

The Role and Challenges of Physical Education and Sports in STEM-Oriented Vocational Education: A Systematic Review

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Abstract

Physical education (PE) and sports play a critical role in promoting holistic development, health, and workforce readiness among students. However, their integration within vocational education and training (TVET) institutions remains inconsistent and underexplored. This systematic literature review synthesizes findings from 11 peer-reviewed studies published between 2014 and 2024, focusing on the structural, pedagogical, cultural, and policy-related barriers to PE implementation in vocational contexts. The review identified five dominant themes: physical inactivity and health concerns, barriers to intervention and implementation, structural and institutional limitations, ideological and cultural influences, and teacher capacity and equity issues. The analysis revealed that despite the physical demands of many

vocational careers, PE is often deprioritized due to limited infrastructure, rigid curricula, insufficient teacher training, and socio-cultural perceptions that devalue physical education. These challenges hinder students' physical and mental well-being and limit the development of essential soft skills. The review highlights a critical need for context-sensitive PE strategies tailored to vocational institutions and calls for further empirical research to support policy and program reform. Addressing these challenges is essential to aligning PE with the holistic educational mission of TVET institutions and enhancing students' long-term occupational health and success.

Keywords: physical education, sports science, vocational education, STEM, TVET, education

1. Introduction

Physical education and sports have long been recognized as essential components of a holistic educational experience, contributing to students' physical health, mental well-being, and social development. They promote qualities such as teamwork, leadership, and resilience, which are valuable throughout life. Numerous global health organizations advocate for the integration of physical activity into school curricula as a means of combating sedentary behavior and preventing chronic illnesses (Motevalli et al., 2025). Participation in sports has also been shown to improve cognitive functions such as memory, attention, and executive skills, which positively impact academic performance (Burns et al., 2020). Additionally, physical education contributes to social cohesion by providing inclusive spaces where students of diverse backgrounds can interact and collaborate (Smith et al., 2020). In light of increasing urbanization, technological advancements, and changing lifestyles, maintaining active routines has become increasingly challenging, further emphasizing the importance of structured physical education within educational systems. While these programs are generally prioritized in primary and secondary education, their prominence tends to decline in higher education settings, particularly within vocational institutions. This trend is concerning, as it limits students' opportunities for structured physical activity during critical years of development and transition into adulthood. Given the documented benefits of physical activity for physical health, mental well-being, and cognitive development, it is essential that all tiers of education provide students with opportunities to engage in regular, meaningful physical activity. Despite this, physical education in vocational institutions has received comparatively little academic attention, with most existing literature focusing on general education or higher education contexts. This literature review aims to address this oversight by systematically examining the challenges associated with physical education and sports programs in vocational education institutions.

Vocational education and training institutions serve a distinct purpose within national education systems by equipping students with practical skills and specialized competencies required in specific trades and industries. As societies increasingly prioritize skills-based economies, vocational institutions play a vital role in preparing future workforces for evolving labor market demands. Unlike general education, vocational programs often emphasize technical training, sometimes to the exclusion of broader developmental subjects

such as physical education. This imbalance is problematic, particularly given that many vocational occupations demand a high level of physical stamina, motor coordination, and ergonomic awareness. Despite this, physical education remains an overlooked component of many vocational programs. Several studies have noted that physical education is marginalized within vocational institutions due to curricular constraints, infrastructural limitations, and a lack of institutional prioritization (Hyland, 2018; Laquinarion et al., 2024). Additionally, vocational students frequently encounter elevated stress levels, as they balance rigorous academic and practical requirements alongside part-time employment and other personal responsibilities (Cao & Zheng, 2023; Dubczak, 2020; Kärner et al., 2024; Yüksel & Açıkel, 2024). Structured physical activity could serve as a valuable coping mechanism for stress management, mental health support, and social engagement, yet opportunities for such engagement are often limited. Cultural attitudes within vocational education may also contribute to the marginalization of physical education, as it is sometimes perceived as recreational or secondary to vocational skills development (Xin, 2025). This perspective risks neglecting the holistic developmental needs of vocational students, particularly those engaged in physically demanding trades. Therefore, assessing the status and delivery of physical education within these institutions is essential for promoting student well-being and occupational readiness.

The integration of physical education into vocational education settings holds particular importance, given the nature of many vocational professions that require consistent physical performance. Jobs in trades such as construction, automotive technology, nursing, and culinary arts demand both physical stamina and technical precision, which can be supported through structured physical education programs. In addition to preparing students for the physical demands of their future careers, regular physical activity contributes to overall health, injury prevention, and occupational safety awareness. Research has demonstrated that physical activity interventions in vocational education settings can enhance students' fitness levels, reduce stress, and improve self-efficacy (Grüne et al., 2020). Furthermore, physical education fosters transferable soft skills such as teamwork, leadership, time management, and interpersonal communication, which are crucial in dynamic work environments. Despite these potential benefits, vocational institutions often face significant obstacles in providing regular physical education opportunities. Studies have revealed that the limited availability of facilities, insufficient qualified staff, and competing curriculum demands consistently undermine physical education delivery (Burns et al., 2020; Quarmby et al., 2025; Yaakop et al., 2023). Additionally, vocational students may display lower motivation to participate in organized physical activities due to fatigue from apprenticeships and work placements, as well as a perception that physical exertion during practical training compensates for structured exercise (Liu, 2025). These challenges highlight the importance of integrating physical education in a manner tailored to the unique demands and schedules of vocational education. Addressing these issues is essential not only for the students' immediate health and well-being but also for promoting long-term occupational health in physically demanding professions.

