

Challenges Faced When Incorporating Technology to Enhance Student Motivation in Physical Education: A Systematic Review

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Abstract

This systematic review synthesizes empirical evidence on the challenges associated with integrating technology to enhance student motivation in physical education (PE). Guided by the Technological Pedagogical Content Knowledge (TPACK) framework, the review examines pedagogical, institutional, and contextual barriers that influence the effective use of digital tools in PE settings. A structured review of peer-reviewed studies published between 2015 and 2024 was conducted, resulting in the inclusion of 27 empirical studies employing qualitative, quantitative, and mixed-methods designs. Thematic synthesis revealed two dominant and interrelated themes: Detrimental Dependency, which reflects the risk of excessive reliance on digital technologies that may reduce physical activity time and undermine core PE learning outcomes; and Confronting Digital Education's Risks Amidst Integration Challenges, which encompasses teachers' limited digital competence, pedagogical readiness, self-efficacy, curriculum constraints, insufficient professional development, and restricted access to technological resources. These challenges were further intensified in online and blended learning environments, where sustaining student engagement and delivering movement-based instruction remain persistent concerns. While technology demonstrates potential motivational and instructional benefits, the findings emphasize the necessity of a balanced, pedagogically grounded approach that positions digital tools as supportive rather than substitutive to authentic physical engagement. The review highlights implications for teacher education, professional development, and policy, underscoring the importance of integrated pedagogical frameworks and sustained institutional support to ensure effective and meaningful technology integration in physical education.

Keywords: *Technology integration in physical education; student motivation, systematic review; TPACK framework; digital competence; online and blended physical education; pedagogical challenges.*

I. Introduction

Integrating technology into physical education (PE) to enhance student motivation presents persistent

challenges related to teacher competence, instructional contexts, and institutional support. Examining these challenges is essential to understanding how technology can be effectively used to promote student engagement and motivation in PE settings. Recent studies highlight that teachers' digital competence and pedagogical readiness are critical factors influencing successful technology integration, with many educators continuing to rely on traditional teaching approaches due to limited training, confidence, and access to professional development (Wallace, Scanlon, & Calderón, 2023; Baek, Keath, & Elliott, 2018). International research further identifies inadequate infrastructure and weak administrative support as ongoing barriers that constrain the sustainable use of digital technologies in physical education (Krause, 2017; Martínez-Rico et al., 2021).

These challenges became more evident during the shift to online and blended learning, where physical education teachers experienced difficulties in sustaining student motivation, delivering quality instruction, and providing meaningful feedback in virtual environments (Lu, Barrett, & Lu, 2020; Webster et al., 2021). In the Philippine context, teachers similarly reported limitations in maintaining student attention and engagement during online PE classes, largely due to restricted opportunities for real-time interaction and feedback (Aguinaldo, 2021). Empirical studies conducted in public secondary schools in Quezon Province and selected areas of Cebu further reveal persistent constraints in access to technological tools and infrastructure, which hinder the effective integration of ICT to support student motivation and engagement in PE instruction (Culajara et al., 2023; Kilag et al., 2023).

Despite the growing body of research on technology integration in physical education, findings on the nature and extent of challenges faced by teachers remain fragmented across contexts and methodologies. A systematic review is therefore necessary to synthesize existing empirical evidence, identify recurring barriers, and examine patterns across international and local studies. By consolidating current research, this review aims to provide a coherent understanding of the challenges associated with incorporating technology to enhance student motivation in physical education and to inform future research, policy development, and

instructional practice.

2. Theory Base

This study is anchored in the Technological Pedagogical Content Knowledge (TPACK) framework (McGraw-Hill, 2019, Lu, C., & Chen, W. 2025), which emphasizes that effective technology integration in education requires a dynamic and interconnected understanding of content knowledge, pedagogical knowledge, and technological knowledge. Within the context of physical education, teachers often encounter difficulties in technology integration due to limited preparation across these intersecting domains. Challenges commonly include resistance to change stemming from reliance on traditional instructional methods, inadequate technological resources and infrastructure, and insufficient professional development opportunities to foster confidence and competence in technology use. By addressing these interconnected knowledge areas, the TPACK framework offers a comprehensive approach to overcoming instructional barriers and enhancing student motivation through the informed and effective use of technology in physical education.

