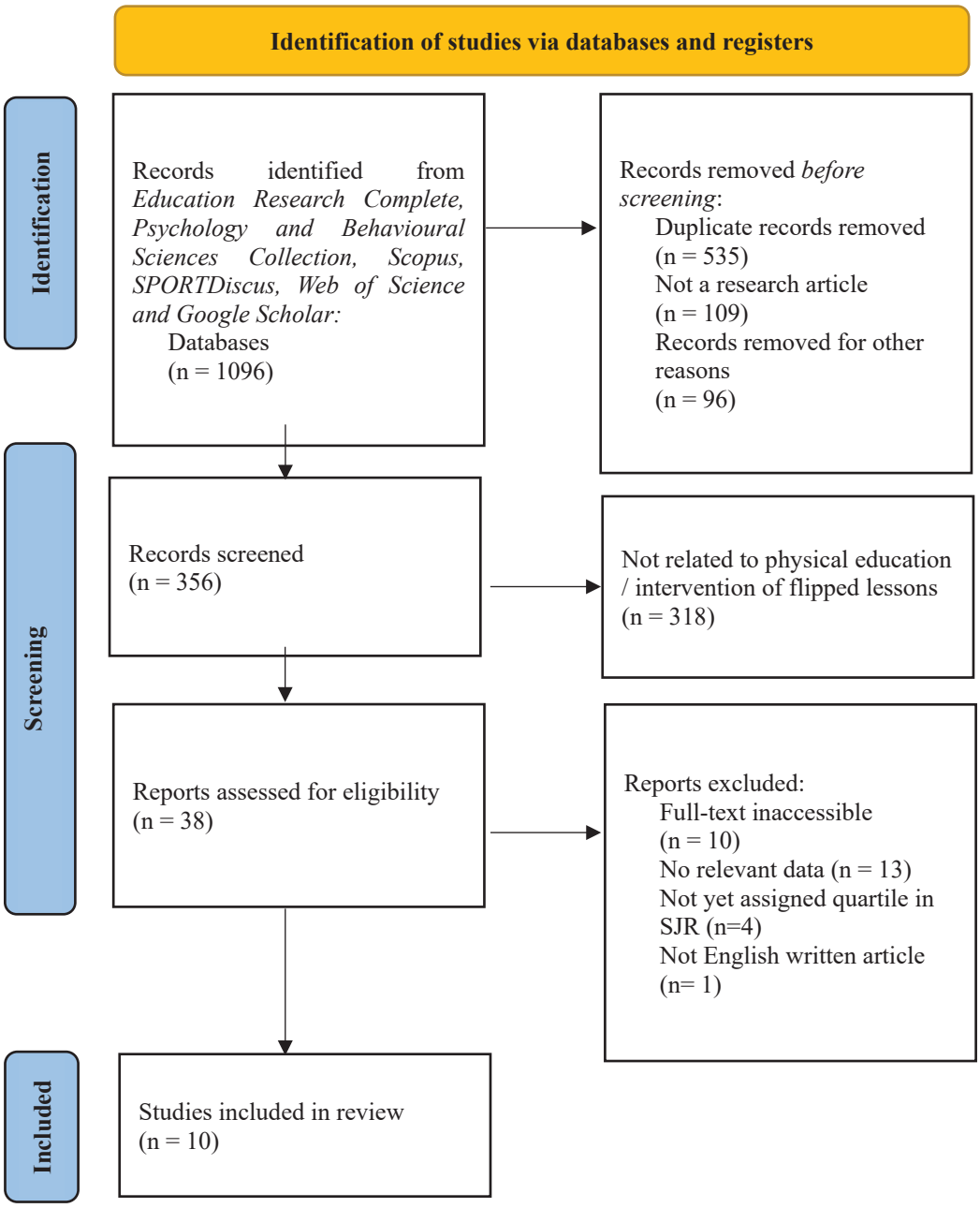

Figure 2. Identification of studies from databases and registers (last searched on 21 April 2024)

Figure 3. AMSTAR 2 Appraisal Process

Results

Ten studies met the inclusion criteria. Publication years were distributed as follows: one study in 2018, two in 2019, one in 2020, three in 2021, two in 2022, and one in 2023. Seven of the 10 studies were published from 2020 onward, indicating growing interest in flipped approaches within PE, although the overall evidence base remains small. Table 3 presents the Investigation Quality Score Checklist used to assess the quality of the included studies.

