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The Impact of Integrating Technology on Teaching and Learning in Physical Education Curriculum

(Kesan Pengintegrasian Teknologi Terhadap Pengajaran dan Pembelajaran dalam Kurikulum Pendidikan Jasmani)

Syed Mohd Najib Syed Yahya, Nur Shakila Mazalan & Khairul Azhar Jamaludin

ABSTRACT

Integrating technology into the Physical Education (PE) curriculum ensures that the quality of teaching and learning is improved. However, the integration of technology in the PE curriculum also faces some challenges that need to be addressed to ensure its successful implementation. Therefore, this paper aims to identify the impact of integrating teaching and learning technologies for the physical education curriculum. This study was conducted by examining the past empirical literature on this topic. The literature shows that there are several challenges in integrating technology in physical education such as insufficient teacher training, infrastructure limitations, and teacher and student resistance to changes in technology integration. Therefore, the findings of the study show several positive and negative effects that exist on teachers and students due to the integration technology that occurred. Among the positive effects that occurred were teacher competence, teaching skills, student engagement, and learning outcomes. Meanwhile, among the negative effects that exist are resistance to implementation, perception, and motivation. As such, the study suggests the need to establish comprehensive technology integration guidelines for teaching and learning and make collaborative efforts between stakeholders to address the challenges of technology integration in the PE curriculum. Future research should also explore innovative approaches and new technologies to further improve the quality of student teaching and learning outcomes. Knowing the challenges and impacts comprehensively, these findings provide useful information to policymakers, teachers, and researchers in this digital age of education.

Key Words: Curriculum, Physical education, Integration, Technology, Teaching and learning

ABSTRAK

Mengintegrasikan teknologi ke dalam kurikulum Pendidikan Jasmani dan Kesihatan (PJK) memberi jaminan dalam meningkatkan kualiti pengajaran dan pembelajaran. Walau bagaimanapun, integrasi teknologi dalam kurikulum PJK juga menghadapi beberapa cabaran yang perlu ditangani untuk memastikan pelaksanaannya berjaya. Oleh itu, kertas kerja ini bertujuan untuk mengenal pasti kesan cabaran dalam mengintegrasikan teknologi pengajaran dan pembelajaran bagi kurikulum pendidikan jasmani. Kajian ini dilakukan dengan meneliti literatur empirikal yang lepas mengenai topik ini. Literatur menunjukkan bahawa terdapat beberapa cabaran dalam mengintegrasikan teknologi dalam pendidikan jasmani seperti latihan guru yang tidak mencukupi, batasan infrastruktur, dan penentangan guru dan pelajar terhadap perubahan integrasi teknologi. Oleh yang demikian, dapatan kajian menunjukkan beberapa kesan positif dan negatif yang wujud terhadap guru dan pelajar akibat cabaran yang berlaku tersebut. Antara kesan yang positif berlaku adalah seperti kecekapan guru, kemahiran mengajar, penglibatan pelajar, dan hasil pembelajaran. Manakala antara kesan negatif yang wujud adalah seperti penentangan pelaksanaan, persepsi, dan motivasi. Oleh yang demikian, kajian mencadangkan keperluan untuk mewujudkan garis panduan integrasi teknologi yang komprehensif untuk pengajaran dan pembelajaran serta kerjasama antara pihak berkepentingan untuk mengatasi cabaran teknologi integrasi dalam kurikulum PJK. Penyelidikan masa depan juga harus meneroka pendekatan inovatif dan teknologi baru untuk meningkatkan lagi kualiti hasil pengajaran dan pembelajaran pelajar. Dengan mengetahui cabaran dan kesannya secara menyeluruh, ulasan ini memberikan maklumat berguna kepada pembuat dasar, guru, dan penyelidik dalam pendidikan era digital ini.

