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Review Article

Identifying Challenges and Opportunities in the Implementation of Mobile Learning in Physical Education: A Literature Review

Raehang[1ABCDE], La Ode Adhi Virama[1ABCDE] and Dewangga Yudhistira[2ABCDE]

[1]Institut Agama Islam Negeri Kendari
[2]Universitas Negeri Surabaya

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Corresponding Author: Raehang, e-mail: raehang70@iainkendari.ac.id
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Abstract

Objectives. This study aimed to identify the challenges and opportunities in implementing mobile learning in physical education, focusing on its impact on learning effectiveness, student engagement, and teacher readiness.

Materials and methods. In this study, a systematic review of Scopus-indexed articles (2019–2024) on mobile learning in physical education was conducted. The study followed the PRISMA methodology, selecting 10 relevant articles from an initial dataset of 241,924. The analysis encompassed publication trends, research focus, methodologies, and citation rates to evaluate mobile learning's role in physical education.

Results. The findings indicate that mobile learning presents both challenges and opportunities in physical education. Key challenges include limited technological infrastructure, insufficient teacher training, and potential reductions in student physical activity due to inappropriate app use. However, using mobile learning technology offers significant benefits, such as increased accessibility, flexible learning options, gamification for motivation, and real-time performance tracking. Effective implementation of this learning technology requires appropriate teacher training, improved infrastructure, and careful selection of digital tools that enhance student engagement in physical activities.

Conclusions. Mobile learning has the potential to enhance physical education when integrated strategically. Overcoming technological and pedagogical barriers can maximize its benefits, making learning more interactive and effective.

Keywords: challenges, opportunities, mobile learning, physical education, literature review.

Introduction

With advancements in computing and multimedia, researchers are increasingly exploring the potential of Mobile Learning to support physical education learning (Yang et al., 2020). Although there is evidence of the negative impact of internet access, social media, and mobile device usage on contemporary education (Chu, 2014), the utilization of mobile technology continues to grow in the field of education (Sobral, 2020). The growth of mobile devices is clearly faster than the growth of the global population. According to the Cisco Annual Internet Report (2018–2023) published in March 2020, smartphones are expected to experience the second-fastest growth by the end of 2023 (Criollo-C et al., 2021).

With the rapid advancement of technology, the education system must adapt and implement these innovations effectively across all academic fields (Bustillo et al., 2017). Therefore, the implementation of mobile learning-based education in learning activities will create a more natural and effective learning method for the current generation (Dingli & Seychell, 2015).

In the context of physical education, mobile learning offers various opportunities to enhance the quality of learning (Kim et al., 2017). This technology allows teachers and students to access learning materials, physical activity guides, and instructional videos that support the practical learning process (Zhu & Dragon, 2016). In addition, mobile learning can enhance student motivation through the integration of game-based applications (gamification) and real-time tracking of physical activities (Khaddage et al., 2016).

Previous studies have shown that the use of mobile learning can have a positive impact on the learning process and outcomes. For example, a study by Luong et al., (2021) found that the use of mobile-based applications in physical education significantly increased student participation

in physical activities. Another study by revealed that the integration of mobile learning in sports education provides a more interactive learning experience and encourages students to be more active in understanding sports concepts (Barker et al., 2015). However, despite these benefits, several barriers hinder teachers' use of technology, including time constraints (Palao et al., 2015), high costs (Orlando, 2014), teacher workload (Pyle & Esslinger, 2014), inadequate teacher competence (Law, 2008), limitations in device practicality and mobility (Palao et al., 2015), and teachers' resistance to change and technology adoption (Kretschmann, 2015).

Considering these challenges and opportunities, it is essential to explore how mobile learning can be optimally adapted in physical education. This study aims to identify the challenges and opportunities in implementing mobile learning and provide strategic recommendations to enhance learning effectiveness in the digital era.

Materials and methods

Study Participants

This study utilizes data sources from internationally published scientific articles registered in the Scopus database, which is recognized for its credibility.

The analyzed data consists of articles with an H-Index published in international journals and accessible through the Taylor & Francis Database, with a publication period between January 2019 and December 2024. Data collection in this study is divided into two categories: primary data sources and secondary data sources. Data coding in this study is conducted using a worksheet that serves a dual role as both an internal audit instrument and a tool for considering the exclusion of certain studies during the synthesis stage.