Intervention Duration and Sample Size

Nine studies examined learning, motivation, engagement, or performance outcomes across a range of physical activities (Capella-Peris et al., 2023; Chao et al., 2021; Chiang et al., 2018; Férriz-Valero et al., 2022; Hsia et al., 2019, 2021; Hsia & Hwang, 2020; Lin & Hsia, 2019; Zheng et al., 2021), whereas one focused primarily on competence development and student satisfaction (Sevillano-Monje et al., 2022). Five interventions lasted between 8 and 12 weeks. Longer interventions included an 18-week programme (Hsia et al., 2021) and a course delivered from mid-February to the end of May (Zheng et al., 2021). Sample sizes ranged from 80 students (Lin & Hsia, 2019) to 326 students (Chiang et al., 2018). This variation in duration and sample size limits direct comparison across studies and should be considered when interpreting the reported effects (see Table 4).

Study Designs

Eight studies used quantitative designs and two used mixed methods. The quantitative studies employed pretest-posttest measures, and most included intervention and comparison groups. Chao et al. (2021), Chiang et al. (2018), and Férriz-Valero et al. (2022) explicitly compared flipped learning with conventional instruction. Other studies evaluated technology-supported or strategy-enhanced variants of the flipped model. Six of these studies were conducted in Taiwan, including four that examined dance instruction (Chao et al., 2021; Hsia et al., 2019; Hsia & Hwang, 2020; Hsia et al., 2021). Outcome measures varied by activity and included knowledge, motivation, self-efficacy, satisfaction, creativity, collaboration, and skill performance, which precluded a pooled quantitative analysis (see Table 5).

Geographical Distribution

The studies were conducted in four geographical settings: Taiwan (Chao et al., 2021; Chiang et al., 2018; Hsia et al., 2019; Hsia & Hwang, 2020; Hsia et al., 2021; Lin & Hsia, 2019), mainland China (Zheng et al., 2021), the United States (Capella-Peris et al., 2023), and Spain (Férriz-Valero et al., 2022; Sevillano-Monje et al., 2022). The concentration of studies in Taiwan and Spain limits the extent to which the findings can be generalised to other educational systems and cultural contexts (see Table 6).

Table 3. Investigation Quality Score Checklist

Articles	Q1*	Q2	Q3	Q4*	Q5	Q6	Q7*	Q8
Capella-Peris et al. (2023)	Yes	PY	Yes	PY	Yes	No	No	Yes
Chao et al. (2021)	Yes	PY	Yes	PY	Yes	No	No	Yes
Chiang et al. (2018)	Yes	No	Yes	PY	Yes	Yes	No	Yes
Férriz-Valero et al. (2022)	Yes	No	Yes	PY	Yes	Yes	PY	Yes
Hsia et al. (2019)	Yes	PY	Yes	PY	Yes	No	PY	Yes
Hsia & Hwang (2020)	Yes	PY	Yes	PY	Yes	No	PY	Yes
Hsia et al. (2021)	Yes	Yes	Yes	PY	Yes	No	PY	Yes
Lin & Hsia (2019)	Yes	PY	Yes	PY	Yes	No	PY	Yes
Sevillano-Monje et al. (2022)	Yes	PY	Yes	Yes	Yes	No	PY	Yes
Zheng et al. (2021)	Yes	PY	Yes	PY	Yes	No	PY	Yes