Key Words: Kurikulum, Pendidikan jasmani, Integrasi, Teknologi, Pengajaran dan pembelajaran

INTRODUCTION

Physical education (PE) plays a pivotal role in promoting health, fitness, and overall well-being among students. Delivering the PE curriculum to students can't success without teachers who provide teaching and learning with experiences. Statistics from the Ministry of Education Malaysia show that the number of Physical Education (PE) teachers in Malaysia for primary and secondary schools is 64935 teachers (KPM, 2023). Most teachers use the traditional method to deliver the PE curriculum and the lack of understanding of the curriculum content as well as understanding the integration technology in physical education (Ali, 2017; Zhen, 2021). Besides that, it also related to large number of non-optional teachers based on statistics which is 16%, or 4647 of teachers in secondary schools are non-optional teachers (KPM, 2023). Traditional approach in PE curriculum often faces challenges in meeting the diverse needs of today's learners because they are exposed to the technologically advanced world. The traditional methods of teaching PE have been criticized because their limited engagement and effectiveness in addressing the individualized needs of students.

As such, there is an urgent need to explore how technology can be leveraged to transform the delivery of PE curriculum in the future. With the rapid advancement of digital technologies, there is a growing recognition of the potential benefits of integrating technology into PE curriculum to enhance teaching and learning experiences. Recent research has shown significant results in various aspects of integrating technology into PE curriculum. For example, studies have investigated the use of information and communication technology (ICT) can help strategies across educational institutions by demonstrating its potential to enhance teaching competencies among teachers (Bondoc, 2024). Additionally, the integration of augmented reality (AR) educational programs has been shown to improve teaching skills and foster interactivity in PE instruction (AL-Sinani & Al Taher, 2023).

However, there are lots of challenges and barriers to integrating technology into PE curriculum. Studies have identified the challenges of technology integration in PE curricula still continuing such as inadequate teacher training, lack of infrastructure, resistance to change among teachers, absence of comprehensive guidelines, and best practices make it complicates to integrating technology into PE curriculum (Cavalcante et. al. 2022; Nepangue & Ibanez, 2022; de Souza et al., 2022; Chugh & Turnbull, 2023). According to Nepangue & Ibanez (2022), tertiary PE teachers experienced difficulties and yet learned to innovate in teaching, assessment, technology use, and handling situations. Other than that, lack of understanding is barriers to adopting ICTs in PE lessons, limited research on perceived challenges faced by PE teachers (Irwahand et. al. 2022). These challenges impact the implementation of the physical education curriculum if not addressed immediately.

Thus, the impact of this challenges has a significant positive and negative impact on the implementation of teaching and learning for the physical education curriculum because the main purpose of technology integration is to improve the quality of teaching and learning. There a lot of positive impact on integration technology into teaching and learning in Physical Education such as teachers' involvement with ICT-assisted strategies reflected improved teaching competencies (Bondoc, 2024). Moreover, online hybrid teaching mode has been used for the purpose of increasing student participation and learning experience (Sun, 2022). This challenge also affects students in developing their potential while improving the quality of the physical education curriculum (de Souza et. al. 2022).

However, this disruptive impact has turned into a negative impact due to the emergence of many challenges that remain unaddressed in implementing the integration of this technology. This evidenced by several studies show that the implementation of technology integration is still not encouraging and does not receive an encouraging response among teachers and students (Irwahand et al, 2022; Zhen, 2021). The study also shows that improvements need to be taken to overcome existing challenges such as increasing the promotion of the implementation of technology integration in PE (Xie, 2021). This proves that the implementation of technology integration poses its challenges and impacts teachers, students and the PE curriculum.

Therefore, this study needs to be carried out comprehensively to look at the impact on teaching and learning due to the challenges that still exist for integrating technology into the physical education curriculum. This study also very important to be carried out because look at the impact that occurs in the integration of this technology in schools can produce suggestion and solutions to be taken to overcome the challenges faced. This needs to be noted because the negative impact that occurs will affect the quality of the implementation of the PE curriculum. Study shows that negative impact can caused the quality of implementation PE curriculum, and the implementation will return to traditional methods (Chao et. al, 2021). Teaching and learning using traditional methods is less relevant now to the needs of students and the need for realistic solutions to overcome the problems that occur and avoid the negative effects (AL-Sinani & Al Taher, 2023; He & Niu, 2021).