Despite its recognized benefits, physical education within vocational education settings faces

a range of persistent challenges. One of the most critical issues is the inadequate infrastructure for physical education and sports activities. Many vocational institutions prioritize investment in technical workshops, laboratories, and industry-specific equipment, often leaving limited resources for sports fields, gymnasiums, or fitness facilities (Huang & Wei, 2024; Zhang, 2020). This infrastructural limitation is particularly evident in underfunded or rural institutions, where even basic facilities are often lacking. Compounding this problem is a shortage of qualified physical education teachers, with some vocational institutions relying on staff who lack specialized training in physical education pedagogy (Cardina & James, 2021). This affects the quality and consistency of program delivery, which can undermine student engagement. Additionally, vocational curricula are typically intensive and tightly structured, leaving limited room for supplementary subjects like physical education. Time constraints due to academic courses, practical placements, and part-time work make it difficult for students to engage in extracurricular activities, including sports and fitness programs (Van Le, 2024). Cultural attitudes also contribute to these challenges. In some contexts, both administrators and students view physical education as non-essential or recreational, leading to its marginalization within the institutional culture (Tannehill & Zakrajsek, 1994). This perception overlooks the physical demands of many vocational careers and the preventive health benefits of regular physical activity. Furthermore, a lack of national policy directives regarding mandatory physical education in vocational institutions has resulted in significant disparities in program availability and implementation between regions and countries (Liu & Hardy, 2021; Michael et al., 2021). Understanding these recurring challenges is crucial for developing targeted strategies and policy interventions aimed at promoting physical education within vocational education.

While extensive research exists on physical education in primary, secondary, and general tertiary education, considerably less attention has been devoted to its role within vocational institutions. Most available studies are geographically localized, small in scale, or narrowly focused on specific aspects of physical education delivery, limiting their generalizability (Liu & Hardy, 2021; Zhang, 2020). Furthermore, existing research often adopts qualitative or descriptive designs, with a scarcity of large-scale, systematic reviews that synthesize broader trends and recurring obstacles (Coledam et al., 2022). This fragmentation in the literature restricts the development of evidence-based policy recommendations and comprehensive program models for vocational institutions. Additionally, vocational students are frequently treated as a homogeneous population, overlooking variations in age, gender, socioeconomic background, and vocational field that shape their attitudes toward physical activity and access to health-promoting programs (Page & Moher, 2017). Few studies have examined the long-term occupational health implications of insufficient physical education opportunities among vocational students, particularly in physically demanding trades. Limited attention has also been given to the role of physical education in supporting vocational students' mental health, social integration, and stress management. These gaps in knowledge hinder the ability of policymakers and educators to develop targeted, inclusive, and context-appropriate interventions. Furthermore, the limited volume and fragmented nature of existing studies highlight the need for more comprehensive, empirical research into PE in vocational contexts. This systematic literature review addresses this issue by consolidating available research on

the challenges of physical education in vocational education settings, offering insights into persistent barriers and their implications for student well-being and workforce readiness.

In light of these challenges and research gaps, this systematic literature review aims to critically examine the existing body of research on physical education and sports in vocational institutions. The primary goal is to identify recurring obstacles to the delivery and participation of physical education programs in these settings, considering infrastructural, pedagogical, institutional, policy, and psychosocial factors. Through systematic selection and analysis of relevant studies, this review seeks to consolidate fragmented knowledge and offer a comprehensive overview of the issue. In doing so, it aims to inform vocational institution administrators, physical education practitioners, and policymakers about the specific barriers affecting program implementation and student participation. This review identifies five recurring challenges: physical inactivity and health issues, barriers to intervention, institutional constraints, ideological and cultural influences, and teacher-related limitations. By presenting evidence-based insights, this review contributes to the broader discourse on holistic education, health promotion, and occupational health preparedness. The remainder of this paper is organized as follows: Section 2 outlines the methodology adopted for the systematic review, including search strategies, selection criteria, and data analysis procedures. Section 3 presents the results, summarizing the key challenges identified in the literature. Section 4 discusses the implications of these findings for vocational education systems, while Section 5 concludes with recommendations for practice, policy, and future research.

2. Method

The literature was reviewed using a PRISMA-guided search technique (Page & Moher, 2017). The implementation of a systematic and reproducible strategy to reviewing improved the rigour and reliability of the results. This study identified, screened, and selected papers using PRISMA criteria, laying the groundwork for an investigation of the link between physical education and vocational education.

2.1 Article Search Strategy

The article search was systematically conducted across three primary academic databases: Scopus, Web of Science (WoS), and ERIC. In Scopus, the search utilized the query: (TITLE-ABS-KEY ("Physical education" OR "physical activity") AND TITLE-ABS-KEY ("vocational institution" OR "vocational college" OR "Vocational university" OR "Vocational college" OR "vocational education" OR "TVET institution")), effectively capturing studies related to both physical education and vocational institution. For Web of Science, a similar strategy was applied, using the following search link: <https://www.webofscience.com/wos/woscc/summary/6fbeb595-fdda-43f3-bec1-4a5142bc4710-0166155e4b/relevance/1>. In ERIC, a title-specific search was conducted using the query: TI ("Physical education") AND TI ("vocational institution"). Boolean operators (AND, OR) were applied across all databases to refine the search results, minimizing irrelevant hits while ensuring comprehensive retrieval. The search identified a total of 617 articles: 405 from Scopus, 202 from Web of Science, and 10 from ERIC, providing a robust foundation for the review process.

2.2 Article Criterion Selection

To ensure the relevance and quality of the selected articles, specific inclusion and exclusion criteria were applied systematically throughout the selection process. These criteria focused on aspects such as publication year, language, type of publication, and research focus. The publication year was limited to studies published from 2014 to October 2024, ensuring the inclusion of recent and up-to-date research. The language was restricted to English to facilitate a comprehensive analysis. Additionally, only peer-reviewed journal articles were included, excluding conference proceedings, theses, and non-peer-reviewed sources, to maintain a high level of scholarly rigor. The criteria applied in this study, which are detailed in Table 1, helped streamline the review process by clearly defining the scope and ensuring a focus on high-quality, relevant research. This thorough technique increased the reliability and validity of the data, providing a solid foundation for the future research.

