

AI-Assisted Strategy in Teaching Aerobic and Anaerobic for Grade 11 Performance in Physical Education: As Basis for Enhanced Instructional Material

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Abstract—This study, "AI-Assisted Strategy in Teaching Aerobic and Anaerobic Exercises for Grade 11 Performance in Physical Education: Basis for Enhanced Instructional Material," aims to determine the impact of AI-driven applications in enhancing students' engagement and performance in PE. Utilizing MyFitnessPal and Fitbod, students monitored their fitness levels, record progress, and created personalized workout suggestions. A quasi-experimental research design was applied to compare pre-test and post-test results, showing a significant improvement in students' knowledge and application of aerobic and anaerobic exercises. While challenges such as internet accessibility, affordability of devices, and reliance on AI tools were identified, the study confirms that AI-assisted learning nurtures active participation, self-regulation, and informed decision-making in fitness and health. As a result, an Enhanced Instructional Material for PE 1 was developed, integrating AI applications into structured lessons. The study concludes that AI-assisted strategies can transform PE instruction, providing personalized, data-driven fitness education that promotes lifelong health and wellness.

Keywords— *AI in Physical Education, AI-assisted learning, Fitness apps, aerobic and Anaerobic Exercises, Instructional Material.*

I. INTRODUCTION

Artificial Intelligence (AI)-assisted strategies in education refer to the use of AI tools and systems to enhance teaching and learning processes through automation, personalization, and data-driven support. In the current educational landscape, Physical Education requires more than traditional instructional approaches, as it demands flexibility, innovation, and learner-centered methods. The integration of AI-assisted strategies offers promising opportunities for improving instruction by supporting teachers in monitoring performance, providing feedback, and tailoring activities to students' needs.

In Physical Education lessons such as aerobic and anaerobic exercises, AI-assisted strategies may be applied through various technological applications, including intelligent tutoring systems, adaptive assessments, personalized learning modules, and data-based decision-making tools. These innovations may help teachers provide more effective instruction and allow students to engage in more meaningful learning experiences.

Studies have shown that AI integration can positively influence teaching and learning outcomes. Hualiang et al. (2022) reported that AI-assisted teaching methods, including exercise instruction, examinations, and assessments, significantly improved teaching effectiveness. Similarly, Al-Turjman (2023) emphasized that AI-driven technology has strong potential in higher education, particularly through personalized lesson planning, enhanced student engagement, improved communication, and holistic assessment methods. These findings suggest that AI has the capacity to transform conventional instructional practices by promoting interactive, efficient, and learner-centered educational experiences.

Despite the growing evidence supporting the effectiveness of AI in education, further research is still necessary to determine its applicability in Physical Education. Most traditional AI systems are designed to support cognitive-based learning tasks such as problem-solving, pattern recognition, and information processing, which are commonly associated with academic subjects like

Mathematics and Language. However, Physical Education involves experiential learning that focuses on the development of motor skills, coordination, movement accuracy, and physical performance. As a result, AI tools that are effective in cognitive subjects may not fully address the unique demands of movement-based learning without proper adaptation.

This study emphasizes the need to explore AI-assisted strategies in teaching Grade 11 Physical Education, particularly in the instruction of aerobic and anaerobic exercises. These fitness components involve various movements and intensities that may be difficult to monitor and teach effectively using traditional methods alone. Challenges such as limited individualized feedback, difficulty in tracking student performance, and lack of personalized instruction highlight the need for innovative strategies that can support both teachers and learners.

Therefore, this study aims to examine the effects of AI-assisted strategies in teaching aerobic and anaerobic exercises among Grade 11 students and to determine how these strategies can contribute to the development of enhanced instructional materials. By exploring the potential of AI-powered learning resources such as interactive modules and adaptive learning tools, the study seeks to improve the quality of instruction and promote more engaging, effective, and personalized learning experiences in Physical Education.