1. **Objective**: Identify the impact of integrating technology on teaching and learning in physical education curriculum

2. **Research question**: What is the impact of integrating technology on teaching and learning in physical education curriculum

LITERATURE REVIEW

Recent years have seen a surge in efforts to integrate technology into physical education (PE) curricula that aimed to improving teaching and learning. This emerging trend encompasses a multifaceted exploration of technological applications within the PE domain because their emerging to addressing various challenges and limitations in implement the PE Curriculum.

For example, the integration of Information and Communication Technology (ICT) into physical education (PE) curriculum has emerged as a critical aspect of enhancing teaching and learning. As mention by Trabelsi (2022), ICTs as educational tools could pave the way for improvements digital literacy and increase usage rate of those tools towards PE teachers if provided with the appropriate technological resources and training. Other than that, ICT integration levels of the physical education and sports teachers differed significantly according to their in-service training status (Koç, 2022). Findings also show the competency of physical education instructors and the impact on student participation and learning experiences has improved with ICT tools (Bondoc, 2024). Additionally, the integration of information technology positively impacted student participation and learning experiences in sports human science courses like Exercise Physiology (Sun, 2022).

Currently, Augmented Reality (AR), Artificial Intelligence (AI) and Virtual Reality (VR) technologies emerged as a promising technology in enhancing teaching skills among PE teachers and it can solve the traditional teaching method problems. While traditional teaching methods have shown limited effectiveness, augmented reality educational programs have positively impacted teaching skills, particularly in planning and implementation, fostering interactivity and efficiency (AL-Sinani & Al Taher, 2023). Initiatives such as AR programs, interactive teaching systems based on AI and advancement of VR have demonstrated promising results in improving teaching skills, student participation, and learning outcomes (He & Niu, 2021; Xu et al., 2022; Yang, 2020; Xilang, 2023).

Furthermore, the adoption of cooperative learning strategies in PE has been explored with revealing diverse implementation methods and impacts on effective teaching. Cooperative learning is a dynamic instructional model that can teach diverse content to students at different grade levels which is students working together in small, structured, heterogeneous groups to master subject content (Dyson, 2012). Cooperative learning has been used for a long time in the teaching method for physical education. Teachers also have implemented various forms of cooperative learning that impacting the success of cooperative learning in PE (Schulze et al., 2023). However, Recent advancements in technology have provided personalized learning experiences to enhanced student interest and engagement and promoted lifelong sports concepts. Findings shows that evolved cooperative learning in physical education nowadays towards fun and learning, self- motivation, learning environment, and learning experiences (Paulson & Ha, 2024; Adank et. al, 2024; Moura, et. al, 2023). Similarly, while some studies explore the effectiveness of blended learning models during the COVID-19 pandemic (Gil-Espinosa et al., 2022)

There also exist development of trends related to gamification methods in the teaching and learning of physical education. The use of gamification in teaching and learning process has also existed for a long time, but the latest trend is more towards advanced technology such as smart phones, tablets, online and social network games (Montiel-Ruiz et. al, 2023; Goodyear et. al, 2023). Findings also show that the use of gamification has positive effects in various aspects including related to knowledge, skills, motivation, and student engagement (El-Tanahi et. al, 2024; Sotos-Martínez et. al, 2024). However, Chugh & Turnbull (2023) noted that variations in understanding and implementation gamification may lead to disagreements regarding its universal applicability. All technology must have some weakness and challenges to use, and it must be to overcome with available capability for produce a good quality of teaching and learning.

Therefore, the development of technology integration in PE will grow and will overcome some challenges that still exist in the integration of this technology in the future. According to Vasily (2021), technological developments that lead to challenges and impacts provide a perspective that the implementation of pedagogical innovations in the physical education curriculum will evolve in the future. However, the challenges need to be observed and examined for the development of PE quality in the future.