Table 1. Article Inclusion and Exclusion Criteria

Criteria	Acceptance	Rejection
Publication period	Journal articles published between 2014 to 2024	Publication before 2014 and after 2024
Language	English	Non-English languages, such as Chinese and Malay
Article access	Open access	Restricted access or non-open access articles
Types of document	Journal article	Conference proceedings, papers, theses, and book
Research field	Physical education and vocational institution	Fields outside of physical education and vocational institution

2.3 Article Selection Process

The article selection process was conducted systematically, following the guidelines of the PRISMA framework (Page & Moher, 2017). The initial search across the three databases Scopus, Web of Science (WoS), and ERIC yielded 617 records: 405 from Scopus, 202 from Web of Science, and 10 from ERIC. After removing 70 duplicate records, 547 unique records proceeded to the screening phase. During this phase, 500 articles were excluded based on a review of titles and abstracts due to irrelevance. A total of 47 full-text articles were sought for retrieval; however, 7 reports could not be accessed due to restrictions. The eligibility assessment of 40 full-text articles led to the exclusion of 29 studies for various reasons, including literature reviews ($n = 3$), meta-analyses ($n = 1$), bibliometric analyses ($n = 1$), lack of specific focus on physical education and vocational institution ($n = 19$), insufficient quality reporting ($n = 2$), and non-educational context ($n = 3$). Ultimately, 11 studies met all inclusion criteria and were included in the final analysis, forming a comprehensive dataset for examining the relationship between physical education and vocational institution. This meticulous selection process, illustrated in Figure 1, minimized bias and ensured that only the most relevant and high-quality studies were included in the review.

2.4 Data Extraction

Physical education and vocational institution were examined in the final 11 studies after thorough data extraction. The retrieved data comprised publishing trends (year of publication), regional distribution (countries of study), and educational institutions analysed. Each article was analysed to find common themes. Table 2 summarises a comprehensive overview of the critical characteristics and findings of the included studies. This organised strategy provided a comprehensive evidence synthesis, emphasising comparable challenges and possibilities in understanding physical education and vocational institution. The comprehensive extraction and analysis revealed significant literature gaps, providing insights for future study and practical advice for educators and policymakers.

3. Results

The analysis of the 11 reviewed studies (see Figure 1) provides insights into the relationship between Physical education and vocational institution. The findings include an overview of publication trends by year, geographic distribution across various countries, and the types of educational institutions studied (Table 2). Additionally, the results highlight key themes identified in the literature: physical inactivity & health concerns, intervention and implementation barriers, structural & institutional limitations, ideological, political and cultural influences, teacher capacity and equity issues.

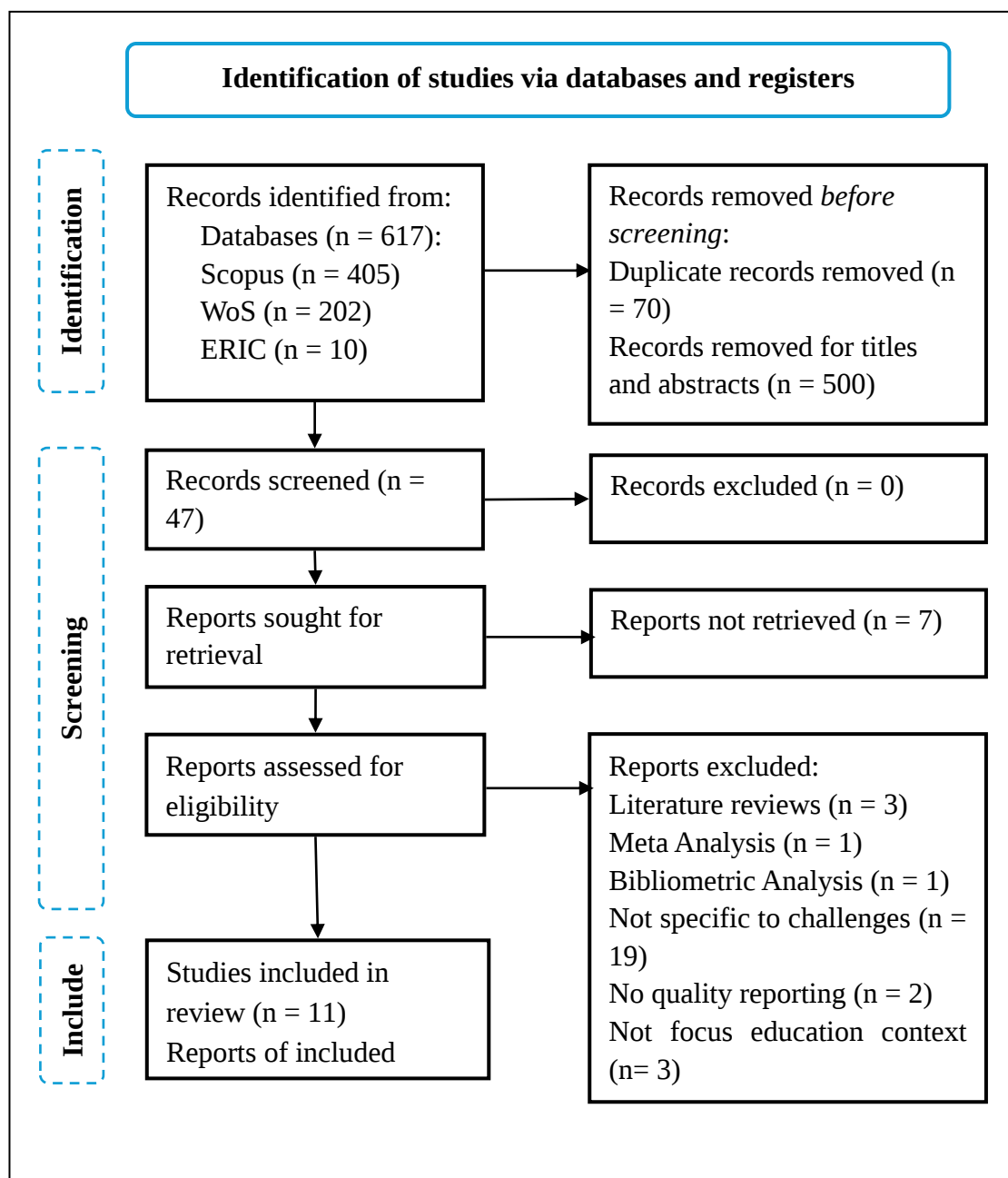


Figure 1. PRISMA Flow Diagram of Article Selection Process (Page & Moher, 2017).