Articles	Q9*	Q10	Q11*	Q12	Q13*	Q14	Q15*	Q16	Quality level
Capella-Peris et al. (2023)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Low
Chao et al. (2021)	Yes	No	NMA	NMA	Yes	Yes	NMA	No	Low
Chiang et al. (2018)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Moderate
Férriz-Valero et al. (2022)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Moderate
Hsia et al. (2019)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Low
Hsia & Hwang (2020)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Low
Hsia et al. (2021)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Moderate
Lin & Hsia (2019)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	No	Low
Sevillano-Monje et al. (2022)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Low
Zheng et al. (2021)	Yes	Yes	NMA	NMA	Yes	Yes	NMA	Yes	Low

Note. High = no weaknesses; moderate = one non-critical weakness; low = more than one non-critical weakness; critically low = one or more critical weaknesses.

A 'no' or 'partial yes' response to any of the seven critical items was treated as a critical weakness. A 'no' or 'partial yes' response to any of the nine non-critical items was treated as a non-critical weakness.

Table 4. Analysis of Study Duration and Sampling

Study Citation	Intervention Duration	Sample Size
Capella-Peris et al. (2023)	Not specified	n = 158
Chao et al. (2021)	10 weeks	n = 290
Chiang et al. (2018)	5 weeks	n = 326
Férriz-Valero et al. (2022)	8 weeks	n = 284
Hsia et al. (2019)	12 weeks	n = 173
Hsia & Hwang (2020)	10 weeks	n = 129
Hsia et al. (2021)	18 weeks	n = 125
Lin & Hsia (2019)	11 weeks	n = 80
Sevillano-Monje et al. (2022)	4 weeks	n = 136
Zheng et al. (2021)	14–16 weeks	n = 274

Table 5. Research Designs and Regional Focus

Research category	Number of Studies	Key Methodological Characteristics	Example Studies
Quantitative	8 (80%)	Pretest and posttest measures; intervention and comparison groups; discipline-specific measurement tools.	Chao et al. (2021); Chiang et al. (2018); Férriz-Valero et al. (2022)
Mixed methods	2 (20%)	Combination of quantitative data with qualitative insights.	Sevillano-Monje et al. (2022)
Regional focus	6 studies in Taiwan	A substantial cluster of studies examined flipped learning in Taiwan, particularly in dance education.	Chao et al. (2021); Chiang et al. (2018); Hsia et al. (2019); Hsia & Hwang (2020); Hsia et al. (2021); Lin & Hsia (2019)

Table 6. Geographic Distribution of Studies

Country	Number of Studies	Specific Region (if noted)	Example Studies
Taiwan	6	Not specified	Chao et al. (2021); Chiang et al. (2018); Hsia et al. (2019); Hsia & Hwang (2020); Hsia et al. (2021); Lin & Hsia (2019)
Mainland China	1	Fujian Province	Zheng et al. (2021)
Spain	2	Not specified	Férriz-Valero et al. (2022); Sevillano-Monje et al. (2022)
United States	1	Not specified	Capella-Peris et al. (2023)

Implementation and Teaching Approaches

The synthesis supports the theoretical expectation that pre-class preparation can enable deeper in-class engagement, but it also highlights the central role of teacher readiness. Effective implementation requires pedagogical and technical competence to produce accessible pre-class materials, use learning-management systems, monitor preparation, and facilitate active in-class learning. Studies described the use of instructional videos, the Watch-Summary-Question approach, guided reflection, and other strategies intended to connect preparatory work with higher-order thinking and collaborative practice (Capella-Peris et al., 2023; Hsia et al., 2019; Hsia & Hwang, 2020; Sevillano-Monje et al., 2022).