3. Methods

This study employed a systematic review as its research design to comprehensively examine and synthesize empirical evidence on the challenges faced when incorporating technology to enhance student motivation in physical education (PE). A systematic review enables the structured identification, evaluation, and integration of findings across multiple studies, allowing for the recognition of recurring barriers, pedagogical constraints, and contextual patterns influencing technology use in PE settings. Unlike narrative reviews, this approach follows a transparent and replicable process for locating and analyzing empirical research, ensuring methodological rigor and minimizing bias (Baek et al., 2018; Casey et al., 2017; Wallace et al., 2023). The review was guided by the objective of consolidating fragmented evidence on technological, pedagogical, and institutional challenges that affect student motivation in technology-enhanced physical

education.

During the literature search phase, the researcher conducted a structured search of peer-reviewed journal articles and scholarly studies focusing on technology integration in physical education. The review covered studies published between 2015 and 2024, reflecting both pre-pandemic and post-pandemic instructional contexts. Studies were identified through manual screening of academic databases and reference lists of relevant articles addressing digital technologies, online and blended learning, flipped learning, learning management systems, and exergaming in PE (Calderón et al., 2020; Jeong & So, 2020; Lu et al., 2020; Martínez-Rico et al., 2021). From the initial pool, 27 studies were deemed relevant and met the inclusion criteria for systematic synthesis, ensuring adequate coverage of diverse educational contexts, instructional modalities, and teacher perspectives.

The criteria for inclusion required that studies: (a) examined challenges associated with integrating digital technologies in physical education; (b) addressed factors influencing student motivation, engagement, or learning in technology-enhanced PE settings; (c) explored teachers’ technological competence, pedagogical readiness, attitudes, or contextual constraints; and (d) employed empirical research designs, including qualitative, quantitative, or mixed methods. Studies were excluded if they focused solely on sports performance, recreational technology use, or non-instructional applications unrelated to pedagogical or motivational outcomes. Following full-text screening and application of these criteria, 27 empirical studies were included in the final synthesis. Data were analyzed using a thematic synthesis approach, involving systematic coding and categorization of recurring challenges to identify overarching pedagogical, institutional, and contextual barriers affecting the effective use of technology to enhance student motivation in physical education.

Table 1. Significant Statements and Formulated Meanings

Significant Result	Codes	Formulated Meanings
Examine the effects of a student-centered	R1	Positive and supportive learning climate

digital technology approach on pre-service teachers' motivation, learning climate, and academic achievement in PETE programs,		may enhance students' intrinsic motivation to engage in learning activities
Relationship between learning climate, intrinsic motivation, and academic achievement.		
Physical education teachers' perceptions of their ability and usage of technology, their perceived competency with various forms of technology, reasons for utilizing technology, challenges faced in implementing technology, and sources of learning to use technology.	R2	Challenges may include access barriers, technical issues, concerns about screen time, and the need for ongoing professional development.
Aiding visual learners, facilitating individual development, and supporting assessment purposes.		
Identify differences based on demographic factors, and		
Potential benefits and challenges associated with technology integration in physical education teaching practices.		
Challenges confronting students in the processes of infusing technology have both direct and indirect significant impacts on the integration of technology is important.	R3	Highlights the need for tailored approaches to address the unique challenges and opportunities present in these settings.
The mediating role of acceptance to use technology via the LMS and the significant positive impact of the LMS on the integration of technology is also an important finding.		
Extended the literature to examine the specific effects of students' challenges on the integration of technology in academic programs in public universities, LMS usage on the Integration of Technology.		
The outcome that is being assessed consists of the degrees to which various	R4	Insights into the extent of ICT integration among different groups of teachers and

teacher groups (physical education and sports teachers versus language, science, and humanities teachers) have integrated information and communication technology, as well as the factors that have an impact on these degrees, including the status of in-service training, income levels, and marital status.

to identify the factors that contribute to variations in technology use.