CHALLENGES OF TECHNOLOGY INTEGRATION

Integration technology into physical education (PE) curriculum presents significant challenges. According to Krause & Jenny (2023), the implementation of technology integration was positive overall but very limited due to the challenges that exist such as budget, equipment, training, and administrative support. Tagimaucia et. al. (2024) mention that despite their readiness of integrating technology, it's remains challenging due to a lack of incentives, limited support, and fear of the unknown. While,

study also found that class size, budget, and lack of resources were the main barriers perceived by physical educators, whereas lack of knowledge and lack of skill were not perceived as barriers to employing technology during instruction (Waller et. al, 2022). This shows that there are many obstacles that occur in implementing the integration of technology in physical education curriculum.

Among the challenges existing, one of major obstacle in integrating technological is inadequate training provided to PE teachers (Niu, 2023; de Souza et al, 2022). These studies emphasize the crucial role of teacher preparation in effectively utilizing digital technologies in PE instruction. Without sufficient training, educators may struggle to integrate technology into their teaching practices and hindering the realization of its benefits. This is because many researchers found that lack of training was a problem in their studies compared to other factors (Xie, 2021; Niu, 2023; Nepangue & Ibanez, 2022)

Furthermore, the lack of infrastructure poses another challenge to be successful integration of technology in PE curriculum. Studies by de Souza et al. (2022) and Cavalcante et al. (2022) underscore the importance of adequate technological support in facilitating the use of digital educational resources by PE teachers. In the absence of such infrastructure, educators may encounter difficulties in accessing and utilizing technology effectively, limiting their ability to innovate in PE instruction.

Resistance or fear to change among educators also become one of the significant challenges in integration of technology into PE curriculum. Research by Nepangue & Ibanez (2022) and Chugh & Turnbull (2023) identifies entrenched beliefs and attitudes as barriers to technology adoption in PE. Overcoming this resistance requires addressing teachers' concerns and providing them with the necessary support and encouragement to embrace new technological tools and pedagogies.

Moreover, the absence of comprehensive guidelines and best practices further complicates the process of integrating technology into PE curriculum. Chugh & Turnbull (2023) emphasize the need for clear guidance to assist educators in designing and implementing effective technology-enhanced teaching strategies. Without such guidance, teachers may struggle to navigate the complexities of integrating technology into their instructional practices, resulting in suboptimal outcomes for students.

Therefore, there is a need to research the impact of these challenges on the physical education curriculum. For that, this study describes the impact of challenges in integration technology into physical education curriculum. By using a comprehensive and systematic research method, the findings produced can help to solve the problems that occur.

METHODOLOGY

This research uses a research design conceptual paper to achieve the objectives of the study and answer the research questions for existing problems. According to Jaakkola (2020), a good research design for conceptual paper can be optimal to addressing the research problem and it communicates the logic of the study in a transparent way. There for, the optimal way to address this problem is to collect the data from past studies and analysis it with conceptual design because less research was done to explain and overcome the impact of challenges on integration technology in physical education. According to Chao et al. (2021), some studies lack longitudinal data or control groups will limiting the ability to draw robust conclusions about the long-term effects of integrating technology into PE curriculum. Thus, this study would explain all challenges that still existed nowadays and it impacted the physical education curriculum. This is in line with Alvesson and Sandberg (2011), that mentions the authors crafting conceptual papers can find valuable advice on problematizing.

Therefore, this study involved the collection of literature from previous studies from the Scopus, WoS, Eric and Google Scholar data databased. Literature materials used to write in these concept papers consists of several types of literature such as chapters in books, research articles, reviews articles and conference papers. The various sources used in this method to avoid bias findings and provide valuable comprehensive findings. Collected literature materials also focus on the integration of technology in the physical education curriculum by focusing on issues that show the gap between desire and reality in implementation of teaching and learning in physical education curriculum.