Implementation also created challenges. Teachers faced additional workload when developing high-quality digital content and assessing learning across pre-class and in-class stages (Férriz-Valero et al., 2022; Zheng et al., 2021). Students varied in their willingness and ability to complete preparatory activities independently, making scaffolding and accountability important (Chao et al., 2021). The studies further suggested that teachers should adapt resources and interaction patterns to learners' digital experience, language, cultural background, and support needs. In diverse classes, synchronous guidance or other blended supports may help students who are less familiar with self-directed online learning (Hsia et al., 2021; Lin & Hsia, 2019).

Overall, effective flipped lessons required more than transferring lectures to digital media. They depended on purposeful instructional design, close alignment between pre-class and in-class tasks, ongoing monitoring of student preparation, and institutional support for teacher development (see Table 7).

Table 7. Teaching Approaches and Instructor Preparedness

Category	Key Findings	Supporting Evidence
Theoretical alignment	Benefits align with constructivist and active-learning theories.	Chiang et al. (2018); Hsia & Hwang (2020)
Teacher preparation and skills	Requires pedagogical and technical skills in digital content creation, learning management system use, and active-learning strategies.	Sevillano-Monje et al. (2022); Hsia & Hwang (2020); Hsia et al. (2019)
Instructional design	Requires alignment between pre-class and in-class activities to promote higher-order thinking and collaboration.	Capella-Peris et al. (2023)
Implementation challenges	Includes high teacher workload, difficulty fostering self-directed learning, and the need to adapt to diverse learner needs and cultural contexts.	Férriz-Valero et al. (2022); Zheng et al. (2021); Chao et al. (2021); Hsia et al. (2021)

Effects on Engagement and Learning Outcomes

Across activities such as dance, volleyball, basketball, and billiards, flipped lessons generally created more class time for practice, feedback, and collaboration. Dance-based interventions that incorporated reflection and creative problem-solving reported improvements in performance, self-efficacy, creative expression, and collaborative learning (Chao et al., 2021; Hsia et al., 2021). In lower-secondary volleyball, flipped instruction was associated with stronger motivation and conceptual understanding, suggesting potential benefits across both cognitive and psychomotor domains (Férriz-Valero et al., 2022).

Some effects varied across student groups and contexts. In mobile-supported 3-on-3 basketball, gender-related differences in performance were reported, although students of both

genders benefited from the interactive design (Chiang et al., 2018). In a digitally supported university dance course, Taiwanese students reported greater satisfaction than international students, suggesting that familiarity with the cultural and technological context may influence students' experiences (Chao et al., 2021). These findings indicate that flipped lessons should be adapted rather than implemented as a uniform model.

The reviewed studies also reported outcomes related to motivation, teamwork, autonomy, reflective thinking, and creativity. Active in-class environments appeared to support intrinsic motivation and self-directed learning when students completed the preparatory work (Férriz-Valero et al., 2022; Zheng et al., 2021). Reflective activities in dance were associated with technical proficiency, critical thinking, and peer interaction (Hsia & Hwang, 2020), while a strategy-based billiards intervention supported planning and reflection (Lin & Hsia, 2019).

Taken together, the findings suggest that flipped lessons can support engagement and learning across several PE activities. However, positive outcomes were not uniform and depended on instructional design, teacher preparation, student readiness, and contextual fit. The short duration and heterogeneity of the studies also limit conclusions about sustained effects and inclusiveness (see Table 8).

Table 8. Effects and Implications of Flipped Lessons

Category	Specific Effects/Findings	Supporting Studies
Performance and engagement	Enhanced performance, self-efficacy, motivation, and conceptual understanding across various sports.	Chao et al. (2021); Hsia et al. (2021); Férriz-Valero et al. (2022); Sevillano-Monje et al. (2022)
Demographic and cultural effects	Gender: Male students outperformed female students in basketball. Culture: Taiwanese students reported higher satisfaction than international students in dance courses.	Chiang et al. (2018); Chao et al. (2021)
Psychosocial and cognitive benefits	Fostered intrinsic motivation, teamwork, creative thinking, critical thinking, and reflective practice.	Férriz-Valero et al. (2022); Zheng et al. (2021); Hsia & Hwang (2020); Lin & Hsia (2019)