Teachers' unfamiliarity with Cooperative Learning and digital tools poses as a significant barrier.

R5

Targeted interventions and support mechanisms to promote effective ICT integration in teaching and learning contexts.

In this study, the teacher's first-time use of Cooperative Learning and digital technologies highlights the challenge teacher's face in adopting new pedagogical approaches.

The study provides empirical evidence that the interrelated dimensions of pedagogy acted as obstacles, complicating the initial integration of technology.

Emphasizes the importance of addressing teachers' learning, students' adaptation, and the educational context to successfully incorporate digital tools in teaching practices.

Explores the benefits of using FL to organize the use of DigiTech in PE.

FL, applied in that way, can provide the form boost to the student-learning, the better feedback and assessment business concepts, and a further student-centered mention of PE. Despite a small sample number of PE teachers who participated in the study.

R6

Flipped learning (FL) approach to incorporate digital technology in PE classes can offer various advantages, including enhanced student learning.

Knowledge and skills concerning technology implementation, attitude toward technology, and classroom management skills.

R7

Emphasizes the need for structured practice opportunities, meaningful learning experiences, and ongoing support to ensure effective implementation and enhance student

In the case of effective impact on student

learning and teachers' efficiency enhancement, universities should create opportunities for pre-service and novice teachers to participate in structured and real practice in technology-enhanced PE lessons.

Learning experience in a meaningful manner integrated into the university courses and PDPs may help teachers in developing their TPK. As for practicing teachers considering the rapidly changing nature of technology, school, and district administrators

Curriculum formulations, grade levels, outdoor knowledge areas, the digital tool used, when it is used, student needs, and teachers' ideological and value orientations. These regulations have different effects on each person and on the school environment.

Introduction of digital technology in this study, which highlights the hegemonic position orienteering holds runs the risk of overshadowing and impeding the advancement of other outdoor education knowledge domains, such as environmental sustainability and place pedagogy.

The regulations also show inconsistencies in how Swedish physical education instructors respond to changes in the curriculum, including the addition of digital technology (SNAE, Citation 2018). Teachers' habits and ideological value orientations, it is unclear how much of an impact curriculum changes have in physical education given the relatively lax use of digital technology by lower grade teachers.

Complexities physical education teachers face in the integration of digital technology

learning outcomes.

R8

Potential risks and challenges associated with the introduction of digital technology in physical education, particularly in outdoor education settings.

R9

Digital technology has the potential to positively influence student motivation.

in the teaching and learning process.

Personal (and student) biographies and contextual school barriers were identified as having a discouraging influence on the integration of digital technology in the enactment of teaching and learning.

Teachers found it difficult to effectively integrate digital technologies given they do not feel competent themselves in such integration and/or do not have the resources in place to do so.

Given the lack of competence and resources, teachers in this study chose not to integrate (or limit their use of) digital technology into their classes on a continual basis. Instead, they opted for the traditional approach to teaching the subject.

Digital technology was found to increase student's motivation levels.

The study offers insights for PETE programs and PDP providers into what training and supports are effective and meaningful to help teachers change beliefs and knowledge for technology integration.

R10

Addressing barriers, providing training and support tailored to teachers' needs, and ensuring a focus on a broad range of knowledge types beyond just technological aspects.

Although there are several barriers to technology integration, this study found that many courses and PDPs tend to be techno-centric, which causes them to miss other knowledge types. Even though TK is the most important knowledge to develop, TK alone cannot lead successful technology integration.

Thus, various learning activities which can help teachers develop other knowledge types should be provided.

Technology integration in the classroom will require the ongoing collaborative efforts of teachers, educational technology professionals, school administrators,

R11

Importance of collaboration, addressing barriers, and providing support to ensure effective technology integration in classrooms.

researchers, and educational software personnel. Fortunately, the benefits to schools, teachers, and students will yield tremendous returns.

Effective technology implementation in the classroom, which includes overcoming external and internal barriers to technology integration, improving access to resources, training, and support, addressing attitudes and beliefs of teachers, reducing resistance towards technology, and enhancing teachers' knowledge and skills in using technology.