Table 2. Summary of Reviewed Studies on Physical Education and Vocational Institution

No.	Authors/ Year	Title	Country	Type of Institution
1.	Grüne et al., 2022	Examining the sustainability and effectiveness of co-created physical activity interventions in vocational education and training: a multimethod evaluation	Germany	Vocational School
2.	Kovalenko et al., 2021	Formation of Vocational Competence of Future Specialists in Physical Education and Sports	Ukraine	Vocational University
3.	Leon et al., 2022	Pedagogical Contexts When Gender and Emotions Intersect with the Body: Interviews with Feminist PE Teachers and Associated Professionals	Spain	Vocational School
4.	Popp et al., 2020	Physical activity promotion in German vocational education: does capacity building work?	Germany	Vocational School
5.	Palabras Clave, 2014	Physical education and sport in vocational universities	Spain	Vocational University
6.	Batista et al., 2014	Possibilities And Challenges Of Physical Education Curriculum Component In The Process Of Regional Expansion Of Federal Institute Of Education, Science And Technology Of The Rio Grande Do Norte	Brazil	Vocational College
7.	Silva et al., 2015	Possibilities of Physical Education in technical secondary education	Brazil	Vocational College
8.	Almeida & Fernandes, 2019	Relationship between physical education, school satisfaction, psychological well-being and academic achievement in vocational students	Portugal	Vocational School
9.	Kirschner et al., 2024	The momentary relationship between physical activity behaviour and mental well-being of vocational education and training students	Netherlands	Vocational School
10.	Qu & Bo, 2023	To Assess the Methods of Integrating Ideological Education into The Second Classroom for Physical Education of Higher Vocational Colleges	China	Vocational College
11.	Melki et al., 2020	University Supervisors' Expectations for Cooperating Teachers during a TVET Practical Traineeship in the Field of Physical Education	Tunisia	Vocational University



Figure 2. Publication Trends of Reviewed Studies (2014-2024)

3.1 Year

From 2014 to 2024 (Figure 2), research related to physical education in vocational education has shown a steady but limited level of academic interest. The number of publications remained relatively consistent, with either one or two articles published per year throughout the period. There was no significant growth trend observed, but a repeated pattern of slight increases followed by declines. Peaks occurred in 2014, 2020, and 2022, with two publications each year, while other years saw only a single publication. This suggests that while the topic has maintained relevance in academic discourse, it has not experienced a rapid surge of scholarly attention.

3.1.1 Overview of Publication Trends

The analysis of 11 studies from 2014 to 2024 shows a consistent but limited trend in research focusing on the challenges of physical education and sports in vocational institutions. Initial contributions appeared in 2014 (Batista et al., 2014; Clave, 2014), followed by single publications in 2015 (Silva et al., 2015) and 2019 (Almeida & Fernandes, 2019). A more stable pattern began in 2020 with studies addressing structural and institutional barriers (Popp et al., 2020), followed by one study in 2021 (Kovalenko et al., 2021) and two more in 2022 (Grüne et al., 2022; Leon et al., 2022), which explored co-created interventions and gender-related issues. The years 2023 (Qu & Bo, 2023) and 2024 (Kirschner et al., 2024) each contributed one study, showing continued academic engagement with the challenges of physical education and sports in vocational institutions.

Although the number of publications per year remains small, the consistent flow of research suggests growing recognition of the issues affecting physical education in vocational contexts. The period after 2020 likely reflects increased attention to student well-being, health promotion, and inclusive education practices following the COVID-19 pandemic. Despite this, research output remains modest, which may be due to limited funding, lower policy

prioritization, or the marginal status of physical education in technical and vocational education systems. This trend highlights the need for further scholarly focus on this area to better understand and address the ongoing challenges in vocational institutions.

3.2 Country

The 11 selected studies cover a range of global regions, including Europe, South America, Asia, North Africa, and the Middle East (Figure 3). Brazil appears most frequently, contributing three studies focused on technical and vocational institutions. Other countries such as Germany, Ukraine, Spain, Portugal, the Netherlands, China, and Tunisia also provide meaningful contributions, reflecting the widespread recognition of challenges in delivering physical education and sports within vocational institutions.

