

Current Status and Solutions for Improving the Effectiveness of Physical Education for Students at Technical Universities in the Context of Comprehensive Educational Reform

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Abstract
In the context of fundamental and comprehensive reform of education and training, physical education plays an increasingly important role in developing human resources with the physical fitness, adaptability, and capacity required to work in modern professional environments. At technical universities, physical education not only contributes to improving health but also helps students develop professional discipline, collaborative skills, and a long-term commitment to physical exercise. This study aims to assess the current status of physical education for students at technical universities, examine the factors influencing its effectiveness, and propose solutions for improving physical education in the context of comprehensive educational reform. The study employs a mixed-methods approach, combining document analysis and synthesis, policy analysis, descriptive statistics, and a survey of 175 administrators, lecturers, and students at seven technical universities in Ho Chi Minh City. The findings indicate that physical education has made positive progress in awareness, the organization of activities, and supporting conditions. However, implementation effectiveness continues to be influenced by institutional governance, lecturer competencies, physical facilities, student motivation, and coordination mechanisms among stakeholders. Accordingly, the study proposes five groups of solutions: curriculum reform, innovative teaching methods, increased investment in physical facilities and digital transformation, the development of a campus environment that promotes a culture of physical exercise, and improved governance mechanisms accompanied by stronger collaboration among universities, enterprises, and society to enhance the quality of physical education for students at technical universities.

Keywords: physical education, technical university students, higher education, educational reform, educational governance

1. Introduction

The fundamental and comprehensive reform of education and training in Vietnam requires a shift from knowledge transmission toward the comprehensive development of learners' qualities, competencies, and health. Within this process, physical education is no longer regarded as a supplementary course but has become an important component of higher education, contributing to the development of human resources equipped with physical fitness, adaptability, and professional capabilities in the context of digital transformation, international integration, and the Fourth Industrial Revolution. This perspective is consistently reflected in the Law Amending and Supplementing a Number of Articles of the Law on Physical Training and Sports (National Assembly, 2018), Resolution No. 08-NQ/TW of the Politburo on strengthening Party leadership over physical training and sports (The Politburo, 2011) [12], and the programmes and regulations of the Ministry of Education and Training concerning physical education in educational institutions (Ministry of Education and Training, 2015, 2018) [8, 10]. These documents affirm that physical education is an inseparable component of comprehensive education, aimed at achieving the harmonious development of learners' physical abilities, intellectual capacities, personal qualities, and professional competencies.

For technical universities, improving the quality of physical education has become particularly urgent. Technical education is generally characterized by demanding academic workloads, extensive practical training, research pressures, and the continuous use of technology. These characteristics increase the risk of reduced physical activity, potentially affecting students' physical fitness, mental health, and ability to sustain effective learning. Meanwhile, the contemporary labor market requires engineers and technical graduates not only to possess professional expertise but also to demonstrate endurance, adaptability to modern production environments, resilience under occupational pressure, and the capacity to maintain productivity over extended periods. Physical education should therefore be regarded as a contributing factor to professional competency development rather than merely a requirement for completing a compulsory course.

In recent years, alongside higher education reform, many universities have invested in facilities, improved teaching content, and diversified sports activities for students. Physical education programmes have gradually been adjusted to emphasize practical activities, expand course options, and encourage participation in extracurricular activities (Ministry of Education and Training, 2015) [8]. At the same time, policies concerning school safety, injury prevention, and the development of healthy educational environments have created favorable conditions for improving physical education quality (Ministry of Education and Training, 2016) [9]. Nevertheless, implementation outcomes remain uneven across educational institutions. Many universities, particularly technical institutions in major urban areas, continue to face difficulties concerning the availability of land for sports activities, physical facilities, course organization, and students' ability to maintain regular exercise habits outside scheduled classes.

Research on higher education reform indicates that educational quality depends not only on curriculum content but also on teaching methods, educational environments, and learners' motivation (Hhiep *et al*., 2020; Hang *et al*., 2020; Hong Van, 2020) [2, 3, 5]. The same applies to physical education. Its effectiveness cannot be assessed solely through the number of instructional hours or physical fitness test results. It must also be evaluated in terms of the development of regular exercise habits, awareness of personal health care, and students' capacity to maintain active lifestyles. According to Novicov and Matveev (1979) [11], as well as Toan and Ton (2018) [13], the fundamental objective of physical education is to develop motor abilities, volitional qualities, and the capacity to adapt to working and living conditions. This approach is consistent with competency-based education, in which learners are regarded as active participants in their physical training and personal development.