The general objective of the study is to get greater insight into the Digital Competence of Physical Education teachers, including their technology usage, the difficulties they encounter, and the types of training and pedagogical techniques they require to instruct in today's classrooms. The variations in gender, age, and teaching experience will be emphasized.

R12

Addressing these challenges and tailoring support to teachers' specific needs, schools and educational institutions can better equip PE teachers to thrive in modern classrooms

The efficiency of pedagogical strategies and e-learning technologies in supporting online learning in physical education and sport, as well as the difficulties and achievements related to their application, are among the outcomes being assessed. The study also seeks to pinpoint possible directions for enhancing online instruction in physical education and sport.

R13

Valuable insights into the use of e-learning technologies and pedagogical strategies in online instruction for physical education and sport.

The study's overall goal is to record how e-learning technologies and pedagogical approaches were used in sport and physical education during the COVID-19 pandemic, with an emphasis on highlighting the successes and challenges that were encountered as well as possible areas where online teaching and learning practices could be improved.

The study also intends to offer insights into

the distinctive e features of PETE that can present difficulties when transferring to online instruction and to recommend future lines of inquiry for this field of study.

The study's overall goals are to investigate the difficulties and remedies related to teaching PETE in virtual settings and to offer recommendations for enhancing online PETE training considering the COVID-19 pandemic's exceptional obstacles.

The COVID-19 epidemic has presented PETE with hitherto unheard-of difficulties. However, PETE instructors would be best served by seizing this unique chance to highlight the benefits of technology rather than its drawbacks and to use it to further PETE.

Additionally, a lot of the content that is taught well in an online setting may be further leveraged and used in blended learning in the post-COVID19 PETE era. This might result in time savings in face-to-face interactions and increase the productivity of PETE. The difficulties teachers and students have when taught and learning PETE online are included in the outcome under evaluation, along with possible solutions to these difficulties.

PE teachers' pedagogical experiences, attitudes, and self-efficacy shape their integration of exergaming technologies.

Teachers' attitudes and self-efficacy are influenced by prior experiences with exergaming integration in PE.

Attitudes, self-efficacy, and influencing factors shape U.S. PE teachers' exergaming integration practices.

R14

Insights into the unique challenges and opportunities associated with teaching PETE in online settings

"Physical Education Teacher Education."

R15

Comprehensive understanding of physical education teachers' perspectives on integrating exergaming technologies, including their attitudes, self-efficacy beliefs, and the factors influencing their implementation practices.

Exergaming (video gaming technology)

Table 2. Formulated Meanings and Clustered Themes

Formulated Meanings	Clustered Themes
Technology integration in physical education can enhance student motivation, engagement, and learning when it supports student-centered instruction and meaningful learning experiences.	Motivational Benefits of Technology Integration
Digital tools improve instructional efficiency in physical education by facilitating feedback, assessment, organization of learning activities, and flexible pedagogical approaches such as flipped learning and exergaming.	Instructional Enhancement through Digital Tools
Excessive or unbalanced reliance on digital technology may reduce physical activity time, overshadow core physical education learning domains, and introduce risks related to screen time and learning quality.	Risks of Overdependence on Technology
Effective technology integration in physical education is constrained by teachers' digital competence, pedagogical readiness, institutional support, curriculum demands, and contextual challenges, including those intensified during online and blended learning.	Pedagogical, Institutional, and Contextual Challenges

Table 3. Clustered Themes and Emergent Themes

Clustered Themes	Emergent Themes
Motivational benefits of technology integration; instructional enhancement through digital tools; and risks associated with overdependence on technology, including reduced physical activity time and diminished focus on core physical education learning outcomes.	Detrimental Dependency
Pedagogical, institutional, and contextual challenges affecting technology integration, including teachers' digital competence, attitudes and self-efficacy, curriculum constraints, limited resources, and challenges intensified in online and blended physical education settings.	Confronting Digital Education's Risks Amidst Integration Challenges