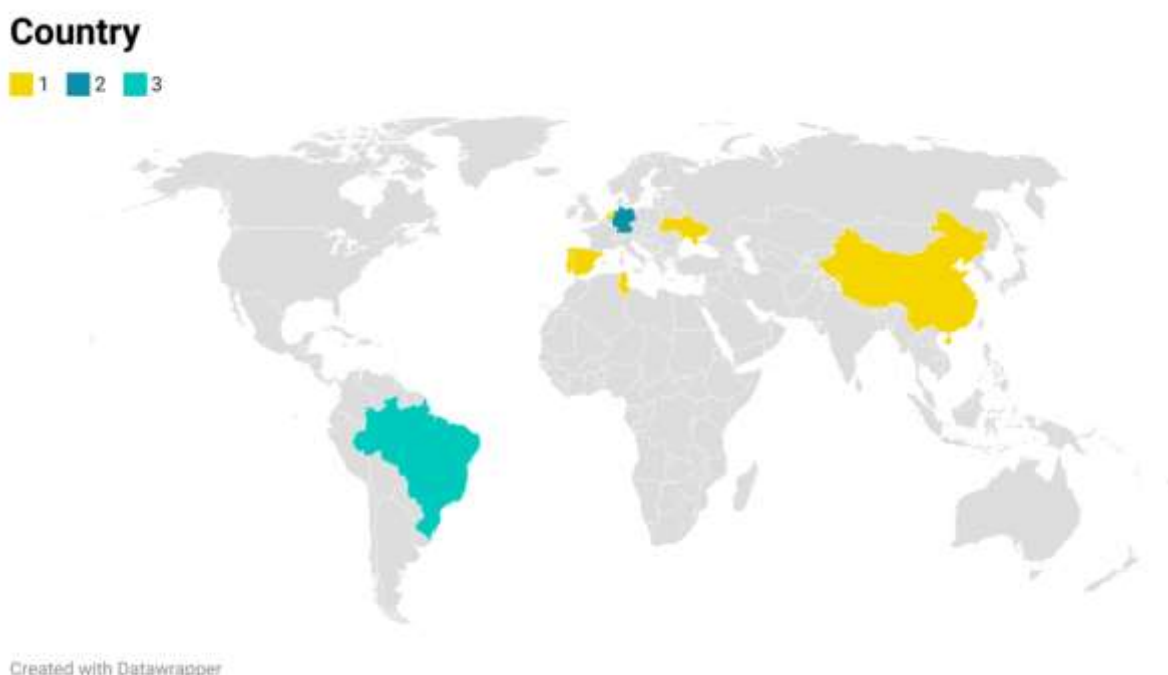


Figure 3. Geographic Distribution of Research

3.2.1 Geographic Distribution of Research

South America is represented by Brazil (Batista et al., 2014; Clave, 2014; Silva et al., 2015), where studies explored physical education in federal institutes and technical secondary schools. In Europe, Germany (Grüne et al., 2022; Popp et al., 2020) produced two studies focusing on co-created interventions and capacity building within vocational education, while Portugal (Almeida & Fernandes, 2019) and Spain (Leon et al., 2022) addressed issues of student satisfaction and gender inclusion. Ukraine (Kovalenko et al., 2021) contributed one study examining the development of vocational competence in physical education at a university level. The Netherlands (Kirschner et al., 2024) offered a study investigating physical activity and mental well-being among vocational students.

From Asia and the Middle East, China (Qu & Bo, 2023) provided insight into the integration of ideological education in physical education at vocational colleges, while Tunisia (Melki et al., 2020) contributed research on teacher training and equity in vocational physical education.

The geographic spread of these studies reflects growing international attention to the institutional, pedagogical, and cultural challenges faced by physical education in vocational contexts. Although the number of studies remains modest, their distribution across continents highlights a shared concern about the role, delivery, and impact of physical education within the technical and vocational education sector.

3.3 Type of Institution

The studies reviewed cover a variety of educational settings, reflecting the diverse ways in which challenges to physical education and sports arise in vocational contexts (Figure 4). Vocational schools represent the most common setting, followed by vocational colleges and vocational universities. This distribution indicates that barriers to implementing effective physical education are not confined to one educational level but are present across secondary, post-secondary, and tertiary vocational systems. The variety of institution types also highlights the widespread and systemic nature of the issues affecting the quality, delivery, and inclusivity of physical education and sports programs in vocational education.

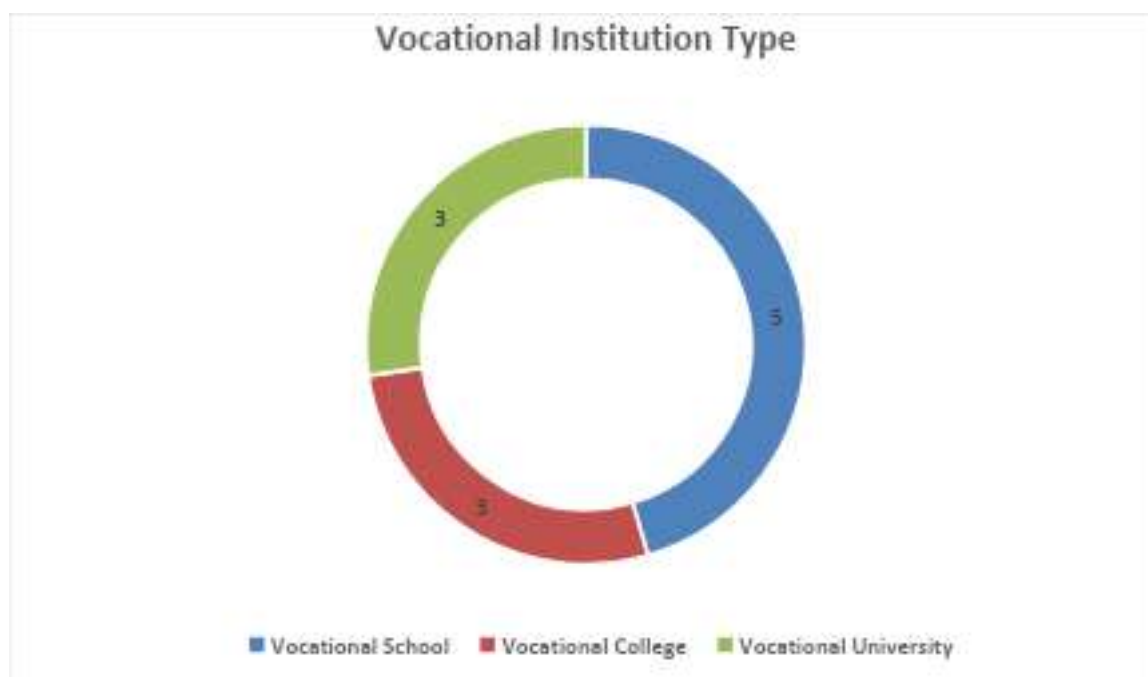


Figure 4. Types of Educational Institutions Analyzed in Reviewed Studies

3.3.1 Educational Settings

The Out of the 11 selected studies, five were conducted in vocational schools, where challenges such as lack of physical activity, gender exclusion, and insufficient institutional support were commonly reported (Almeida & Fernandes, 2019; Grüne et al., 2022; Kirschner et al., 2024; Leon et al., 2022; Popp et al., 2020). Three studies were set in vocational colleges, focusing on issues like limited infrastructure, traditional pedagogical models, and weak policy alignment (Batista et al., 2014; Qu & Bo, 2023; Silva et al., 2015). The remaining three studies were based in vocational universities, where attention was given to teacher preparation, curriculum development, and institutional ideologies shaping physical education (Clave, 2014;

Kovalenko et al., 2021; Melki et al., 2020). This distribution demonstrates that regardless of educational level, physical education in vocational settings faces structural, cultural, and policy-driven challenges. It also indicates the importance of tailoring interventions to suit the unique characteristics and constraints of each type of vocational institution

3.4 Challenges of Physical Education and Sports in Vocational Institution

Understanding the challenges of physical education and sports in vocational institutions requires careful examination of structural, pedagogical, and socio-cultural factors (Figure 5). These challenges are shaped by institutional priorities, limited infrastructure, inconsistent policy implementation, and varying levels of teacher preparedness. In addition, diverse student populations, ideological influences, and differing educational goals across vocational schools, colleges, and universities complicate the development of effective PE programs. This section explores these challenges through the five major themes identified in this review, supported by relevant literature and empirical evidence from the selected studies.