II. THEORITICAL FRAMEWORK

A. Artificial Intelligence (AI)-Assisted Instruction in Physical Education

First, Artificial Intelligence has increasingly been integrated into education through learning management systems, assessment platforms, and adaptive learning tools that support skill development and personalized instruction. As educational technologies continue to evolve, AI is expected to contribute to more efficient instructional processes by supporting teachers in monitoring learning progress, delivering individualized feedback, and managing instructional resources. AI-assisted tools may also help reduce routine administrative tasks, allowing teachers to focus on higher-level instructional practices such as facilitating understanding, engagement, and meaningful learning experiences (Ascione, 2023).

In the context of PE, AI-assisted strategies may support the delivery of lessons by providing guided instruction, monitoring physical performance, and enhancing learner participation through interactive learning materials.

B. Constructivist Theory

The perspective advanced by Lev Vygotsky, emphasizes that learning occurs through active engagement, social interaction, and meaningful experiences. Learners are not passive recipients of information; instead, they construct knowledge by connecting new experiences with prior understanding. Vygotsky further highlights the importance of guidance and scaffolding in learning, particularly within the Zone of Proximal Development (ZPD), where learners develop competencies with the support of teachers, peers, or instructional tools.

AI-assisted strategies align with Constructivist Theory by providing opportunities for active learning through personalized tasks and adaptive instructional support. AI-powered learning systems may assess learners' progress and provide customized content, allowing students to engage with activities that match their ability level while gradually increasing complexity. This adaptive approach supports scaffolding, as learners are guided through instructional activities based on their needs and readiness (Gibson et al., 2023). In PE, AI-assisted modules may offer individualized fitness activities and training plans based on students' physical performance, health indicators, and learning pace. Such strategies support the constructivist view that knowledge and skills develop through experience and continuous engagement (Stefanic, 2024).

In addition, constructivist learning promotes inquiry-based learning and problem-solving. AI tools may be used to generate performance challenges, simulations, or scenario-based PE tasks that encourage learners to apply their knowledge and physical

skills in meaningful contexts. This promotes active participation and deeper learning through experience, which is consistent with constructivist instructional principles (Seo et al., 2021). AI-assisted resources such as instructional videos, fitness applications, and interactive learning materials may further strengthen learning by encouraging exploration and engagement, which are essential elements of constructivist learning.

Connectivism, proposed by George Siemens and Stephen Downes, views learning as a process that occurs through networks of information sources, digital tools, and social connections. Knowledge is not limited to individual cognition; rather, it is distributed across systems and networks. This theory highlights the importance of accessing, evaluating, and connecting information from multiple resources to support continuous learning. AI-assisted strategies support Connectivism by enabling learners to access digital learning networks and educational resources more efficiently. In PE, AI-powered platforms may recommend relevant materials such as online tutorials, interactive simulations, exercise demonstrations, and fitness-related articles that support students' understanding of aerobic and anaerobic exercises. Additionally, wearable technologies and fitness monitoring applications can provide real-time performance data, allowing learners to connect their physical activity experiences with digital feedback systems. This reflects the connectivist principle that learning occurs through interaction with both technological and human networks (Markauskaite et al., 2022).

Connectivism also emphasizes collaboration and social learning. AI tools may support the development of online learning communities where students can exchange experiences, participate in group discussions, and collaborate on physical fitness activities. These digital learning environments may strengthen the social component of PE by allowing peer learning even in blended or remote settings (Haleem et al., 2022). Furthermore, connectivism views learning as an ongoing process. AI-assisted systems may promote continuous learning by offering updated training routines, exercise recommendations, and progressive learning content based on students' performance and goals, ensuring that learning remains dynamic and relevant over time (Kop & Hill, 2008).

C. Cognitive Load Theory

CLT developed by John Sweller, emphasizes that learners have limited working memory capacity and that instructional design must manage cognitive load to support effective learning. CLT explains that learning improves when instructional materials minimize unnecessary cognitive demands and allow learners to focus on essential information. This theory highlights the importance of reducing extraneous cognitive load while strengthening germane cognitive load, which contributes to meaningful learning and skill development.