The article search in the Scopus database was conducted using two keywords: "Mobile Learning" and "Physical Education," with a publication timeframe from January 2019 to December 2024. The application of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) standards is illustrated through a flow diagram (Figure 1) (Karo-Karo et al., 2023; Moher et al., 2016; Sari et al., 2024), which is applied in the stages of identification, screening, eligibility selection, and inclusion, resulting in a total of 10 articles analyzed from 241,924 articles.

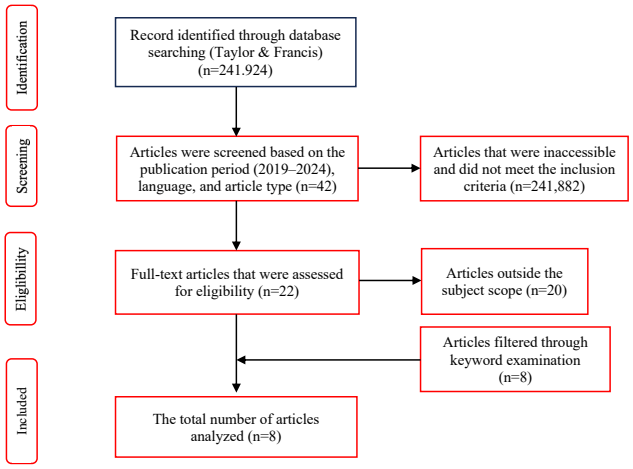

Fig. 1. Flow diagram of article selection

Bibliometric analysis involves various components, including the total number of authors, fields of study (such as mobile learning and physical education), types of research (such as experimental, descriptive, correlational, and others), annual publication trends from January 2019 to December 2024, distribution of publications based on the first author's institution, total number of authors, and the average number of citations per article.

Study Organization

The literature analysis covers six main aspects: publication trends during the period from January 2019 to December 2024, the institutions of the first authors, the composition of the number of authors, the focus of the study on Mobile Learning and Physical Education, the research methodologies (experimental, descriptive, correlational, and others) applied, as well as the average citation rate per article

Statistical Analysis

The article titles, abstracts, and keywords were condensed to form a core set of publications that can be utilized and reviewed further. The review authors only included open-access articles in their study to ensure that everyone could access the research. The application of inclusion and exclusion criteria was carried out to select studies that specifically address one particular topic.

Results

Analysis of the 8 selected articles from a total of 241,924 articles using the PRISMA method revealed several key findings regarding the implementation of mobile learning in physical education. The results of this study highlight that the implementation of mobile learning in physical education faces various challenges while also offering significant opportunities.

Discussion

The results of this study indicate that the implementation of mobile learning in physical education faces various challenges, but also offers significant opportunities for enhancing the effectiveness of learning. The main challenges identified include the lack of teacher training in the use of technology, limited infrastructure, and the potential decrease in student physical activity due to the use of inappropriate apps. Additionally, the readiness of both teachers and students to adopt digital technology remains a challenge that needs attention. Resistance to technology in outdoor education environments is also a factor that can hinder the optimal implementation of mobile learning.

According to the study by Ng et al. (2021), one of the biggest barriers to the implementation of mobile learning is the lack of teacher competence in integrating technology into teaching methods. Teachers need to understand the Technological Pedagogical Content Knowledge (TPACK) approach to effectively integrate technology into physical education. In addition, research by Bonfield et al. (2020) shows that infrastructure limitations, such as access to devices and stable internet, pose significant challenges in

