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Analysis of Physical Education Teachers' Readiness in Integrating Digital Literacy into Learning

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ABSTRAK

The development of digital technology requires Physical Education, Sports, and Health (PJOK) teachers to have qualified digital literacy in order to be able to integrate technology-based media, methods, and evaluations in learning. However, the readiness and ability of PJOK teachers in this aspect is still a challenge that needs to be further researched. This study aims to analyze the influence of PJOK teachers' digital literacy on learning outcomes, learning achievements, student empowerment, evaluation quality, and student motivation and involvement. The method used is Systematic Literature Review (SLR) with 24 articles from reputable national and international journals (2020–2025) selected as the basis for the analysis. Data was analyzed through thematic synthesis to identify the pattern of influence of teachers' digital literacy on various aspects of learning. The results of the study show that PJOK teachers' digital literacy contributes positively to improving learning outcomes, competency achievement, and the quality of learning evaluation, and digital literacy also empowers students to be more independent, increase active participation, and foster intrinsic motivation in learning activities, the implications of this study are the need for sustainable teacher digital literacy training programs, support for educational infrastructure, and policies that are encouraging the integration of technology in PJOK learning in the digital era.

INTRODUCTION

The development of digital technology in the last two decades has brought significant changes in various fields, including education, digital transformation not only changes the way of communicating and accessing information, but also affects learning strategies that were previously dominated by traditional approaches, in the era of the Industrial Revolution 4.0 towards the era of 5.0, digital literacy is a key competency that must be possessed by educators, digital literacy does not only include technical skills operating digital devices, but also the ability to think critically, ethically, and creatively in utilizing them to support learning, for physical education teachers (PJOK), the integration of digital technology presents both challenges and opportunities (Saiz-González, Sierra-Díaz, Gallego, & Fernández-Río, 2024).

PJOK teachers' digital literacy includes understanding concepts, technical skills, and attitudes in using digital technology. Jingfu and Ruiming (2024) stated that increasing teachers' digital literacy is an important factor in facing the transformation of education 5.0. This is important so that teachers are able to create technology-based learning that is flexible and relevant. Research by S., Rohidi, and Rustiadi (2023) added that PJOK teachers in this era are required to be more adaptive even though there are still many who face limited competencies and supporting facilities, this phenomenon shows that there is a gap between the demands of digital education and factual conditions in the field.

The readiness of PJOK teachers is not only determined by technical skills, but also includes a pedagogical dimension. Lapesigue (2024) emphasized that teachers' technical competence determines the success of distance learning, especially when the pandemic encourages the use of digital platforms. Wallace, Scanlon, and Calderón (2022) emphasized that teachers' digital competencies need to be understood comprehensively, including technical, pedagogical, and interactive dimensions with students, so that teachers' digital literacy cannot be separated from the quality of learning strategies.

Multimedia technology is one of the important instruments in strengthening digital literacy. Sorokolit, Rymar, Bodnar, Khanikiants, and Solovey (2024) emphasized that multimedia can help teachers and students improve digital skills and facilitate the PJOK learning process. Ze, Zhao, and Chen (2024) added that the path of fostering teachers' digital literacy needs to be systematically designed through training, provision of resources, and institutional support so that technology integration runs sustainably, the findings indicate that teacher readiness is not only an individual issue, but also involves the role of the education system.

In addition to competence, teachers' attitudes towards digital technology greatly affect the success of learning. Belisario (2024) emphasized that the relationship between attitudes, competencies, and the use of technology is very close, teachers who have a positive attitude tend to be more open to digital-based innovation. However, Martínez-Rico, Pérez-Campos, and González-García (2021) show that there are still doubts about the extent to which PJOK teachers are really ready to face the digital era because gaps are still found in the mastery of digital competencies, this shows that the readiness of PJOK teachers is still a complex issue that needs to be further researched.

Teachers' digital pedagogical skills also have a direct effect on student motivation and achievement. Montilla, Rodriguez, Aliazas, and Gimpaya (2023) found that teachers' digital pedagogical competencies contribute to students' academic motivation and performance in PJOK, similar results were conveyed by Alkasasbeh and Amawi (2024) who stated that technology can improve the role of PJOK teachers to a more professional level. Afriliandhi, Hidayati, Istiqomah, and Melawati (2022) also emphasized that teachers' digital literacy is an important factor in improving the overall quality of learning.