Physical education is also closely associated with the development of campus culture and human values in the context of international integration. Studies by Trung *et al*. (2020a, 2020b) [14, 15] emphasize that higher education is responsible not only for transmitting professional knowledge but also for cultivating cultural values, a sense of responsibility, and learners' adaptability. From an educational governance perspective, Vu (2022) [18] argues that improving educational quality must be accompanied by the development of learning environments that encourage participation, initiative, and students' comprehensive competency development. For technical university students, qualities such as discipline, collaboration, resilience under pressure, and commitment to physical fitness can be developed and reinforced through physical education activities organized systematically and in accordance with the characteristics of their academic programmes.

Although physical education has received considerable attention in policy and management, existing research has primarily concentrated on curricula, teaching methods, or the organization of school sports activities. Relatively few studies have examined physical education among technical university students through an integrated perspective linking the characteristics of professional training, requirements for high-quality human resource development, and the context of comprehensive educational reform. Furthermore, solutions proposed in previous studies have largely focused on improving teaching conditions without fully examining the relationships among institutional governance, learning motivation, exercise environments, and the formation of sustainable physical activity habits among students.

Against this background, the present study aims to assess the current status of physical education for technical university students in the context of higher education reform, analyze factors influencing the effectiveness of physical education activities, and propose solutions for improving physical education quality through a comprehensive developmental approach. These solutions are intended to meet the demand for technically qualified human resources with adequate physical fitness, adaptability, and the capacity to work in modern professional environments. The findings not only contribute a scholarly foundation for improving physical education at technical universities but also provide practical evidence for implementing higher education reform policies in Vietnam.

2. Literature Review

2.1. Assessment of Research Findings Relevant to the Study

Physical education in higher education has attracted increasing scholarly attention, particularly in the context of competency-oriented educational reform and efforts to improve human resource quality. An analysis of relevant research and policy documents indicates that existing studies have primarily followed four approaches:

a. the theoretical foundations of physical education;
b. physical education policy and management;
c. higher education reform and learner development; and
d. values education, culture, and comprehensive human development.

These research directions have established an important foundation for improving physical education quality in educational institutions while also revealing several gaps requiring further investigation.

First, studies examining the theoretical foundations of physical education have established fundamental principles for organizing physical education in schools. Novicov and Matveev (1979) [11] argue that physical education is not limited to developing physical strength but also contributes to cultivating willpower, personal qualities, and individuals' adaptability to working and living conditions. This approach was subsequently adopted and developed by Toan and Ton (2018) [13], who emphasize that modern physical education must integrate physical training, motor skill development, and the promotion of active lifestyles. From this perspective, physical education is no longer a supplementary activity but

an integral component of comprehensive human development. These studies have provided an important theoretical basis for reforming physical education curricula and teaching methods at universities.

Second, research and policy documents focusing on physical education management have contributed to strengthening its legal framework. The Law Amending and Supplementing a Number of Articles of the Law on Physical Training and Sports (National Assembly, 2018), Resolution No. 08-NQ/TW of the Politburo (2011) [12], Circular No. 25/2015/TT-BGDDT, and the 2018 General Education Curriculum issued by the Ministry of Education and Training clearly establish physical education as a compulsory component of the national education system. These documents not only regulate curricula, content, and teaching arrangements but also emphasize the need to establish safe educational environments, improve physical fitness, promote health, and develop healthy lifestyles among learners (Ministry of Education and Training, 2015, 2016, 2018) [8, 9, 10]. As a result, physical education has progressively been recognized as an important element of human resource development strategies and educational quality improvement.