Table 1. Summary of the Research Table

No	Author and Years	Method	Main Result
1.	(Ng et al., 2021)	Quantitative	Challenges: Difficulties in technology use by teachers, limited student access to technology, and the adaptation of digital assessment methods. Opportunities: Mobile Learning can serve as a solution to enhance the effectiveness of distance learning, particularly for students with special needs, as highlighted in this study.
2.	(Bonfield et al., 2020)	Literature Review	Challenges: Technical and infrastructure barriers, including access to devices and stable internet. The readiness of teachers and students to adopt technology in movement-based learning. Opportunities: Mobile learning can enhance accessibility and flexibility in PJOK learning, especially in theoretical lessons. Additionally, AI and digital assistants can provide personalized feedback to students in physical exercises.
3.	(Goad et al., 2019)	Qualitatitve	The main challenge in online physical education is ensuring that students are genuinely participating in physical activities. This article mentions that traditional verification methods, such as activity logs, online discussions, and self-reports, are less accurate. Mobile learning may limit the interaction between students and instructors, which is a crucial element in physical education. Opportunities: Mobile learning allows students to access materials anytime and anywhere. This aligns with the concept of blended learning used in online physical education. Additionally, applications like Fitocracy, MyFitnessPal, and MapMyRun support activity-based learning with features for tracking exercises, performance analysis, and social interaction.
4.	(Iannucci et al., 2023)	Self-Study Research	Teachers recognize that the use of digital technology can help overcome assessment challenges in physical education. Digital technology allows teachers to access various assessment methods that are more accurate and flexible. However, teachers face obstacles such as limited technical support, time, and resources.
5.	(Isgren Karlsson et al., 2023)	Mixed-Methods	In outdoor education, digital technology allows students to access prior information, better preparing them for outdoor activities and documenting the learning process. However, a challenge faced is that some teachers feel digital technology disrupts students' experiences in natural environments. They believe that outdoor education should focus on direct interaction with nature without the distractions of technology.
6.	(Laughlin et al., 2019)	Qualitative	Video technology allows teachers to provide immediate feedback, monitor student skill development, and conduct evidence-based assessments. This presents an opportunity for more effective implementation of mobile learning. Challenges: Technical barriers (access to devices and applications); readiness of teachers and students to adopt technology.
7.	(Lee & Gao, 2020)	Qualitative	Challenges: Reduced physical engagement as some apps increase students' sedentary time, the selection of inappropriate apps that focus only on classroom management without making a significant contribution to physical activity, and difficulties for teachers in aligning the use of technology with learning objectives. This necessitates careful consideration in choosing apps that can truly enhance physical involvement and student motivation. Opportunities: Positive potential in using mobile technology for physical education, where selecting the right apps—such as those based on gamification or physical activity tracking—can enhance students' learning experiences. This is especially true when apps provide immediate feedback through features like movement analysis based on video, which has the potential to improve self-efficacy and students' understanding of various sports movements.
8.	(Klimova, 2019)	Quantitative	Challenges: Ensuring that the use of mobile learning continues to promote physical activity and does not inadvertently reduce students' movement. Opportunities: Mobile apps can be used to provide immediate feedback, monitor physical activity, and deliver theoretical content related to sports.

the implementation of mobile learning, especially in areas with limited resources.

On the other hand, mobile learning offers various opportunities that can support physical education learning. This technology can enhance accessibility and flexibility in learning, allowing students to access materials anytime and anywhere. According to Goad et al. (2019), the implementation of gamification-based mobile apps can enhance student motiva-

tion and participation in physical activities. Apps like MyFitnessPal and MapMyRun have been proven to increase student engagement in monitoring their physical activity, thus contributing to the development of a healthy and active lifestyle.

The ability of mobile learning to provide evidence-based assessments and real-time feedback is also an advantage that can help students better understand sports movements. The study conducted by Iannucci et al. (2023) found that video-based technology allows students to review their movements and receive real-time feedback, which helps in the development of motor skills and understanding of sports concepts. This technology can also support personalized learning by allowing students to adjust the pace of their learning according to their own preferences.

In addition, the use of mobile learning in the blended learning model is increasingly growing in the field of education. According to research by Lee and Gao (2020), the combination of digital learning and face-to-face learning provides greater flexibility for both students and teachers in managing time and learning methods. With mobile learning, students can independently study sports theory through digital materials, while practical sessions are still conducted directly on the field.

The implementation of mobile learning can also help overcome time and resource limitations in physical education. According to Klimova (2019), digital technology allows teachers to automate several aspects of learning, such as assessments and tracking student progress, enabling them to focus more on direct interaction with students during physical activities. Thus, mobile learning not only enhances teaching efficiency but also helps optimize the student learning experience.

However, it is important to note that the success of implementing mobile learning in physical education greatly depends on the strategies employed. As revealed by Isgren Karlsson et al. (2023), some teachers still feel that the use of technology may disrupt students' direct experience with the natural environment in outdoor education. Therefore, there needs to be a balance between the use of technology and experiential learning to ensure that students can still reap the full benefits of both approaches.