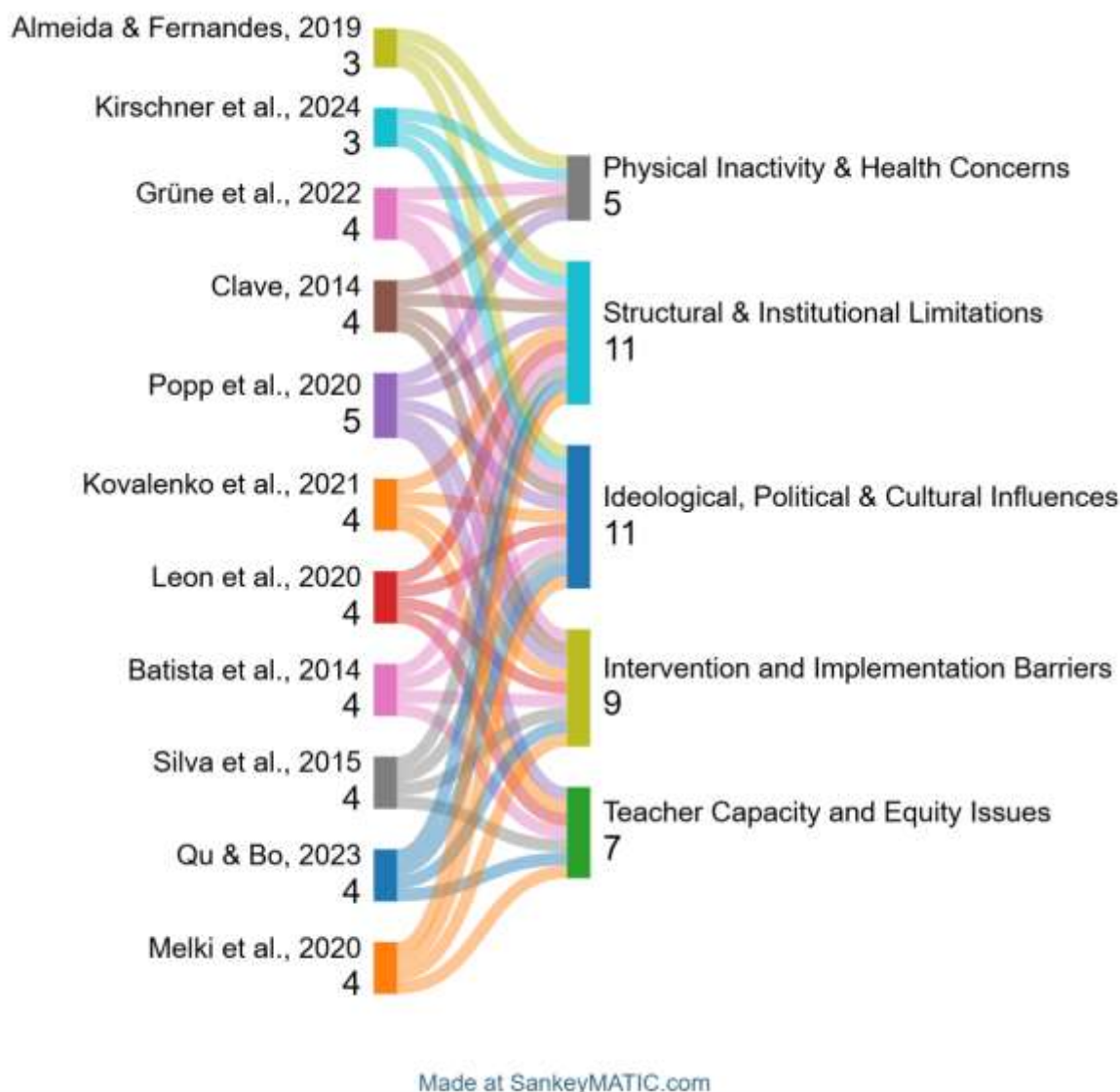


Figure 5. Challenges Themes of Physical Education and Sports in Vocational Institutions

3.4.1 Physical Inactivity & Health Concerns

Several studies Almeida & Fernandes, (2019); Clave, (2014); Grüne et al., (2022); Kirschner et al., (2024); Popp et al., (2020) reported that the challenges to Physical Education (PE) at vocational institutions are strongly linked to Physical Inactivity and Health Concerns. The study by (Grüne et al., 2022) highlighted that although some sectors like automotive mechatronics and nursing care show higher physical activity levels, a significant portion of apprentices still lack sufficient physical activity, posing risks to long-term health and well-being. Popp et al., (2020) further emphasized this concern by reporting that apprentices experienced frequent back pain and headaches, with over 40% in some sectors showing low physical activity levels, yet PA promotion remained a low priority within institutional goals. Clave (2014) acknowledged the need to promote sports and physical activity in vocational universities, indirectly addressing sedentary behavior, although explicit strategies were limited. Meanwhile, Almeida and Fernandes, (2019) identified a clear connection between low physical activity and poor psychological well-being among vocational students, contributing to school dissatisfaction and academic struggles. Lastly, Kirschner et al., (2024) revealed that approximately 80% of Dutch VET students maintain a sedentary lifestyle, with minimal moderate-to-vigorous physical activity, and suggested simple interventions like standing desks and light physical activity to enhance mental well-being. These findings collectively suggest that tackling physical inactivity is critical not only for physical health but also for improving students' educational engagement and psychological resilience.