A number of previous studies have discussed the issue of digital literacy of PJOK teachers from various perspectives. Research by Saiz-González et al. (2024) highlights the barriers and readiness of teachers in integrating technology, Jingfu and Ruiming (2024) research discusses strategies for improving teachers' digital literacy, while research by S., Rohidi, and Rustiadi (2023) emphasizes teacher adaptation in the 5.0 era. Lapesigue (2024) emphasizes the importance of teachers' technical competence in distance learning. Wallace et al. (2022) examined teachers' digital competencies holistically. Sorokolit et al. (2024) emphasized the role of multimedia, while Ze et al.

(2024) highlighted the development of teachers' digital literacy. Belisario (2024) examines the relationship between competencies, attitudes, and the use of technology.

However, these studies generally partially discuss digital literacy factors, in terms of technical competence, attitudes, and institutional support, so they do not provide a comprehensive picture of the readiness of PJOK teachers in facing the demands of the digital era, so this study focuses on the analysis of the readiness of PJOK teachers in integrating digital literacy by emphasizing three main aspects, namely competence, attitudes, and obstacles, this holistic approach is the focus The research is expected to fill the literature gap and provide a more comprehensive understanding than previous studies.

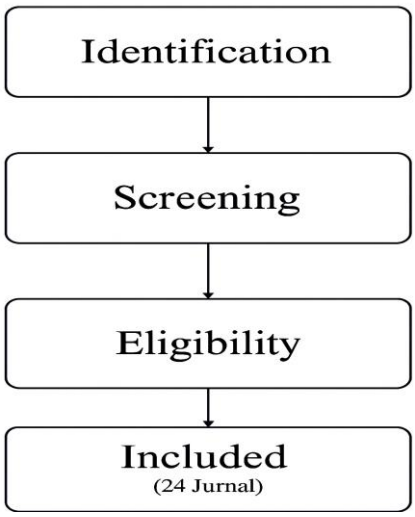
The purpose of this study is to analyze the readiness of physical education teachers in integrating digital literacy into learning, the results of the research are expected to contribute to the development of strategies to improve the quality of technology-based PJOK learning while enriching literature related to teachers' digital literacy in the context of physical education.

METHODOLOGY

This study uses the Systematic Literature Review (SLR) approach to analyze the readiness of physical education teachers (PJOK) in integrating digital literacy into learning, this approach was chosen because it is in accordance with the research objectives that focus on literature mapping, trend identification, and determination of research gaps related to teacher digital literacy. Several previous studies with similar themes also used the review method, such as the study by Østerlie, Kristensen, Holland, Miñano, and Whatman (2025) which conducted a scoping review on the use of digital technology in physical education, the research of Wohlfart and Wagner (2022) which examined the role of teachers in the digitalization of education through umbrella review, and Basilotta-Gómez-Pablos, Matarranz, Casado-Aranda, and Otto (2022) which used systematic literature review to examine the digital competence of lecturers. This shows that SLR is the right method to produce a comprehensive picture of PJOK teachers' readiness in digital literacy integration.

Research data sources come from national and international academic databases, such as Scopus, Web of Science, SpringerLink, Taylor & Francis Online, ScienceDirect, and Google Scholar. The literature search strategy uses a combination of keywords: "digital literacy and physical education teachers", "teacher readiness and digital competence", and "technology integration and physical education." The publication range is limited to articles published in 2020–2025 to ensure relevance to the latest developments, the articles considered include empirical studies and literature reviews that directly discuss the digital literacy of PJOK teachers.

Inclusion criteria include: (1) articles published in peer-reviewed journals, (2) focus on digital literacy, competence, readiness, or technology integration by PJOK teachers, and (3) in English or Indonesian, articles in the form of editorial, opinions, non-academic reports, or irrelevant to PJOK teachers are issued, the selection process is carried out systematically until only relevant articles are used as analysis materials.