Thus, despite the various challenges in implementing mobile learning, the benefits it offers demonstrate that this technology holds great potential in enhancing the effectiveness of physical education learning. Therefore, appropriate strategies are needed to address existing challenges, such as enhancing teacher training, developing technological infrastructure, and selecting applications that can truly support students' physical activities. With a well-planned approach, mobile learning can become an innovative solution in physical education in the digital era.

Conclusions

The implementation of mobile learning in physical education faces challenges such as infrastructure limitations, lack of teacher competence in technology, and the potential decrease in physical activity among students due to the use of inappropriate applications. However, this technology also offers significant opportunities to enhance accessibility, flexibility, and student engagement through gamification, physical activity tracking, and evidence-based assessment. Its successful implementation depends on the right strategies, including teacher training, infrastructure improvement, and the selection of applications that support active learning. Thus, mobile learning can become an innovative solution in physical education in the digital era.

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Conflict of Interest

All the authors have no conflicts of interest to declare.

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Визначення викликів та можливостей у впровадженні мобільного навчання на заняттях з фізичного виховання: Огляд літератури

Раехан[1ABCDE], Ла Ода Адхі Вірама[1ABCDE], Девангга Юдхістіра[2ABCDE]

[1]Кендарійський державний ісламський інститут
[2]Державний університет Сурабая

Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 6 с., 1 табл., 1 рис., 27 джерел.

Мета дослідження. Це дослідження мало на меті визначити виклики та можливості щодо впровадження мобільного навчання у фізичному вихованні, акцентуючи увагу на його впливі з точки зору ефективності навчання, залученості студентів та підготовленості викладачів.

Матеріали та методи. У цьому дослідженні проведено систематичний огляд статей, індексованих наукометричною базою даних Scopus (2019-2024 рр.), у яких розглянуто питання застосування мобільного навчання у фізичному вихованні. Дослідження проводилось згідно з методологією PRISMA, шляхом відбору 10 релевантних статей з початкового набору

даних у кількості 241,924. Аналіз охоплював тенденції публікацій, фокус досліджень, методології та частоту цитування з метою оцінювання ролі мобільного навчання у фізичному вихованні.

Результати. Отримані дані вказують на наявність як викликів, так і можливостей щодо застосування мобільного навчання у фізичному вихованні. Основні проблеми включають обмежену технологічну інфраструктуру, недостатню підготовку викладачів та потенційне зниження фізичної активності студентів через неналежне використання додатків. Однак використання технології мобільного навчання пропонує значні переваги, як-от підвищена доступність, гнучкі варіанти навчання, гейміфікація з метою мотивації та відстеження успішності в реальному часі. Ефективне впровадження зазначеної технології навчання потребує відповідної підготовки викладачів, покращеної інфраструктури та ретельного відбору цифрових інструментів, які сприятимуть залученню студентів до занять фізичною активністю.

Висновки. Мобільне навчання має потенціал для поліпшення навчального процесу з фізичного виховання за умови його стратегічної інтеграції. Подолання технологічних та педагогічних бар'єрів може максимізувати його переваги, сприяючи більш інтерактивному та ефективному навчанню.

Ключові слова: виклики, можливості, мобільне навчання, фізичне виховання, огляд літератури.

Information about the authors:

Raehang: raehang70@iainkendari.ac.id; https://orcid.org/0000-0003-0630-7604; Faculty of Education and Teacher Training, Institut Agama Islam Negeri Kendari, Jl. Sultan Qaimuddin No.17, Baruga, Kec. Baruga, Kota Kendari, Sulawesi Tenggara 93870, Indonesia.

Virama, La Ode Adhi: laodeadhivirama@iainkendari.ac.id; https://orcid.org/0000-0002-5081-1026; Faculty of Education and Teacher Training, Institut Agama Islam Negeri Kendari, Jl. Sultan Qaimuddin No.17, Baruga, Kec. Baruga, Kota Kendari, Sulawesi Tenggara 93870, Indonesia.

Yudhistira, Dewangga: dewanggayudhistira@unesa.ac.id; https://orcid.org/0000-0002-4194-1283; Faculty of Sport Science and Health, Universitas Negeri Surabaya, Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Kota SBY, Jawa Timur 60213, Indonesia.

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