Third, numerous studies have approached physical education within the broader context of higher education reform. Hhiep *et al*. (2020) [3] argue that reforming educational methods is essential for improving educational quality and meeting the demands of modern society. According to these authors, the transition from traditional teaching models to competency-based education requires coordinated changes in curricula, teaching methods, and educational environments. Similarly, Hang *et al*. (2020) [2] maintain that effective teaching strategies must stimulate learning motivation, encourage initiative, and foster learner creativity. Hong Van (2020) [5] also demonstrates that teaching methods directly influence learning interest, independent learning abilities, and students' active participation. Although these studies do not directly examine physical education, they suggest that the effectiveness of physical education activities is similarly influenced by teaching arrangements, learning environments, and students' level of active engagement.

Fourth, several studies have broadened the understanding of higher education by emphasizing cultural values and human development. Trung *et al*. (2020a) [14] argue that higher education plays an important role in transmitting traditional cultural values and shaping learners' character. In a subsequent study, Trung *et al*. (2020b) [15] further emphasize the importance of preserving cultural identity in the context of international integration. Similarly, Van (2022) [17] and Hoduc *et al*. (2022) [4] maintain that education policy reform should promote adaptability, social responsibility, and human resource quality amid educational transformation. Vu (2022) [18] likewise affirms that competency-based educational management requires learning environments that encourage learners' active participation. These findings suggest that physical education contributes not only to health but also to the development of qualities such as discipline, collaboration, perseverance, and personal responsibility.

Overall, existing research has established important theoretical foundations concerning physical education, educational management, higher education reform, and human development. Nevertheless, these research directions have largely been pursued independently. Physical education is commonly examined from the perspective of curricula or specialized educational activities, while its relationship with the distinctive training requirements of different disciplinary groups, particularly technical fields, has not been sufficiently analyzed.

2.2. Research Gaps and Directions

First, most existing studies have examined physical education in higher education generally, while research specifically addressing students at technical universities remains relatively limited. Technical education is characterized by demanding academic workloads, extensive practical training, and the pressure of continuous technology use, creating distinctive requirements for physical education. However, these characteristics have not been adequately examined as variables influencing the effectiveness of physical education.

Second, many studies have evaluated physical education quality primarily through curricula, facilities, or learning outcomes without sufficiently analyzing the relationships among learning motivation, exercise environments, teaching methods, and the development of students' long-term physical activity habits. Consequently, assessments of physical education effectiveness have tended to emphasize outcomes while paying insufficient attention to the processes through which positive behaviors and lifestyles are developed.

Third, although research on educational innovation has emphasized the importance of institutional governance and learner competency development, relatively few studies have integrated these factors into physical education research. The connections among education policies, institutional governance, the distinctive characteristics of technical education, and the demand for high-quality human resource development remain insufficiently explored.

To address these gaps, the present study examines the current status of physical education among technical university students in the context of comprehensive educational reform, analyzes factors influencing the effectiveness of physical education provision, and proposes a set of solutions appropriate to the characteristics of technical education. This approach not only strengthens the scholarly foundations of physical education research in higher education but also provides practical evidence for improving policies, reforming institutional governance, and enhancing the quality of technical human resource development to meet socioeconomic development requirements in the new era.

3. Research Methods

This study employed a mixed-methods approach, combining qualitative and quantitative research to ensure a comprehensive examination of the theoretical foundations, current conditions, and proposed solutions for improving the effectiveness of physical education among technical university students in the context of comprehensive educational reform. This research design enabled the integration of theoretical evidence, policy analysis, and empirical data, thereby enhancing the reliability and practical relevance of the findings.

First, document analysis and synthesis were employed to establish the study's theoretical foundations and analytical framework. The sources included legal and policy documents issued by the Communist Party of Vietnam, the National Assembly, the Government, and the Ministry of Education and Training concerning physical education and higher education reform, alongside national and international studies on physical education, educational management,

higher education, competency development, and human resource development. The documents were examined through cross-referencing, comparison, and systematic synthesis to clarify key concepts, principles, models, and research trends while identifying gaps that informed the survey content and the proposed framework of solutions.

In addition, policy analysis was employed to assess the development of physical education policies within higher education. Documents including the 2018 Law Amending and Supplementing a Number of Articles of the Law on Physical Training and Sports, Resolution No. 08-NQ/TW of the Politburo, Circular No. 25/2015/TT-BGDDT on physical education programmes in universities, the 2018 General Education Curriculum, and related implementing guidelines were analyzed to identify the objectives, requirements, and directions of physical education reform in the contemporary context.