The diagram depicts the main stages, starting from the identification to the remaining 24 journals that meet the inclusion criteria and are relevant to the focus of the research, each stage, including screening and feasibility assessment, emphasizes a strict selection procedure, so that only valid and relevant studies are analyzed, this visualization confirms the transparency and regularity of the systematic literature review (SLR) method, making it easier for readers to understand the mechanism of literature selection, With the screening of 24 journals, this diagram at the same time emphasizes the quality and relevance of sources as the basis for analyzing the digital literacy competencies of PJOK teachers in the education era 5.0.

RESULTS AND DISCUSSION

The results of this study show that the digital literacy of PJOK teachers has a significant influence on learning outcomes and student learning achievements, teachers who have a high level of digital literacy are able to utilize technology to design learning that is more interactive, adaptive, and contextual, so that students can more easily understand the concepts taught. The use of digital media such as simulations, interactive videos, online platforms, and digital-based evaluation tools strengthens the learning process, increases student engagement, and allows for more accurate measurement of achievement. These findings support the research of Iannucci, Fletcher, and Scanlon (2023), who assert that teachers who implement digital assessment practices are able to improve their assessment literacy, which has a positive impact on student learning outcomes. In other words, the mastery of digital literacy of PJOK teachers plays a key driving factor in improving student learning achievement.

In addition, this study found that teachers' digital competence has a direct effect on the quality of learning and student achievement. Maksimović and Lazić (2023) show that teachers with high digital competence are able to integrate technology to manage the classroom, provide instruction, and evaluate learning outcomes effectively. With adequate digital competence, PJOK teachers can design collaborative learning strategies, use interactive media, and adjust teaching methods according to individual students' needs, this is in line with the results of Østerlie et al.'s (2025) research, which emphasizes that the use of digital technology in physical education improves teachers' pedagogical skills and empowers students to play an active role in learning, thus indicating that literacy

PJOK teachers' digital skills not only affect the learning process, but also improve learning outcomes and overall student competency achievement.

This study emphasizes the role of digital data and evaluation in PJOK learning, teachers who are able to utilize student learning outcome data through digital platforms can analyze competency gaps and adjust teaching strategies appropriately. This supports the findings of Falloon (2020), who states that the transformation of digital literacy into digital competencies allows teachers to design adaptive learning and responsive to students' different abilities, with effective use of data, teachers can identify individual student learning needs, provide accurate feedback, and design more targeted learning interventions. These findings are also supported by Zimmer and Matthews (2022), who show that the virtual coaching model improves teachers' digital competence, making the learning process more efficient and supporting the achievement of student learning outcomes.

The results of this study also confirm that PJOK teachers who have high digital literacy can empower students to take an active role in learning. Lin, Yang, Jiang, and Li (2022) show that data literacy and teachers' digital competencies contribute to student empowerment, increasing creativity, participation, and learning independence. H, Ramli, Bena, Arwadi, Syawaluddin, and Nur (2024) added that teachers' readiness in online learning, which includes digital literacy, self-efficacy, pedagogical competence, attitudes, infrastructure, and management support, has a positive impact on student achievement, so that digitally competent teachers are able to design learning that is challenging and fun, so that students are encouraged to actively participate and improve their academic achievements.

These findings are in line with the results of research by Wohlfart and Wagner (2022), which emphasized that teachers are the main actors in the digitalization of education, so that teachers' digital literacy is a key factor in improving learning outcomes. Sánchez-Cruzado, Campión, and Sánchez-Compaña (2021) also emphasized that teachers' digital literacy is a major challenge post-COVID-19 pandemic, because teachers who do not master technology experience difficulties in optimizing the online learning process, so that PJOK teachers' digital literacy is a variable that determines the effectiveness and achievement of student learning in the digital learning era.

In addition, this study shows that digitally competent teachers are able to increase student motivation and engagement through the use of interactive media and technology-based learning methods. Basilotta-Gómez-Pablos et al. (2022) stated that teachers' digital competencies in higher education allow teachers to design more creative, adaptive, and collaborative teaching strategies. These findings support the research of Chan, Tan, and Verma (2025), which shows that there is a positive relationship between teachers' digital literacy and the use of technology in learning, resulting in a significant increase in students' academic achievement. Through good digital competencies, teachers can create relevant and challenging learning experiences, increase student participation, and ensure each student achieves competency standards.