FINDINGS AND DISCUSSION

The current literature on integrating technology into physical education (PE) curriculum reveals several strengths and weaknesses on the impact of technology integration. The integration of technology into physical education (PE) curriculum holds promise for revolutionizing teaching and learning because numerous studies highlighting its positive impacts and benefits of the integration of this technology Bondoc (2024) underscores the effectiveness of information and communication technology (ICT) in improving teaching competencies among physical education instructors. Similarly, AL-Sinani & Al Taher (2023) emphasize the positive impact of augmented reality (AR) programs on enhancing teaching skills, particularly in planning and implementation, fostering interactivity, and improving efficiency (Niu, 2023). Moreover, Sun & Zheng (2021)

demonstrate how multimedia courseware incorporating basketball technology can significantly enhance student engagement, interest, and learning outcomes in basketball teaching, revitalizing traditional teaching methods. These findings collectively suggest that leveraging technology such as ICT, AR, and multimedia courseware can effectively enhance teaching competencies, foster interactivity, and improve student engagement and learning outcomes in PE instruction (Bondoc, 2024; AL-Sinani & Al Taher, 2023; Sun & Zheng, 2021).

The development of digital teaching resources and multimedia courseware also shown to improve student participation, learning experiences, and outcomes in PE courses (Ouyang, 2023; Sun & Zheng, 2021). Emerging technologies such as artificial intelligence (AI), virtual reality (VR), and cloud computing offer new opportunities to personalize learning, enhance engagement, and provide immersive experiences in PE curriculum (He & Niu, 2021; Rohayati et al., 2022; Sheng, 2022).

Despite the potential benefits, integrating technology into PE curriculum faces negative impacts effects due to the many challenges in implementing technology integration into teaching and learning have not been overcome. For instance, the weakness in implementing technology integration such as lack of resources. training and infrastructure (Irwahand et al., 2022). Therefore, the effectiveness of technology integration that can improve teacher efficiency will be affected by unresolved challenges. Studies show that these challenges affect the perception of teachers to be ready to implement technology integration in teaching and learning proses (Irwahand et. al. 2022).

Other than that, Nepangue & Ibanez (2022) and de Souza et al. (2022) identify inadequate teacher training, lack of infrastructure, and resistance to change among educators as significant barriers to effective technology integration in PE instruction. Furthermore, Chugh & Turnbull (2023) emphasize the absence of comprehensive guidelines as a complicating factor in integration efforts. These challenges highlight the need for tailored strategies to support educators, provide infrastructure support, and develop clear guidelines for effective technology integration in PE curriculum (Nepangue & Ibanez 2022; de Souza et. al. 2022; Chugh & Turnbull, 2023).

The synthesis of literature on integrating technology into PE curriculum make broader implications for practice, policy, and further research in PE education. Wilkinson & Penney (2023) stress the importance of policy efforts in providing educators with the necessary resources and support to overcome resistance to change and implement technology-enhanced teaching methods effectively. Moreover, teachers can benefit from evidence-based recommendations to design and implement technology in PE to improving teaching quality and student outcomes.

Innovative approaches and solutions are also needs to overcome challenges and maximize the potential of technology integration in PE curriculum. For instance, Ouyang (2023) proposes a sports digital teaching resource recommendation model to address the difficulty in choosing sports information resources due to overload and it can significantly improve the efficiency and accuracy of users' access to sports information resources. Similarly, Shaowei et al. (2022) demonstrate the potential of Java-based cloud-based PE teaching to improve students' performance through highlighting the role of cloud computing in enhancing PE instruction. Furthermore, showcase the potential of AI-based interactive teaching systems to improve physical education, emphasizing personalized teaching, higher-order thinking, and lifelong sports concepts (Ouyang, 2023; Shaowei et. al, 2022; Xu et. al, 2022). The study also emphasises the vital importance of technology in creating engaging and relevant PE experiences and recommends the provision of specialised resources, personalised curriculum guidance, and a change in teacher training institutions' paradigms to incorporate contemporary technological applications in PE (Tagimaucia et. al, 2024).