AI-assisted strategies support CLT by providing clear, structured, and simplified instructional delivery. In PE, learners may struggle when instructions are too complex or when tasks are introduced without proper progression. AI-powered learning platforms may help address this challenge by delivering step-by-step explanations, organizing lessons into manageable segments, and adjusting activity difficulty based on student readiness. This approach supports effective cognitive processing by reducing overload and ensuring that learners focus on essential movement patterns and exercise procedures (Howley-Rouse, 2024).

Moreover, AI-assisted modules may enhance gradual skill development by providing adaptive exercises that increase in complexity as learners improve. This aligns with CLT's emphasis on sequencing instruction in a way that matches learner capacity. AI may also strengthen learning through the use of multimedia resources such as animations, interactive videos, and movement demonstrations, which support learners' understanding of physical skills by improving visualization and reducing confusion (Koć- Januchta et al., 2022). Additionally, AI-based instructional applications may reduce distractions and irrelevant information, thereby minimizing extraneous cognitive load and allowing students to focus on proper technique and performance (Sweller, 2019).

D. Policy and Institutional Support for AI Integration in PE

The integration of AI-assisted strategies in PE is further supported by educational policies and initiatives in the Philippines that encourage the development of physical education and the use of technology in instruction. The Department of Education

(DepEd) promotes PE as part of the national curriculum and supports initiatives that strengthen student fitness and holistic development. Republic Act No. 6847, also known as the Physical Education and Sports Development Act of 1990, emphasizes the importance of PE and sports programs in promoting a healthy lifestyle and developing students' physical well-being.

Additionally, the DepEd Digital Education Roadmap highlights the importance of integrating technology into education to improve learning outcomes and strengthen digital learning systems (Department of Education, 2022). Similarly, CHED Memorandum Order No. 8, s. 2017 encourages Higher Education Institutions (HEIs), including those offering Senior High School programs, to integrate Information and Communication Technology (ICT) into curricula and instructional delivery. These policies provide institutional support for adopting innovative teaching strategies, including the use of AI-assisted learning tools in PE instruction.

III. METHODS

A quasi-experimental research design was adopted for this study. Specifically, a one-group pre-test post-test design was utilized to determine the efficacy of an AI-assisted strategy in teaching aerobic and anaerobic exercises in Physical Education. It allows researcher to measure the effect of an intervention when random assignment is not feasible. In this study, students' performance in Physical Education was assessed before and after the implementation of AI-assisted strategies to assess their efficacy.

The significance of the difference between the students' pre-test and post-test scores was examined using a paired t-test. To determine whether the observed progress in students' performance following the intervention was statistically significant, this statistical test is appropriate for evaluating two related measurements from the same group. The study wanted to assess whether the use of AI in physical education had a significant effect on student learning outcomes by comparing the mean difference between pre-test and post-test results.

The Systems Model Approach (SMA) was employed as a communication tool for detailed planning, implementation, and discussion of a wide range of potentials. Three (3) parts make up the study's flow: input, process, and output. Each participant will receive a personal explanation of the study's objectives from the researcher on the designated day, as well as via Google Meet or Zoom, as necessary. Before becoming eligible to participate in the study, students must give their informed consent. Instructions will be given on how to correctly complete the survey questions. The collected data was examined, and came to the proper conclusions and suggestions. The respondent-groups were questioned online utilizing a chat platform based on their questionnaire results.

IV. FINDINGS AND DISCUSSIONS

A. Pretest Performance of the Grade 11 Students in Aerobic and Anaerobic Exercise for the First Semester

Overall, the pre-test results revealed that all competencies were classified as **Needs Mastery**, indicating that students' knowledge, application, and execution of essential Physical Education skills are lacking. The competencies "Self-assessing health-related status" and "Setting frequency, intensity, and time goals" both obtained a weighted mean of 1.46, showing that students struggle in self-monitoring, goal setting, and applying FITT-based fitness planning. Similarly, "Engaging in moderate to vigorous physical activity" (1.47) and "Analyzing Physiological Indicators" reflect difficulties in participating in fitness activities and evaluating physiological responses such as heart rate and recovery time.