3.4.2 Intervention and Implementation Barriers

The several studies Batista et al., (2014); Clave, (2014); Grüne et al., (2022); Kovalenko et al., (2021); Leon et al., (2022); Popp et al., (2020); Silva et al., (2015) reported that the challenges to PE at vocational institutions are also due to various intervention and implementation barriers. The Grüne et al., (2022) study described how co-created physical activity programs in sectors like automotive mechatronics and nursing care were difficult to implement consistently, with limited evidence of long-term success. It also found that physical activity was not a major priority for many institutions, making interventions hard to sustain. According to (Kovalenko et al., 2021), there is a lack of well-developed strategies specifically designed for vocational education, and more research is needed to understand how interventions can be effectively applied. The Leon et al., (2022) paper pointed out that emotional education and gender-sensitive approaches were rarely integrated into intervention plans, making it hard to measure progress or outcomes. Meanwhile, Popp et al., (2020) emphasized that despite recognizing low activity levels among apprentices, most schools and companies placed higher importance on vocational goals rather than health promotion, leading to weak implementation. In addition, Batista et al., (2014); Clave, (2014); Silva et al., (2015) showed that political, ideological, and administrative obstacles, such as limited budgets, unclear leadership roles, and conflicting priorities often delay or block the rollout of effective PE programs. Overall, these studies suggest that without coordinated planning, supportive leadership, and institutional commitment, most physical activity interventions in VET settings struggle to succeed.

3.4.3 Structural & Institutional Limitations

The several studies Almeida & Fernandes, (2019); Batista et al., (2014); Clave, (2014); Grüne et al., (2022); Kirschner et al., (2024); Kovalenko et al., (2021); Leon et al., (2022); Melki et al., (2020); Popp et al., (2020); Qu & Bo, (2023); Silva et al., (2015) reported that the challenges to PE at vocational institutions are significantly related to structural and institutional limitations. The study by Grüne et al., (2022) described how the lack of integration of physical activity into institutional missions, along with limited resources and leadership commitment, constrained implementation. Kovalenko et al., (2021) emphasized the need for modern educational reforms and curriculum redesign to match international standards and student needs, highlighting an outdated system. Leon et al., (2022) pointed out the misalignment between pedagogical intentions and practical delivery due to rigid structures and insufficient facility support. Popp et al., (2020) identified gaps in infrastructure, a lack of dedicated PE spaces, and institutional preferences that prioritize vocational content over health education. Similarly, Batista et al., (2014); Clave, (2014) stressed how poor infrastructure, limited budgets, and bureaucratic barriers hindered consistent PE programming. Silva et al., (2015) echoed these concerns, noting a lack of government investment and political commitment to building sustainable PE environments. Furthermore, Almeida & Fernandes, (2019) and Kirschner et al., (2024) noted that these limitations contribute not only to reduced physical activity opportunities but also to dropout rates and poor psychological well-being. Qu & Bo, (2023) added that outdated curriculum frameworks make it difficult to integrate modern educational goals, while Melki et al., (2020) described difficulties in securing appropriate practical training environments due to institutional inflexibility. These findings suggest that without adequate facilities, funding, and curriculum reform, PE in vocational institutions cannot meet the holistic needs of students.

3.4.4 Ideological, Political & Cultural Influences

The several studies Almeida and Fernandes (2019), Batista et al. (2014), Clave (2014), Grüne et al. (2022), Kirschner et al. (2024), Kovalenko et al. (2021), Leon et al. (2022), Melki et al. (2020), Popp et al. (2020), Qu and Bo (2023), and Silva et al. (2015) reported that the challenges to PE at vocational institutions are deeply influenced by ideological, political, and cultural factors. The study by Grüne et al., (2022) highlighted that institutional perceptions of the relevance of physical activity were shaped by ideological priorities, affecting program support and implementation. Kovalenko et al., (2021) discussed how socio-political transitions and democratization processes influence educational reforms, often steering PE toward market-driven goals rather than holistic development. Leon et al., (2022) revealed how patriarchal and binary gender norms embedded within institutional culture created resistance to emotional and inclusive pedagogies in PE. Popp et al., (2020) pointed out that legal frameworks and policy reforms, while sometimes supportive, also act as barriers due to political inconsistency and lack of alignment with institutional realities. Similarly, Clave, (2014) and Batista et al., (2014) traced the ideological legacy of past regimes where PE served as a tool of control rather than empowerment, leaving lasting cultural impacts on current practices. Qu & Bo, (2023) emphasized how neoliberal education agendas prioritize vocational efficiency over student well-being, undermining the broader purpose of PE. Studies

like Almeida & Fernandes, (2019) demonstrated how societal pressure and educational expectations marginalize PE in favor of academic and labor market outcomes. Meanwhile, Qu & Bo, (2023) addressed the push to integrate ideological education, such as patriotism and political values, directly into PE classes, often at the expense of physical and personal development. Finally, Melki et al., (2020) illustrated how conflicting ideologies about the purpose of teacher training programs lead to tensions in curriculum design and delivery. Overall, these studies reveal that ideological control, political agendas, and cultural traditions continue to shape, and in some cases, restrict the growth of meaningful and inclusive PE in vocational education.

3.4.5 Teacher Capacity and Equity Issues

The several studies Leon et al. (2022), Melki et al. (2020), Popp et al. (2020), and Qu and Bo (2023) reported that challenges to PE at vocational institutions are also caused by teacher capacity limitations and equity-related issues. The study by Popp et al., (2020) pointed out that many vocational PE teachers lack the formal training and support needed to deliver physical activity content effectively, particularly in fields like nursing and mechatronics. Leon et al., (2022) emphasized the need for specialized and compulsory training for teachers, especially those involved in integrating gender and emotional education, while also highlighting the unequal distribution of mentoring roles among staff. According to Qu & Bo, (2023), the success of ideological and moral education within PE depends heavily on frequent teacher training, but many institutions fail to provide this consistently. The Melki et al., (2020) study revealed that conflicting expectations and lack of clarity between cooperating teachers and university supervisors undermine the quality of practical teacher training, leading to mismatched mentoring experiences. Popp et al., (2020) also noted that even when PA programs were introduced, many educators lacked the leadership or confidence to champion them. Similarly, Qu & Bo, (2023) highlighted weak collaboration between university supervisors and on-site mentors as a barrier to practical teacher development, and Melki et al., (2020) reported insufficient preparation for TVET PE teachers in Tunisia, particularly in understanding inclusive practices and dealing with equity gaps. These findings indicate that without investment in comprehensive teacher training and equitable mentoring systems, vocational PE will struggle to address diverse student needs and achieve broader educational goals.