To examine current conditions, a questionnaire survey was conducted with 175 participants, comprising administrators, lecturers, and students from seven technical universities in Ho Chi Minh City. The universities were selected through convenience sampling, with attention to diversity in institutional types, size, and technical disciplines to ensure that the collected data reasonably reflected the characteristics of technical universities. The survey sample included administrators responsible for academic affairs or student services, physical education lecturers and subject-specialist lecturers, and students from different academic years and degree programmes. Surveying multiple respondent groups enabled the study to examine the issue from different perspectives, thereby strengthening the objectivity of its assessment of current physical education practices.

Data were collected using a structured questionnaire developed on the basis of previous research and the study's objectives. The observed variables were measured using a five-point Likert scale ranging from 1 = Strongly disagree to 5 = Strongly agree. The questionnaire focused on five main dimensions: (1) awareness of the role of physical education in preparing technical university students; (2) the current state of physical education curricula, content, and teaching methods; (3) enabling conditions, including facilities, teaching staff, and exercise environments; (4) factors influencing the effectiveness of physical education; and (5) the perceived necessity of solutions for improving physical education effectiveness at technical universities.

Before the formal survey was conducted, the questionnaire was reviewed by several experts in educational management and physical education to refine its content, wording, and question structure, ensuring clarity and suitability for the target respondents. Data collection followed the principles of voluntary participation, confidentiality of personal information, and exclusive use for scientific research purposes.

After collection, the survey data were checked, coded, and processed using descriptive statistical methods. Indicators including frequency, percentage, mean, and standard deviation were employed to identify assessment patterns among respondent groups for each survey item. The study also compared the responses of administrators, lecturers, and students to identify similarities and differences in their perceptions and assessments of physical education practices at technical universities.

Furthermore, comparative analysis, cross-referencing, and scientific reasoning were applied throughout the research process to examine the relationships between survey findings, theoretical foundations, policy regulations, and previously published studies. Integrating empirical data with theoretical arguments helped clarify the underlying causes of persistent limitations in physical education provision and provided a basis for proposing feasible solutions suited to the characteristics of technical education and the requirements of comprehensive higher education reform in Vietnam.

4. Research Findings

4.1. Awareness of the Role of Physical Education Among Technical University Students

Students' and lecturers' awareness of the role of physical education is considered a prerequisite influencing participation levels and the effectiveness of physical training activities. When physical education is recognized as a component of professional education rather than merely a compulsory course, students' motivation to participate and institutional investment tend to become more positive.

Table 1: Assessment of the Role of Physical Education in Technical University Education (Survey Data, n = 175)

Survey item	Agree and strongly agree	Mean	SD
Physical education contributes to improving health	164 (93.71%)	4.61	0.52
Physical education enhances students' ability to cope with academic pressure	156 (89.14%)	4.42	0.61
Physical education supports the development of teamwork skills	149 (85.14%)	4.27	0.69
Physical education contributes to developing professional discipline and work habits	145 (82.86%)	4.18	0.72
Physical education is a course that deserves commensurate investment	160 (91.43%)	4.53	0.56

The survey findings indicate that respondents generally held positive perceptions of the role of physical education. The statement receiving the highest level of agreement was "Physical education contributes to improving health," with 164 of 175 respondents agreeing or strongly agreeing, representing 93.71% of the total sample. The mean score was 4.61 out of 5.00. This finding indicates that health continues to be regarded as the most fundamental and readily recognized benefit of physical education in the university environment.

More notably, statements linking physical education to professional training requirements also received high levels of agreement. A total of 89.14% of respondents believed that physical education helps students improve their ability to adapt to academic pressure, while 85.14% considered sports activities beneficial for developing collaboration and teamwork skills. These findings suggest a shift in perceptions of physical education from a traditional understanding focused primarily on physical fitness toward an approach that recognizes its contribution to the development of soft skills essential in technical workplaces.