Furthermore, "Observing Personal Safety Protocols" (1.45) and "Demonstrating Proper Etiquette and Safety" (1.49) indicate limited knowledge of injury prevention, safety precautions, and responsible participation in physical activities. The lowest mean was recorded in "Organizing Fitness Event" (1.44), suggesting that students need improvement in planning and implementing fitness initiatives. The findings emphasize the need for structured instruction, guided practice, and meaningful learning experiences to strengthen students' mastery in Physical Education.

TABLE I. PRETEST PERFORMANCE

Learning Competencies	Mean	Std Dev	Category
Self- assessing health related status	1.46	0.94	Needs Mastery
Setting Frequency Tracks Progress in Achieving Health- Related Fitness Goals Through Regular Self-Assessment Y Intensity Time Goals	1.46	0.94	Needs Mastery
Engaging In Moderate to Vigorous Physical Activity	1.47	0.95	Needs Mastery
Analyzing Physiological Indicators	1.46	0.95	Needs Mastery
Observing personal safety protocol	1.45	0.94	Needs Mastery
Demonstrating Proper Etiquette and safety	1.49	1.00	Needs Mastery
Recognizing the Value of Optimizing	1.49	0.99	Needs Mastery
Organizing Fitness Event	1.44	0.91	Needs Mastery
Average Weighted Mean/Standard Deviation/ Category	1.47	0.95	Needs Mastery

Legend: 1.00 – 1.75= Need Mastery (NM), 1.76 – 2.50= Lack Mastery (LM),

2.51 – 3.25= Near Mastery (NMA), 3.26 – 4.00=Attained Mastery (AM)

B. Posttest Performance of The Grade 11 Students in Aerobic and Anaerobic Exercise for The First Semester

The post-test results show that all competencies were classified as **Attained Mastery**, indicating significant improvement from the pre-test results which were categorized as Needs Mastery. Under the competency “Self-assessing health-related status” (3.82), students demonstrated improved ability to track, evaluate, and act to enhance their physical well-being. Similarly, “Setting frequency, intensity, and time goals” (3.86) reflects students’ strengthened capacity to apply FITT principles in designing, assessing, and implementing structured exercise programs.

The competency “Engaging in moderate to vigorous physical activity” (3.85) shows increased proficiency and engagement in MVPA, indicating that students are now able to understand, select, and participate in moderate-to-intense physical activities. Students also improved in assessing physiological indicators, demonstrating better comprehension of skill-related fitness and the ability to evaluate their fitness levels and make informed training decisions.

Moreover, “Observing Personal Safety Protocols” (3.81) and “Demonstrating proper etiquette and safety” (3.86) confirm that students have enhanced their understanding and application of safety precautions and responsible behavior during physical activities. The competency “Recognizing the Value of Optimizing” (3.80) indicates greater awareness of the importance of physical activity in health optimization. Lastly, “Organizing Fitness Event” (3.80) shows improved leadership, planning, and participation skills.

In totality, the shift from Needs Mastery in the pre-test to Attained Mastery in the post-test demonstrates that the AI-Assisted Strategy with integration was effective in improving students’ knowledge, skills, engagement, and overall performance in Physical Education.

TABLE II. POSTTEST PERFORMANCE

Learning Competencies	Mean	Std Dev	Category
Self- assessing health related status	3.82	0.47	Attained Mastery
Setting Frequency Tracks Progress in Achieving Health-Related Fitness Goals Through Regular Self-Assessment Y Intensity Time Goals	3.86	0.41	Attained Mastery
Engaging In Moderate to Vigorous Physical Activity	3.85	0.42	Attained Mastery
Analyzing Physiological Indicators	3.82	0.46	Attained Mastery
Observing personal safety protocol	3.81	0.48	Attained Mastery
Demonstrating Proper Etiquette and safety	3.86	0.38	Attained Mastery
Recognizing the Value of Optimizing	3.80	0.50	Attained Mastery
Organizing Fitness Event	3.80	0.50	Attained Mastery
Average Weighted Mean/Standard Deviation/ Category	3.83	0.45	Attained Mastery

Legend: 1.00 – 1.75= Need Mastery (NM), 1.76 – 2.50= Lack Mastery (LM),

2.51 – 3.25= Near Mastery (NMA), 3.26 – 4.00=Attained Mastery (AM)

C. Significant Difference Between Pre-Test and The Post-Test Performance of The Students

This research demonstrates the presumption of no significant difference between the initial and final performance of the Grade 11 students in Aerobic and Anaerobic exercise using the AI-assisted strategy. At 0.05 level, the degree and extent of relationship was significant.

