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Artificial Intelligence for Teaching and Learning in Physical Education: A Systematic Review

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Abstract: *Artificial intelligence (AI) is increasingly being used in physical education (PE). This systematic review examined 35 studies on how AI has been used to support teaching and learning in PE. AI was used for lesson planning, movement analysis, assessment, feedback, personalised learning and teacher professional development. In the included studies, artificial intelligence was meant to support teachers rather than replace them, with teachers remaining responsible for instructional decisions. The review suggests that AI is becoming part of the whole teaching process rather than being used for individual tasks. Future research should focus on exploring how to apply artificial intelligence to daily physical education teaching effectively.*

Keywords: *Artificial Intelligence; Physical Education; Teaching and Learning; Educational Technology; Systematic Review*

1. Introduction

1.1 Background

Artificial intelligence (AI) is becoming an important part of teaching and learning across educational settings. In physical education (PE), its growing use reflects the potential to support different aspects of teaching and learning [1].Unlike many classroom based subjects, PE relies on learning through physical movement, requiring continuous observation and timely feedback. These characteristics make PE well suited to AI-supported teaching and learning.

1.2 Research Gap, Aim and Research Questions

Recent systematic reviews have synthesised the application of AI and digital technologies in physical education [2, 3]. However, less attention has been given to synthesising the evidence according to the educational roles of AI in physical education.

The aim of this systematic review was to synthesise current evidence on the educational roles of AI in physical education. The review was guided by the following research question: How is artificial intelligence currently being used to support teaching and learning in physical education?

2. Methods

2.1 Search Strategy

A literature search was conducted in the Web of Science Core Collection on 26 June 2026. AI-related keywords (e.g., artificial intelligence, machine learning, deep learning, ChatGPT, computer vision, and intelligent tutoring systems) were combined with physical education keywords (physical education and PE) using Boolean operators. The search was limited to studies published between 2019 and 2026.

2.2 Eligibility Criteria

Studies were included if they: (1) were conducted in school, university, or physical education

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teacher education (PETE) settings; (2) investigated AI to support teaching and learning in physical education; (3) used AI technologies, including generative AI, machine learning, deep learning, computer vision, educational robotics, or intelligent tutoring systems; (4) were published as Englishpeer-reviewed journal articles or reviews; and (5) were available in full text.

Studies were excluded if they focused on sports coaching, athlete training, rehabilitation, sports medicine, or healthcare rather than physical education teaching and learning. Manuscripts focusing primarily on AI algorithm or model development, rather than physical education educational applications, will be excluded.

2.3 Study Selection

A total of 853 records were identified after database filtering. Following title screening, 190 records were retained for abstract screening and83 were assessed for full-text eligibility. Finally, 35 studies met the inclusion criteria.

2.4 Data Extraction and Synthesis

Data were extracted using a structured table and synthesised into five themes based on how AI supported teaching and learning in physical education.

3. Results

3.1 Characteristics of Included Studies

A total of 35 studies met the inclusion criteria, most were published between 2024 and 2026 which indicating growing interest in AI in physical education. These studies were conducted across multiple countries with China contributing the largest proportion. Quantitative designs predominated, however qualitative, mixed-methods, and review studies were also included. AI technologies included large language models, computer vision, machine learning, deep learning, AI-based platforms, and robotics were used.

3.2 Supporting Lesson Planning and Teaching

Twenty-one studies examined on how AI supports lesson planning and teaching in physical education. Most of them function AI as a teaching support tool for lesson preparation and classroom instruction while maintaining teachers' central role in pedagogical decision making.

Large language models, particularly ChatGPT, supported lesson preparation by generating instructional materials. Lesson plans developed collaboratively by teachers and LLMs were rated higher than those generated by LLMs alone [4]. Lesson plans produced by different LLMs, although generally acceptable, still required teacher refinement before classroom implementation [5]. Together, these findings conclude that generative AI supports lesson preparation, but cannot replace teachers' pedagogical judgement.

AI also supported classroom teaching by enhancing instructional delivery and student learning. GPT-based learning assistants provided immediate responses to students' questions [6], while AI-supported teaching platforms integrated virtual demonstrations, learning analytics, expert systems, and Internet of Things technologies to support lesson delivery and classroom organisation [7]. AI-assisted teaching models improved classroom participation and teaching effectiveness, with learning outcomes comparable to or better than traditional teaching [8]. Together, these findings suggest that AI enhances classroom teaching by supporting instructional delivery and student engagement.

Overall, AI supports lesson planning and classroom teaching while improving teaching efficiency.

3.3 Enhancing Movement Analysis, Assessment, and Feedback

Twenty-two studies investigated the use of AI to support movement analysis, assessment, and feedback in physical education. Overall, AI provided more objective assessment and timely feedback to support skill learning.

AI-supported movement analysis provided a more objective way to evaluate students' performance.

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Computer vision detected technical movement errors automatically [9],while human pose estimation compared students' movements with reference techniques to identify posture deviations [10]. Real-time visual analysis systems also supported performance evaluation during practice [11]. Collectively, these technologies made movement analysis more objective than relying on teacher observation alone.

AI also supported assessment and feedback throughout skill learning. Automatic grading enabled more consistent performance evaluation [12]. Learning records were used to monitor students' progress [13], and assessment data informed more targeted instructional support [14]. Real-time feedback systems allowed students to correct movement errors immediately [15]. ChatGPT-based systems encouraged reflection and movement refinement through structured feedback [16]. Some systems also stored repeated performance data so that learners could track their own progress over time [17]. Immediate feedback was a common feature of these studies, enabling students to identify errors and improve their movements during practice.