For technical universities, this finding is particularly significant. Technical education requires students to undertake extensive practical training, work in teams, and adapt to academic pressures and emerging technologies. In this context, physical education not only improves health but

also helps develop psychological resilience, discipline, and coordination, qualities highly valued in industrial production and technical research environments.

Nevertheless, only 82.86% of participants agreed that physical education contributes to the development of professional discipline and work habits. This was the lowest proportion among the five assessment criteria. The finding indicates that the relationship between physical education and professional competencies has not yet been fully recognized. In many cases, students still tend to regard physical education as an independent course without clearly understanding how physical training contributes to work performance, adaptability to industrial environments, and long-term career development.

This finding may be explained by current approaches to organizing physical education. Many programmes continue to focus on meeting course learning outcomes rather than enabling students to apply the benefits of physical activity to their academic studies and professional preparation. Consequently, although learners clearly recognize the health benefits, the connection between physical education and professional competencies remains insufficiently emphasized.

The survey findings also indicate that 91.43% of respondents believed physical education should receive investment commensurate with that allocated to specialized courses. This reflects a shift in perceptions of the position of physical education within university curricula. Whereas this course was previously regarded primarily as a compulsory requirement for programme completion, many respondents now recognize physical education as a component capable of directly supporting the quality of human resource development.

The above findings are consistent with the orientations set out in the 2018 Law Amending and Supplementing a Number of Articles of the Law on Physical Training and Sports, Resolution No. 08-NQ/TW of the Politburo, and Circular No. 25/2015/TT-BGDDT, all of which emphasize the role of physical education in learners' comprehensive development. The findings also align with the studies of Novicov and Matveev (1979) [11] and Toan and Ton (2018) [13], which regard physical education as a process that simultaneously develops physical fitness, willpower, and adaptability. From the perspective of higher education reform, these findings further contribute to the research of Hhiep *et al*. (2020) [3], Hang *et al*. (2020) [2], and Vu (2022) [18] by demonstrating that learner competency development must be considered in relation to the learning environment, educational methods, and experiential activities, among which physical education serves as an important supporting component.

4.2. Current Status of Physical Education Activities at Technical Universities

The survey findings indicate that physical education activities at technical universities have undergone positive changes in the implementation of educational reform policies. Nevertheless, progress has been uneven across different components of physical education, reflecting the gap between the requirements of competency-based educational reform and the practical conditions under which technical institutions organize these activities.

Table 2: Current Status of Physical Education Activities (Survey Data, n = 175)

Assessment criterion	Mean	SD
Physical education curricula are appropriate to the characteristics of technical education	3.89	0.76
Course content is diverse and meets learners' needs	3.81	0.81
Teaching methods promote students' active participation	3.74	0.83
Extracurricular sports activities are organized regularly	3.58	0.87
Testing and assessment methods are appropriate	3.71	0.80
Overall satisfaction with physical education activities	3.79	0.74

The survey results show that the appropriateness of physical education curricula to the characteristics of technical education received the highest rating (Mean = 3.89; SD = 0.76). This suggests that most respondents recognized the gradual implementation of physical education programmes at technical universities in accordance with the Ministry of Education and Training's guidelines, ensuring compliance with requirements concerning instructional hours, content, and learning outcomes under Circular No. 25/2015/TT-BGDDT. However, the mean score, which did not reach a particularly high level, indicates that existing curricula still have considerable room for adjustment to better accommodate the characteristics of different technical disciplines.

Technical university students are typically characterized by demanding academic workloads, extensive practical training, and the pressure of continuously adapting to technological advances. Consequently, their need for physical training extends beyond improving health to enhancing endurance, concentration, and adaptability to demanding working environments. The survey findings suggest that although curricula have maintained consistency with regulatory requirements, the integration of content tailored to occupational characteristics remains at a moderately positive level. This issue warrants further consideration when refining physical education curricula at technical universities.

The diversity of course content and its responsiveness to learners' needs received a mean score of 3.81 (SD = 0.81). This reflects a positive trend toward expanding elective courses, introducing a wider range of physical activities, and diversifying instructional content. Nevertheless, the rating also indicates that some learners continue to seek greater choice in programmes suited to their interests, physical conditions, and career orientations. As higher education increasingly adopts a learner-centered approach, diversifying content not only enhances learning engagement but also helps establish long-term exercise habits. This finding is consistent with Hang *et al*. (2020) [2], who argue that curriculum flexibility and responsiveness to learners' needs are important conditions for improving educational quality.