In addition to the influence on engagement, teachers' digital literacy also has an impact on the quality of assessment and monitoring of learning outcomes. Nguyen and Habók (2023) found that the use of digital evaluation tools allows teachers to accurately assess students' competencies, provide timely feedback, and identify learning intervention needs. This reinforces the research of Iannucci et al. (2023) and Falloon (2020), which affirm that digitally competent teachers are able to design and implement formative and

summative assessments effectively, so that learning outcomes and student learning outcomes are increased.

The results of this study show that the digital literacy of PJOK teachers not only affects academic achievement, but also on student empowerment, teachers who have high digital competence can integrate technology for collaborative, creative, and reflective learning, the results of this study are in line with Lin et al. (2022) and Zimmer & Matthews (2022), who emphasize that teachers with high digital literacy are able to empower students to learn independently, collaborate, and think critically. Thus, teachers' digital literacy is a crucial factor in improving the quality and achievement of student learning as a whole.

This study emphasizes that PJOK teachers' digital literacy affects all stages of learning, from planning, implementation, to evaluation. Maksimović & Lazić (2023) show that teachers with digital competence are able to manage classrooms, design interactive learning activities, and adapt teaching methods to students' needs. Østerlie et al. (2025) added that the use of digital technology improves teachers' pedagogical skills and empowers students. Falloon (2020) emphasized that digitally competent teachers are able to design adaptive learning, so that learning outcomes and student learning achievement increase significantly.

Digital Literacy Aspects of PJOK Teachers (X)	**Impact on Learning Outcomes & Learning Outcomes (Y)**	**Explanation of Findings**	**Supporting References**
Digital learning design	Learning outcomes and competency achievement	Teachers design interactive, adaptive, and contextual learning with digital media so that students can understand the material more easily.	Iannucci et al. (2023); Maksimović & Lazić (2023); Falloon (2020); Østerlie et al. (2025)
Student empowerment through technology	Student independence & participation	Teachers empower students to think critically, collaborate, and independently in learning through the use of technology.	Lin et al. (2022); H et al. (2024); Zimmer & Matthews (2022); Chan et al. (2025)
Digital-based evaluation	Quality of assessment & accuracy of assessment	Teachers use digital tools for formative/summative assessments that are more varied, objective, and accurate.	Iannucci et al. (2023); Nguyen & Habók (2023); Basilotta-Gómez-Pablos et al. (2022); Wohlfart & Wagner (2022)
Learning media innovations	Student motivation & involvement	Interactive digital media increases students' interest, intrinsic motivation, and active involvement in PJOK learning.	Sánchez-Cruzado et al. (2021); Chan et al. (2025); Østerlie et al. (2025); Zimmer & Matthews (2022)

Digital pedagogical competencies	Holistic learning achievement	Teachers' digital literacy is not only technical, but also pedagogical, thereby improving the overall quality of learning.	Wohlfart & Wagner (2022); Falloon (2020); Basilotta-Gómez-Pablos et al. (2022)

The table shows a summary of the results of the research on the influence of PJOK teachers' digital literacy on various aspects of learning outcomes and student learning achievements, from the table it appears that teachers' digital literacy contributes to improving learning outcomes and achievement of competencies through designing digital learning that is more interactive and adaptive. In addition, teachers' digital literacy also plays a role in empowering students through technology, which encourages independence, active participation, and collaboration in the learning process, and digital-based evaluation aspects have been proven to improve the quality of assessments, assessment accuracy, and relevance of the learning strategies used. Digital media innovations implemented by teachers also affect student motivation and engagement, while teachers' digital pedagogical competencies contribute to holistic learning achievements.

CONCLUSION

This study concludes that the digital literacy of PJOK teachers is an important factor that affects learning outcomes, learning achievement, student empowerment, evaluation quality, and student motivation and involvement. Teachers with high digital competence are able to design more interactive, adaptive, and data-based learning so that students can achieve learning goals more optimally, in addition, mastery of digital literacy has also been proven to empower students to be more independent, increase active participation, and foster intrinsic motivation in PJOK learning. The implication of this study is the need to strengthen teachers' digital literacy through continuous training programs, the provision of adequate educational technology infrastructure, and school policies that encourage digital integration in learning. Teachers are not only required to master technical skills, but must also be able to relate them to pedagogical strategies that suit the characteristics of students.

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