3.5 Summary of Discussion

The review of 11 articles Almeida and Fernandes (2019), Batista et al. (2014), Clave (2014), Grüne et al. (2022), Kirschner et al. (2024), Kovalenko et al. (2021), Leon et al. (2022), Melki et al. (2020), Popp et al. (2020), Qu and Bo (2023), and Silva et al. (2015) reveals that vocational institutions are struggling to position physical education (PE) as a core component of the learning experience. Across the studies, physical inactivity and sedentary behavior are consistently reported, especially among VET students in countries like Germany (Popp et al., 2020) and the (Netherlands Almeida & Fernandes, 2019). Despite some physically demanding fields such as automotive mechatronics and nursing (Grüne et al., 2022; Popp et al., 2020), PE is often deprioritized in favor of technical content. Almeida & Fernandes, (2019) showed that

this neglect directly contributes to psychosocial issues, student disengagement, and dropout risks. Yet, institutional commitment to student health and well-being remains weak. This trend suggests that the undervaluation of PE is not an isolated issue but reflects a systemic flaw: vocational institutions are fundamentally structured to serve labor-market efficiency rather than support holistic student development (Kovalenko et al., 2021; Silva et al., 2015; Yaakop et al., 2025).

In addition to this structural imbalance, the reviewed studies highlight widespread barriers in the design and sustainability of physical activity interventions. Batista et al. (2014), Grüne et al. (2022), and Popp et al. (2020) emphasized that fragmented implementation efforts, weak leadership, and inconsistent coordination between sectors create major roadblocks. Even co-created and context-specific interventions struggle to gain traction due to complex evaluation needs and institutional inertia (Grüne et al., 2022). Ideological and political influences further constrain reform efforts. As reported by Clave (2014) and Leon et al. (2022), the lingering presence of indoctrination, patriarchal culture, and rigid binary gender norms restrict emotional education and inclusive approaches in PE. Additionally, external political reforms and the influence of international institutions, Batista et al. (2014) and Qu and Bo (2023), reinforce neoliberal priorities, which shift PE away from fostering personal growth toward fulfilling economic outcomes (Melki et al., 2020; Silva et al., 2015).

Teacher capacity and equity are also pressing concerns across the literature. Studies such as (Leon et al., 2022; Melki et al., 2020; Qu & Bo, 2023) and those by (Melki et al., 2020; Qu & Bo, 2023) reveal that teacher training is often insufficient or outdated, particularly in terms of preparing educators for inclusive, student-centered practices. The mentoring structures are also fragile, with conflicting expectations between academic supervisors and school-based mentors creating inconsistent support for teacher trainees (Melki et al., 2020; Qu & Bo, 2023). This lack of institutional alignment and practical exposure is compounded by limited collaboration between universities and vocational institutions. Although some initiatives, such as those in (Popp et al., 2020) and (Grüne et al., 2022), offer integrated models linking PE to real-world vocational training, these remain isolated cases rather than institutional norms. Overall, vocational PE remains constrained by historical traditions, institutional rigidity, and an economic agenda that continues to marginalize its educational and developmental value.

4. Results

This systematic literature review identified five major themes of challenges related to physical education (PE) in vocational education and training (TVET) institutions. The analysis of 11 articles revealed recurring issues in the areas of physical inactivity and health, weak implementation of interventions, structural and institutional constraints, ideological and cultural influences, and teacher capacity. Physical inactivity and sedentary lifestyles among vocational students were repeatedly noted in several studies (Almeida & Fernandes, 2019; Grüne et al., 2022; Kirschner et al., 2024), with limited institutional initiatives in place to improve health-related outcomes. These students, often subjected to long hours of seated learning or physically repetitive training, show clear signs of psychological and physical stress. Yet, PE remains underemphasized and disconnected from the core mission of many vocational institutions (Clave, 2014; Popp et al., 2020).

Beyond health concerns, multiple studies reported barriers to intervention and implementation. Authors noted that while some programs exist, they are often short-lived, poorly evaluated, and not suited to the specific needs of vocational learners (Batista et al., 2014; Kovalenko et al., 2021; Popp et al., 2020). The studies highlighted limited leadership engagement, poor cross-sector collaboration, and the absence of contextualized models as significant obstacles to long-term sustainability. Structural limitations such as outdated curricula, lack of infrastructure, and policy rigidity were also prominent in many findings (Melki et al., 2020; Qu & Bo, 2023; Silva et al., 2015), although the policy recommendations proposed in these studies often remain generic and lack deeper cost–benefit or feasibility analyses to support practical implementation. In addition, ideological and cultural issues, such as patriarchal norms, rigid gender roles, and neoliberal pressures continue to undermine inclusive, emotionally supportive approaches to PE (Clave, 2014; Leon et al., 2022; Silva et al., 2015). These influences not only restrict content development but also reinforce inequities among learners.

Teacher-related challenges were among the most persistent. Many institutions do not provide adequate training, mentoring, or professional development support for PE instructors in vocational settings (Leon et al., 2022; Melki et al., 2020; Qu & Bo, 2023). This results in a workforce that is underprepared to deliver inclusive and relevant instruction. Therefore, the practical implication of this review is that TVET institutions must reposition PE as a strategic priority that supports student well-being, academic success, and workforce readiness. Future research should focus on evaluating integrated PE models within vocational contexts, developing inclusive teaching frameworks, and assessing teacher education programs that align with the evolving needs of vocational learners

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