4. Results and Discussions

The findings of this systematic review reveal two dominant and interrelated themes: Detrimental Dependency and Confronting Digital Education's Risks Amidst Integration Challenges. Detrimental Dependency highlights the paradox of technology use in physical education, wherein digital tools can enhance instructional delivery and student motivation, yet excessive or uncritical reliance on technology risks diminishing active participation, reducing physical activity time, and diverting attention from core physical education learning outcomes. Conversely, Confronting Digital Education's Risks Amidst Integration Challenges encapsulates the multifaceted pedagogical, institutional, and contextual barriers that constrain effective technology integration, including teachers' limited digital competence, resistance to pedagogical change, insufficient professional development, curriculum constraints, and restricted access to technological resources. These challenges are further intensified in online and blended learning environments, where sustaining student engagement and delivering movement-based instruction remain persistent concerns. Collectively, the findings underscore the necessity of a balanced, pedagogically grounded approach to technology integration that enhances student motivation while preserving the fundamental objectives of physical education.

5. Implication and Future Direction

This chapter presents the conclusions and recommendations derived from the findings of the study. The researchers synthesized the results to address the research problems concerning the integration of technology in physical education, particularly its implications for student motivation and instructional effectiveness. The conclusions are grounded in empirical evidence that supports the analyses discussed in the preceding chapter. Based on these findings, recommendations are offered to guide the enhancement of current practices, policies, and professional development initiatives aimed at promoting balanced, effective, and pedagogically sound technology integration in physical education.

5.1. Implication

The findings of this systematic review underscore the critical importance of adopting a balanced and pedagogically grounded approach to technology integration in physical education. While digital tools demonstrate clear potential to enhance student motivation, engagement, and instructional efficiency, the emergent theme of Detrimental Dependency highlights the risks associated with excessive or uncritical reliance on technology. Physical education remains fundamentally activity-based, and overdependence on digital platforms may inadvertently reduce opportunities for meaningful movement experiences and holistic skill development. Consequently, technology should be positioned as a supportive instructional resource that enhances, rather than replaces, authentic physical engagement. Educators are encouraged to align technology use with clearly defined learning objectives, ensuring that digital integration reinforces core physical education outcomes and promotes sustained student participation.

From an institutional and professional standpoint, the theme Confronting Digital Education's Risks Amidst Integration Challenges emphasizes the need for comprehensive support systems that address pedagogical, contextual, and structural barriers. Teachers' technological competence, pedagogical readiness, and self-efficacy play a central role in determining the success of technology-enhanced instruction. These findings suggest that teacher education programs, professional development initiatives, and policy frameworks should move beyond techno-centric training models and instead emphasize integrated technological pedagogical content knowledge (TPACK). Investment in continuous professional learning, access to appropriate digital infrastructure, and collaborative support mechanisms can empower educators to make informed instructional decisions and reduce resistance to pedagogical innovation in physical education contexts.

5.2. Future Direction

Future research should prioritize longitudinal and context-sensitive investigations that examine how technology integration in physical education evolves across different educational levels, cultural settings, and

instructional modalities. Given the rapid expansion of online and blended learning environments, there is a need to explore sustainable instructional models that effectively balance digital innovation with active, movement-based learning. Studies that examine the long-term effects of technology-enhanced instruction on student motivation, physical activity levels, and learning outcomes will provide valuable insights into the durability and effectiveness of current integration practices. Such research can contribute to the refinement of evidence-based frameworks that guide responsible and purposeful technology use in physical education

Additionally, future studies should focus on intervention-based and experimental designs that evaluate the impact of targeted professional development programs on teachers' digital competence, pedagogical confidence, and instructional effectiveness. As emerging technologies such as artificial intelligence, virtual reality, and advanced exergaming platforms continue to gain prominence, empirical research is needed to assess their pedagogical value, ethical considerations, and practical applicability in physical education settings. Investigating equity-related concerns, including access to resources and technological disparities, will also be essential to ensuring inclusive and effective implementation. Collectively, these research directions can inform policy development and support the advancement of technology-integrated physical education that is pedagogically sound, equitable, and future-ready.

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