Discussion

This review suggests that flipped lessons can support student engagement and learning in PE when pre-class instruction and in-class practice are deliberately connected. Across secondary and tertiary settings, the included studies generally reported improvements in motivation, participation, collaboration, conceptual understanding, self-efficacy, creativity, or skill performance. These patterns are consistent with constructivist and active-learning perspectives: students first develop a foundational understanding independently and then refine it through guided practice, feedback, and peer interaction (Bergmann & Sams, 2023; Férriz-Valero et al., 2022). Nevertheless, the small and heterogeneous evidence base does not justify treating flipped learning as uniformly superior to conventional instruction. Table 9 summarises the studies included in the systematic review.

Implementation conditions appear to be central to effectiveness. Students must be able and willing to engage with pre-class materials, and those with lower self-efficacy or weaker self-regulation may require additional structure, reminders, or support (Hsia & Hwang, 2020; Hsia et al., 2021). Pre-class resources must also be accessible, concise, and clearly connected to the practical work undertaken during class. Teacher competence in digital content design and active facilitation is therefore as important as the technology itself. Because most interventions

were short, the observed improvements in engagement and self-direction cannot yet be interpreted as evidence of lifelong fitness habits.

The review extends previous syntheses by applying a more explicit PE-specific definition of a flipped lesson and by examining the implementation conditions associated with positive and inconsistent findings. Its conclusions broadly accord with the scoping review by Østerlie et al. (2022), which identified potential gains in motivation, conceptual understanding, and skill acquisition. For practice, the evidence favours short and accessible pre-class resources, mechanisms for checking preparation, in-class tasks that require active application, timely feedback, and alternatives for students with limited digital access or self-regulatory skills. Professional development should help PE teachers align these components rather than focus only on producing instructional videos.

Table 9. Summary of Studies Included in the Systematic Review

Author and year	Objectives	Methods	Country	Teaching Approaches	Findings
Capella-Peris et al. (2023)	To analyse the effects of active learning (AL) on social entrepreneurship (SE) among physical education teacher education students (n = 158) from an urban school.	Mixed-methods design	United States	Flipped classroom and active learning	Quantitative analysis indicated that AL benefited SE among physical education teacher education students (PETEs); qualitative analysis also indicated a positive effect on their SE.
Chao et al. (2021)	To explore the effects of different teaching methods on dance-skill performance and satisfaction among Taiwanese and international students in a physical activity course.	Experimental design	Taiwan	Blended learning (BL), flipped learning (FL), and traditional teaching methods in dance	Compared with traditional teaching, BL improved Taiwanese students' dance skills and satisfaction in cognitive development, fun and enjoyment, diversionary experiences, and relaxation. It also improved international students' dance skills.
Chiang et al. (2018)	To reduce gender differences in learning through autonomous flipped learning and a diverse choice of learning channels.	Experimental design	Taiwan	Flipped classroom with an app (FCA), projecting teaching (PT), and traditional teaching (TT) in basketball	The results showed a significant interaction between teaching strategy and student gender in relation to learning performance.
Férriz-Valero et al. (2022)	To assess the effects of a flipped classroom (FC) approach on 284 Spanish secondary PE students' conceptual learning in volleyball and their motivation from a self-determination theory (SDT) perspective.	Natural experiment	Spain	Flipped classroom and traditional methodology in volleyball	Participation in the FC approach had positive effects on student motivation and learning.