Quick action must be taken because the integration of technology into PE curriculum guarantee enhancing teaching quality and improving student outcomes. Sun & Zheng (2021) demonstrate how multimedia courseware incorporating basketball technology can significantly improve student engagement, interest, and learning outcomes in basketball teaching. Moreover, Sun & Zheng (2021) emphasize the importance of leveraging technology to revitalize traditional teaching methods and promote interactive and immersive learning experiences. Similarly, Ming (2021) highlights the role of intelligent sports teaching environments in improving campus sports development, teaching quality, and students' understanding of sports knowledge (Sun & Zheng, 2021; Ming, 2021).

Effective implementation of technology integration in PE curriculum requires collaborative efforts among stakeholders to address challenges and leverage opportunities. Nepangue & Ibanez (2022) stress the importance of tailored strategies to support educators, provide infrastructure support, and develop clear guidelines for effective technology integration in PE curriculum. Similarly, de Souza et al. (2022) highlight the need for intrinsic and extrinsic factors influencing PE teachers' engagement with digital technology, including beliefs and pedagogical time. Moreover, Cavalcante et al. (2022) present MADDIs, a web platform supporting school PE teachers in using digital educational resources, enhancing teaching practice, and promoting the use of digital technology (Nepangue & Ibanez, 2022; de Souza et. al, 2022; Cavalcante, 2022).

This study also shows that the findings of challenges in technology integration have an impact on the technology integration model in teaching which is Technology Pedagogical Content Knowledge (TPACK) model. The TPACK model shows that effective technology integration in teaching and learning must first be mastered by teachers in the following three important aspects, namely knowledge technology, pedagogical knowledge and content knowledge (Koehler & Mishra, 2009). Based on the findings obtained through the existing challenges, most teachers still do not fully master the three pillars of the TPACK model, resulting in the implementation of this technology integration is still ineffective. Therefore, the priority that should be given to teachers is to understand the correct way of teaching through training and assessment (Shulman, 1987).

Although the integration of this technology has many benefits, but it will prevent them from obtaining these benefits. Past studies have shown that physical education teachers are still weak in integrating technology in their teaching and need to be given training and guidance to improve the implementation of technology integration in the physical education curriculum (Zhen, 2021). Other studies have also shown that the many challenges in integrating technology have caused teachers to be less interested in applying technology integration in teaching (Irwahand et. al. 2022). This shows that negative impacts are more dominant than positive impact in the implementation of technology integration in physical education teaching.

Therefore, there is a need for immediate efforts and actions to overcome the challenges and the benefits of technology integration can be disseminated. That effort also will improve the quality of the physical education curriculum in the future.

CONCLUSION

In conclusion, studies have shown that integration technology has an impact on teaching and learning but there are also challenges in implementation into PE curriculum. Findings from comprehensive literature analysis show that the improvement of technology integration in teaching and learning does not occur comprehensively due to the big challenges in implementation. Therefore, urgent efforts must be taken to overcome these big challenges so that the benefits of technology integration can be distributed widely. This study also will be able to give implications for future studies in solving this challenge and contributing to the technology integration model. These findings also provide valuable insights for exploring innovative approaches, addressing existing gaps, and evaluating the long-term impact for physical education curriculum. Other than that, this study also has limitations in terms of material search sources and the scope of the study which is focused on small scope and resources. Further studies are proposed to look at the wider sources and scope of the study and to research the best methods in solving existing challenges.

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Syed Mohd Najib Syed Yahya
Faculty of Education,
Universiti Kebangsaan Malaysia
p121434@siswa.ukm.edu.my

Nur Shakila Mazalan
Faculty of Education,
Universiti Kebangsaan Malaysia
shakila@ukm.edu.my

Khairul Azhar Jamaludin
Faculty of Education,
Universiti Kebangsaan Malaysia
khairuljamaludin@ukm.edu.my

Corresponding Author: Khairul Azhar Jamaludin