Teaching methods that encourage students' active participation received a mean score of 3.74 (SD = 0.83). This assessment suggests that teaching methods have undergone some innovation, although the changes have not been consistent across institutions. In practice, many physical education classes continue to emphasize technical instruction

and the assessment of movement performance, while activities aimed at developing independent learning, teamwork, problem-solving, or the application of technology in physical education remain limited. This indicates that the competency-based teaching reforms discussed in higher education research (Hhiep *et al*., 2020; Hong Van, 2020) [3, 5] need to be applied more extensively in physical education.

Notably, extracurricular sports activities received the lowest rating (Mean = 3.58; SD = 0.87). This indicates that although universities have organized various sports competitions and participation campaigns, these activities have not been conducted regularly enough or have failed to attract broad student participation. Possible explanations include the academic pressures experienced by technical students, limited available time, insufficient diversity among sports clubs, and facilities that do not adequately accommodate activities outside scheduled classes. This finding suggests that physical education is unlikely to achieve sustainable effectiveness if it relies exclusively on compulsory classes without an accompanying ecosystem of extracurricular activities that encourages students to maintain regular exercise habits.

Testing and assessment methods received a mean score of 3.71 (SD = 0.80). This finding suggests that current assessment systems generally satisfy course management requirements but remain oriented toward evaluating technical performance or physical fitness indicators. In the context of educational reform, assessment should incorporate additional criteria reflecting learners' progress, participation levels, ability to maintain exercise habits, and awareness of personal health care. This approach is consistent with the orientation toward developing learners' qualities and competencies in the 2018 General Education Curriculum, as well as the trends in educational management reform discussed by Vu (2022) [18].

Overall satisfaction with physical education activities received a mean score of 3.79 (SD = 0.74), indicating that most respondents provided positive, though not particularly strong, assessments. This suggests that technical universities have achieved certain results in organizing physical education, but its effectiveness continues to be influenced by curriculum flexibility, teaching methods, opportunities to participate in extracurricular activities, and the extent to which physical education is aligned with professional training objectives.

Overall, the survey findings indicate that physical education at technical universities is moving from a compliance-oriented model toward one that seeks to improve the quality of students' learning experiences. However, this transition remains incomplete and uneven. To improve physical education effectiveness in the context of comprehensive educational reform, universities need to continue refining curricula to reflect the characteristics of technical disciplines, adopt learner-centered teaching methods, expand extracurricular sports activities, and improve competency-oriented assessment mechanisms. These adjustments would not only enhance the quality of physical education courses but also establish a foundation for active lifestyles, long-term health, and professional adaptability among technical university students.

4.3. Factors Influencing the Effectiveness of Physical Education Among Technical University Students

The effectiveness of physical education depends not only on curricula but also on various factors associated with institutional management, teaching staff, supporting conditions, and learner characteristics. To determine the perceived influence of these factors, the study surveyed administrators, lecturers, and students regarding their levels of agreement with six groups of factors considered to directly affect the quality of physical education at technical universities.

Table 3: Factors Influencing Physical Education Effectiveness (Survey Data, n = 175)

Factor	Agree and strongly agree	Mean	SD
Commitment of university leadership	162 (92.57%)	4.58	0.52
Students' motivation and commitment to physical training	158 (90.29%)	4.43	0.59
Lecturers' professional competencies	154 (88.00%)	4.37	0.63
Physical facilities	149 (85.14%)	4.26	0.69
Institutional support policies	147 (84.00%)	4.19	0.71
University–industry collaboration	132 (75.43%)	3.96	0.83

The survey findings indicate that the commitment of university leadership was perceived as the most influential factor affecting physical education effectiveness (Mean = 4.58; SD = 0.52), with 92.57% of respondents agreeing or strongly agreeing. This reflects a shared understanding that physical education can develop sustainably only when it becomes an integral component of institutional development strategies. The role of university leadership extends beyond issuing plans, allocating resources, and investing in facilities to creating educational environments that value health, encourage students' participation in physical activities, and promote coordination among university departments. This finding is consistent with Vu (2022) [18], who argues that educational quality depends substantially on institutional governance capacity and the ability to organize effective learning environments.