These applications combined movement analysis, assessment, and feedback, so students could identify mistakes and adjusts while they were still practicing.

3.4 Promoting Active Learning and Self-regulated Learning

Twenty-nine studies examined how AI supported active learning and self-regulated learning in physical education. Overall, AI shifted students from passive recipients of instruction to more active learners by promoting autonomy, engagement, and self-monitoring.

AI supported personalised learning by adapting learning support to students' individual needs. AI-generated training programmes adjusted practice recommendations based on students' movement performance and physiological data [18]. AI-assisted tactical instruction provided immediate language explanations and visual guidance [19]. These studies highlight the role of AI in adapting learning support to individual learners.

AI also promoted student engagement, motivation, and participation. A gamified AI movement assessment approach increased learning engagement through active participation during practice [20]. A robotic exercise coaching system improved children's motivation, satisfaction, and enjoyment during physical activity [21]. An NAO robot-assisted physical education programme increased children's attention and motivation, encouraging greater participation during lessons [22]. Student engagement and participation improved consistently across these studies.

AI also supported self-regulated learning. A reflection-promoting AI system enabled students to reflect on feedback and improve subsequent practice [23]. These findings suggest that AI supported self-regulated learning through continuous feedback and reflection.

These studies showed that AI help to encourage students to participate actively, learn at their own pace and reflect on their learning.

3.5 Reshaping Teachers' Professional Roles and Competencies

Eleven studies mention how AI is reshaping teachers' professional roles and competencies in physical education. Teachers needed additional knowledge and skills to use AI effectively and responsibly in physical education.

AI literacy and digital competence emerged as the most frequently discussed competencies. Integrating AI into physical education requires teachers to develop competencies beyond traditional teaching knowledge [24]. Teachers also need to critically evaluate AI-generated information and address ethical issues associated with AI use [25]. A common finding across these studies was that effective use of AI required both technical competence and critical judgement.

Teachers also remained responsible for interpreting AI-generated information and making pedagogical decisions. AI-generated results required teacher interpretation before being applied in practice [26]. These findings indicate that AI functions as a decision support tool rather than an autonomous teaching system.

Professional development was another recurring focus. Teachers required ongoing professional learning to integrate AI effectively into teaching [27]. AI also supported professional development by analysing teaching behaviours and generating personalised recommendations [28]. AI-supported reflection further helped teachers identify strengths and areas for improvement [29]. Together, these

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findings suggest that AI supports teachers' professional learning and reflective practice.

Across the included studies, effective use of AI was consistently associated with teachers' technical knowledge, professional judgement, and ongoing professional learning.

3.6 Challenges and Barriers to AI Implementation in Physical Education

Fifteen studies identified some challenges with implementing AI in physical education. The most frequently reported challenges are related to teacher readiness, technological limitations, ethical concerns and institutional support.

Teacher readiness emerged as a major challenge. Teachers need more training before AI could be effectively integrated into physical education [30]. Insufficient teacher preparation can be a problem during AI implementation.

Current AI technologies also have important limitations. Large language models may generate inaccurate information and cannot provide hand on guidance or movement-specific feedback during practical lessons [31]. This limitation reduced AI's ability to support practical physical education lessons.

Ethical and implementation challenges were also frequently reported. Common concerns included data privacy, informed consent and equitable access to AI technologies [30]. Successful implementation also depended on adequate infrastructure, institutional support and financial investment [27]. Ethical governance and institutional support were frequently identified as important implementation considerations.

Teacher readiness, technological limitations, ethical issues, and institutional support were the most reported implementation challenges.

4. Discussion

The results of this study indicate that the application of artificial intelligence in physical education is no longer limited to individual teaching tasks. Instead of supporting lesson planning, assessment and feedback separately, they combined these parts within the same teaching loop. This means that information collected during learning could be used immediately to support teaching decisions, rather than relying only on teachers' classroom observations [32]. As a result, teachers were able to monitor students' progress more continuously and adjust while learning was still taking place.

In the included studies we can conclude that artificial intelligence was primarily used to assist teachers instead of replacing them. As teachers need to decide whether the information generated by AI was suitable for their courses and students [33]. This indicates that the effective use of artificial intelligence depends not only on the technology itself, but also on teachers' ability to interpret and adjust its output in different classroom situation.

Receiving feedback during practice can change how students learn in physical education classes. Students no longer have to wait until the end of the course to find the problems, instead they can discover mistakes, reflect on their performance and make adjustments during practice [34]. Over time, this may encourage students to focus more on their own progress rather than relying solely on teacher feedback.

One limitation of the existing evidence is that most studies only examine the development of artificial intelligence over a relatively short period of time. It remains unclear whether teachers will continue to use these tools after the initial implementation, and whether students will maintain longterm engagement. The next step may not be to develop more AI tools, but to understand how existing AI tools can be used in daily physical education classes, and what changes they will bring to teaching and learning in the long term[35].

5. Conclusion

Overall, this review found that artificial intelligence is being applied in many aspects of physical education including lesson planning, assessment, feedback and personalised learning. Research shows that artificial intelligence is most effective when assisting teachers in their work rather than working independently. While artificial intelligence offers new possibilities for teaching and learning, its

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educational value depends on how it is applied in the actual classroom. Therefore, future research could focus more on actual classroom use and explore how artificial intelligence can be integrated into daily teaching in the long term.

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