The test of significant difference at 0.05 level of significance reveals that there is enough evidence to reject the null hypothesis. Hence, there is significant difference between the initial and final performance of the Grade 11 students in Aerobic and Anaerobic exercise using the AI-assisted strategy.

Students' understanding and performance in aerobic and anaerobic workouts were significantly improved by the AI-assisted technique, as seen by the significant improvement in post-test results across all competencies. The change from a Needs Mastery classification in the pre-test to Attained Mastery in the post-test demonstrates how well the intervention worked to reinforce ideas, enhance students' capacity for self-evaluation, and expand their application of knowledge in physical fitness activities.

The notable enhancement suggests that AI-assisted learning techniques can be a useful instrument for improving physical education training. In fact, according to Y. Wang and Wang (2024), new developments in AI technology have the potential to enhance PE by serving as auxiliary tools. The use of AI technology in physical education is expanding quickly, increasing student engagement and learning outcomes while making the activity more focused and engaging. By incorporating technology-driven learning strategies, students can receive individualized and interactive feedback, which could have improved their understanding of safety procedures, fitness concepts, and performance.

TABLE III. SIGNIFICANT DIFFERENCE BETWEEN PRE-TEST AND THE POST-TEST PERFORMANCE OF THE STUDENTS

	t-value	p-value	Interpretation
Self- Assessing Health Related Status	31.4	<.001	significant
Setting Frequency Intensity Time Goals	32.9	<.001	significant
Engaging In Moderate to Vigorous Physical Activity	33.3	<.001	significant
Analyzing Physiological Indicators	31.6	<.001	significant
Observing Personal Safety Protocol	30.7	<.001	significant
Demonstrating Proper Etiquette and Safety	30.4	<.001	significant
Recognizing The Value of Optimizing	31.9	<.001	significant
Organizing Fitness Event	31.2	<.001	significant

The study found that after the AI-assisted intervention, learners' learning outcomes significantly improved. The pre-test results first showed that all competencies needed to be mastered. However, post-test results following the intervention proved that students had achieved competence, demonstrating the efficacy of AI-integrated training.

With the notable improvements, challenges and barriers arose when putting AI-assisted learning into practice. The integration of technology in physical education was hampered by problems like the cost of AI-compatible devices, the availability of dependable internet, and restricted access to AI tools. Concerns were also raised regarding students' excessive dependence on AI, possible data misinterpretation, and the absence of direct human supervision when engaging in physical activities. These difficulties show how structured implementation is necessary to make sure AI complements conventional teaching techniques rather than replaces them.

V. CONCLUSION

Based on the results, AI-Assisted Strategy with the integration of interactive digital tools and personalized learning pathways in teaching Aerobics and Anaerobic Exercises improved learners' mastery. The results of the post- test offer compelling proof that using AI tools in physical education can enhance students' mastery of the competency. However, for sustainable adoption, issues like reliance on AI technologies, device affordability, and access to dependable internet must be resolved.

There are certain steps that need to be taken to guarantee sustainable integration of AI-assisted learning in physical education. Prioritizing the development of enhanced instructional material for PE 1 should come first. This content should balance technology and teacher-led training by integrating AI- driven tests, customized fitness tracking, and interactive learning modules. Schools also need to improve internet connectivity and secure affordable AI- compatible gadgets for students, perhaps through partnerships with tech companies.

To provide teachers the skills they need to successfully incorporate AI tools into physical education, teacher training programs ought to be implemented. Moreover, further research must be done to study the long-term health and mental effect of integrating technology into PE. AI-assisted learning can be maximized to improve physical education instruction and give students a more effective and engaging learning experience by tackling these issues and putting these suggestions into practice

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