The second most highly rated factor was students' motivation and commitment to physical training, with a mean score of 4.43 (SD = 0.59). A total of 90.29% of respondents believed that learners' attitudes and motivation directly determine the effectiveness of physical education. Among technical university students, academic pressures, extensive practical training, and demanding specialized coursework often mean that physical exercise receives insufficient priority. Consequently, if learners do not fully recognize the benefits of physical activity for their health and professional competencies, their participation in compulsory classes and extracurricular activities is unlikely to achieve the desired effectiveness. This finding demonstrates that improving physical education requires not only lecturers' efforts but also the development of students' learning motivation and commitment to independent physical training.

Lecturers' professional competencies were identified as another important influencing factor (Mean = 4.37; SD = 0.63). This result reflects the role of teaching staff in reforming instructional methods, generating learning interest,

and guiding students in developing appropriate exercise plans. In the context of higher education reform, physical education lecturers must move beyond teaching movement techniques to applying active pedagogical methods, integrating technology, and organizing experiential activities that develop independent learning abilities and sustain long-term exercise habits. This finding is consistent with the studies of Hhiep *et al*. (2020) [3], Hang *et al*. (2020) [2], and Hong Van (2020) [5], which emphasize the role of teaching innovation in improving educational quality.

Physical facilities received a mean score of 4.26 (SD = 0.69), reflecting relatively strong agreement regarding the importance of sports grounds, gymnasiums, equipment, and spaces dedicated to physical activities. However, this result also indicates that facilities are not the sole determinant of physical education quality. In practice, some institutions possess relatively adequate facilities but continue to report limited student participation in extracurricular activities. This suggests that physical education effectiveness improves only when adequate facilities are combined with suitable curricula, active teaching methods, and mechanisms encouraging regular student participation.

Institutional support policies received a mean score of 4.19 (SD = 0.71). This indicates that policies concerning academic scheduling, encouragement of sports participation, financial support, and the development of sports clubs substantially influence physical education quality. The finding is consistent with the directions of education policy reform discussed by Van (2022) [17] and Hoduc *et al*. (2022) [4], who emphasize that policies should create favorable environments for learners' comprehensive development rather than concentrating exclusively on specialized academic outcomes.

University–industry collaboration received the lowest assessment (Mean = 3.96; SD = 0.83). Although 75.43% of respondents still considered it an important factor, the result indicates that the connection between physical education and labor market requirements remains insufficiently developed. While technical enterprises are increasingly concerned with occupational health, resilience under pressure, and employees' teamwork abilities, collaboration in organizing physical training programmes, health education, and professional skills development through sports activities remains limited. This finding suggests that physical education at technical universities should extend beyond institutional boundaries to establish stronger connections with enterprises, thereby better meeting the requirements of high-quality human resource development.

Overall, the findings indicate that physical education effectiveness is shaped by the combined influence of governance, teaching staff, learners, and supporting conditions. Among these, governance-related factors and learner motivation were perceived as more influential than physical conditions alone. This suggests that improving physical education effectiveness at technical universities requires a coordinated approach integrating governance reform, faculty development, policy refinement, and the cultivation of a physical exercise culture throughout the educational environment.

5. Solutions for Improving the Effectiveness of Physical Education for Technical University Students in the Context of Comprehensive Educational Reform

Drawing on theoretical analysis, survey findings, and the requirements of higher education reform, the study proposes five key groups of solutions to improve the effectiveness of physical education for students at technical universities.

First, physical education curricula should be reformed through a competency-based approach aligned with the distinctive characteristics of technical education. Physical education programmes need to be reviewed and adjusted to increase flexibility, diversify elective courses, and establish stronger connections with the occupational characteristics of technical students. In addition to basic physical training, programmes should incorporate activities aimed at developing endurance, adaptability to demanding working conditions, teamwork skills, stress management, and occupational health awareness. Experiential learning, project-based learning, and practical activities should also be strengthened to help students recognize the relationship between physical health, academic performance, and professional competencies.