Author and year	Objectives	Methods	Country	Teaching Approaches	Findings
Hsia et al. (2019)	To enhance students' performance in dance courses.	Experimental design	Taiwan	Watch-Summary-Question (WSQ)-based flipped learning and a conventional learning approach in dance	The WSQ guiding mechanism significantly improved students' dance skills, indicating that it can facilitate learning and improve performance.
Hsia & Hwang (2020)	To examine the benefits of an annotation, reflection, questioning, and interflow (ARQI)-based flipped learning approach.	Experimental design	Taiwan	ARQI-based teaching approach in dance	The ARQI approach significantly enhanced students' dance performance, and interviews indicated that it promoted reflection.
Hsia et al. (2021)	To develop a creative problem-solving (CPS)-based dance-learning approach that facilitates active learning, provides more opportunities for peer collaboration, and stimulates creativity.	Experimental design	Taiwan	Creative problem-solving (CPS)-based flipped learning in dance	The CPS-based flipped learning approach significantly improved students' choreography creativity, dance skills, and creative-thinking tendencies.
Lin & Hsia (2019)	To propose an annotation, summarising, questioning, and interflow (ASQI) mobile flipped learning approach that strengthens pre-class learning through social interaction and the sharing of experiences and strategies for billiards competition cases.	Experimental design	Taiwan	ASQI mobile flipped learning in billiards	Compared with traditional flipped learning, the ASQI-based flipped classroom helped students with lower initial skill performance catch up with peers who had stronger initial skills.
Sevillano-Monje et al. (2022)	To examine differences in knowledge acquisition among first-year students after using the flipped classroom method, analyse its effect on competence levels, and determine student satisfaction.	Mixed-methods, pre-experimental design	Spain	Holistic flipped classroom methodology	Knowledge acquisition differed significantly after the methodology was applied, with a significant effect on students' competence levels. Students also reported high levels of satisfaction across several areas.
Zheng et al. (2021)	To propose, examine, and discuss a new blended teaching method.	Experimental design	Mainland China (Fujian)	Blended learning through live online broadcasts and WeChat official account notifications	Students in blended learning performed better across the measured outcomes than students in single-mode learning, supporting the practicality and effectiveness of the proposed method.

Limitations

This review has several limitations. Only English-language, peer-reviewed studies published between January 2018 and January 2024 were eligible, and only the first 200 Google Scholar results were screened. The final evidence base comprised 10 studies, most of which were conducted in a small number of geographical settings. Considerable heterogeneity in activities, intervention designs, durations, outcome measures, and participant characteristics prevented meta-analysis and limited generalisability. Most interventions were short, several outcomes relied on self-report, and implementation fidelity was not consistently described. The appraisal framework was also not designed specifically for the full range of primary study designs included, which may have limited the precision of quality judgements. Consequently, evidence concerning long-term learning, transfer beyond the course, and the formation of lifelong fitness habits remains insufficient.

Future Research Directions

Future research should use adequately powered experimental or strong quasi-experimental designs, preregistered protocols, clearly defined flipped components, and measures of implementation fidelity. Longer follow-up periods are needed to determine whether improvements in engagement, knowledge, and skill persist and translate into sustained physical activity. Studies should include more diverse educational systems, age groups, ability levels, and cultural contexts, and should examine equity in access to devices, connectivity, and learning support. Greater consistency in outcome measurement would facilitate meta-analysis. Research should also compare alternative forms of pre-class content, identify the most effective methods for supporting students who do not prepare independently, and evaluate teacher workload, training needs, and cost-effectiveness.

Conclusion

The available evidence suggests that flipped lessons are a promising, but context-dependent, approach to PE. By moving selected instructional content before class, teachers can create additional time for guided practice, feedback, collaboration, and higher-order learning. Reported benefits include stronger engagement, motivation, conceptual understanding, self-efficacy, and skill performance, although findings are based on a small and heterogeneous group of mostly short-term studies. Successful implementation requires accessible pre-class resources, clear alignment with in-class activities, support for student self-regulation, and sustained teacher development. More rigorous and diverse research is needed before firm conclusions can be drawn about long-term effects or lifelong physical activity habits.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author(s) used ChatGPT to assist with improving language clarity, grammar, and phrasing. The authors carefully reviewed and revised the output to ensure accuracy and take full responsibility for the content of the final manuscript.

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