Second, teaching methods should be reformed, and the competencies of physical education lecturers should be strengthened. Lecturers need to move from the role of teaching movement techniques toward organizing learning activities, providing guidance, and motivating students. Applying active teaching methods, such as cooperative learning, scenario-based learning, physical activity games, formative assessment, and individualized feedback, would help increase learner participation. At the same time, universities should establish regular professional development programmes covering specialized knowledge, pedagogical methods, educational technology, and sports activity organization to equip lecturers with the competencies required for higher education reform.

Third, investment in physical facilities should be increased alongside the promotion of digital transformation in physical education. Technical universities should prioritize investment in and upgrading of sports grounds, gymnasiums, exercise equipment, and teaching facilities to ensure that they are modern, safe, and appropriate to institutional enrollment levels. Alongside investment in conventional infrastructure, digital platforms should be used effectively to support learning management, develop electronic learning materials, provide online exercise guidance, monitor physical training activities, and assess students' learning outcomes. The application of digital technology would not only improve management effectiveness but also enable students to maintain regular physical exercise outside scheduled classes.

Fourth, universities should develop campus environments that foster a culture of physical exercise and promote student sports participation. Physical education can achieve sustainable effectiveness only when physical activity becomes an integral part of campus life. Universities should therefore diversify sports clubs, regularly organize competitions, sports festivals, and interdepartmental and interuniversity activities, and encourage students to participate actively in physical exercise programmes. Health education, nutrition, occupational disease prevention, and the promotion of active lifestyles should also be incorporated into extracurricular activities to establish long-term exercise habits. Developing a health-oriented campus environment would help strengthen students' commitment to independent physical training, collaborative spirit, and adaptability.

Fifth, governance mechanisms should be improved, and collaboration among universities, families, enterprises, and social organizations should be strengthened. Universities need to establish physical education development strategies

aligned with their overall institutional development plans, clearly defining objectives, targets, and the responsibilities of individual units in implementation. At the same time, cooperation with enterprises should be strengthened to integrate occupational health content, organize experiential activities and counseling programmes, and develop skills for adapting to professional working environments. The involvement of families, enterprises, and social organizations would contribute to establishing a comprehensive physical education ecosystem, helping students maintain regular exercise habits, improve physical fitness, and prepare more effectively for their studies and professional development after graduation.

These five groups of solutions are mutually reinforcing and should be implemented in a coordinated manner. Curriculum and teaching reforms provide the professional foundation; investment in facilities and digital transformation establishes the necessary supporting conditions; the development of a physical exercise culture strengthens learner motivation; and improvements in governance and stakeholder collaboration create the conditions for continuity and sustainable development. Consistent implementation of these solutions would help improve physical education quality and develop technically qualified human resources with the physical fitness, adaptability, and competencies required to meet labor market demands in the context of comprehensive educational reform.

6. Conclusion

This study examined the current status of physical education among technical university students in the context of comprehensive educational reform, identified influencing factors, and proposed solutions for improving the effectiveness of physical education activities. The findings indicate that physical education is increasingly recognized as an important component of technical human resource development, contributing not only to improved health but also to endurance, professional discipline, collaborative skills, and adaptability to modern working environments. Nevertheless, implementation effectiveness remains influenced by several factors, including institutional leadership commitment, teaching staff quality, physical facilities, student motivation, and coordination mechanisms among stakeholders.

Accordingly, the study proposes five key groups of solutions: reforming physical education curricula to reflect the characteristics of technical education; improving teaching methods and developing faculty competencies; increasing investment in physical facilities alongside digital transformation; establishing campus environments that promote a culture of physical exercise; and strengthening governance mechanisms while expanding collaboration among universities, enterprises, and social organizations. These solutions are mutually reinforcing and seek to improve physical education quality through competency development and comprehensive education.

Despite its theoretical and practical contributions, the study has several limitations, as the survey was confined to technical universities in Ho Chi Minh City and relied primarily on cross-sectional data. Future research should extend the survey to different regions and types of educational institutions and incorporate advanced quantitative analytical methods or longitudinal research to test models of influencing factors and evaluate the effectiveness of the proposed solutions across different contexts.

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