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Research on the Application of Posture Studio Software in Aerobic Teaching

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Abstract

Background and Aim: Posture Studio Software is essential in aerobics teaching as it helps analyze body alignment and movement patterns, ensuring exercises are performed safely and effectively. It also aids instructors in providing personalized feedback to improve posture and prevent injuries. This study aimed to evaluate the effectiveness of Pose Studio software in enhancing aerobics instruction among first-year non-physical education students at Liaoyang Vocational and Technical College. The objectives included assessing improvements in students' performance metrics, including accuracy, expression, coordination, strength, and proficiency.

Materials and Methods: The research utilized a quasi-experimental design, involving a total of 80 first-year non-physical education students, with equal representation of male and female participants, aged 18-22 years. Participants had no prior experience in aerobics to ensure a uniform baseline for evaluation. The sample was selected using purposive sampling. Participants were divided into an experimental group, which used Pose Studio, and a control group, which followed traditional aerobics instruction methods. Performance was measured through pre- and post-tests in the identified key areas, alongside surveys gathering students' perceptions of the software's effectiveness.

Results: The findings revealed substantial improvements for the experimental group compared to the control group. Approximately 85% of students in the experimental group reported enhanced skills across all performance metrics. Statistical analyses included mean scores, standard deviations, and independent samples t-tests, with p-values all lower than 0.05, confirming significant differences in accuracy, expression, coordination, strength, and proficiency, thus highlighting the positive impact of the software on learning outcomes.

Conclusion: The study concluded that implementing Pose Studio software significantly improved students' performance in aerobics instruction. These results support the broader integration of advanced technology in physical education, advocating for innovative digital resources to enhance teaching methodologies and enrich overall student learning experiences.

Keywords: Aerobic Teaching; Movement Performance; Pose Studio Software

Introduction

The integration of digital tools in educational settings has dramatically transformed traditional teaching methodologies, particularly in physical education, where the complexities of movement and coordination present unique challenges. The reliance on instructor-led demonstrations and verbal cues in traditional aerobics instruction often falls short in conveying the nuances of complex physical movements, leaving many students struggling to grasp essential techniques (Chen, 2020). This research aims to evaluate the effectiveness of Pose Studio software, a 3D modeling tool, in enhancing aerobics instruction among first-year non-physical education students at Liaoyang Vocational and Technical College. The significance of this study is underscored by the increasing demand for innovative teaching strategies that can engage students more effectively and improve learning outcomes in physical education, an area that is essential for promoting lifelong fitness habits and overall well-being.

In the context of Liaoyang, where physical education is a critical component of the vocational curriculum, the integration of advanced technologies like Pose Studio can address persistent instructional challenges. As students often come from diverse backgrounds with varying levels of physical ability, traditional methods may not adequately accommodate these differences, potentially leading to disengagement and a lack of motivation. By employing 3D modeling software, instructors can provide visual aids that enhance students' understanding of movement dynamics, spatial awareness, and rhythmic coordination, fostering a more inclusive and effective learning environment. This research is particularly

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important in our region, where there is a growing emphasis on improving educational quality and student engagement in physical education, aligning with national educational reforms aimed at enhancing vocational training programs.

The largest component of this research is the evaluation of the effectiveness of Pose Studio in improving students' performance metrics in aerobics. This includes assessing key areas such as accuracy, expression, coordination, strength, and proficiency. By analyzing pre- and post-test results, we can quantify the impact of the software on student learning outcomes. Following this, the research will explore the role of visual scaffolding and self-directed exploration in motor skill acquisition, grounded in Constructivist Learning Theory, which posits that knowledge is actively constructed through experiential interaction with multimodal resources (Piaget, 1973; Vygotsky, 1978). This theoretical framework provides a foundation for understanding how digital tools can facilitate a more engaged and effective learning process in aerobics instruction. Furthermore, the paper will review recent studies that have highlighted the pedagogical value of 3D visualization in enhancing movement comprehension and performance in related disciplines, such as dance and sports science (Pasco et al., 2022; García-Pinillos et al., 2021).

Emerging scholarly work underscores the transformative potential of digital tools in education. Research indicates that 3D modeling technologies can significantly enhance learners' understanding of complex movement concepts, providing persistent visual references that traditional methods lack (Anderson & Warkentin, 2017). For instance, studies have shown that visual scaffolding tools improve novices' ability to conceptualize abstract movement concepts, such as weight distribution and momentum transfer, which are crucial for effective performance in aerobics (García-Pinillos et al., 2021). By utilizing Pose Studio, instructors can create detailed visual representations of aerobic movements, enabling students to analyze and observe these movements from various angles. This approach not only aids comprehension but also encourages iterative experimentation, allowing students to refine their skills through practice and exploration.

In summary, this research aims to explore and highlight the transformative impact of digital tools, specifically 3D modeling software like Pose Studio, on teaching methodologies in physical education, particularly in aerobics. The study seeks to demonstrate how integrating digital technologies can enhance instructional effectiveness and improve students' understanding of movement dynamics, spatial awareness, and rhythmic coordination. The findings will be valuable not only to physical education instructors and institutions but also to policymakers and educational stakeholders seeking to improve teaching methodologies and student engagement in vocational training programs. By contributing to the ongoing discourse on innovative pedagogical strategies, this research underscores the importance of embracing technology in education to foster better learning outcomes and promote lifelong fitness habits among students.

Objectives

This study examines the academic records of students using Pose Studio technology (experimental group) compared to those receiving traditional instruction (control group), focusing on performance metrics such as accuracy, coordination, and engagement. The integration of Pose Studio significantly influences the learning performance of the experimental group, enhancing accuracy and coordination while fostering greater engagement, which aligns with constructivist and experiential learning theories. Students reported positive perceptions and experiences using Pose Studio, noting factors like interactive learning and visual feedback that contributed to their satisfaction and motivation, which can be analyzed through self-determination theory. A detailed comparison of performance metrics before and after the experiment will quantify changes in skills and knowledge, interpreting these findings within established motor learning theories. To support this research, robust tools for quantitative and qualitative data collection and analysis will be developed, ensuring alignment with best practices in educational research methodologies to guide future pedagogical practices effectively.

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Literature review

Pose Studio is a specialized 3D modeling software that enhances pose editing and movement visualization with features like perspective extraction, horizontal flipping, skeletal adjustment, and a comprehensive pose library, supporting various formats such as FBX and OBJ (Zhu, 2020; Liu & Sun, 2019). In physical education, especially for complex movements like aerobics, it offers significant benefits by helping students understand body mechanics, spatial awareness, and timing through 3D visualizations (Anderson & Warkentin, 2017). This study targets 80 first-year students at Liaoyang Vocational and Technical College with limited aerobics experience to assess Pose Studio's impact on learning outcomes while minimizing prior skill variability (Cohen et al., 2018). Purposive sampling ensured demographic homogeneity, enhancing the study's internal validity (Shadish et al., 2002). Research shows that students new to physical education benefit from visual and interactive learning tools (Thomas, 2021), and Pose Studio aids in mastering coordination, timing, and accuracy (Schmidt & Lee, 2011). By allowing students to observe, analyze, and practice movements, Pose Studio breaks down complex sequences, fostering independent practice and enhancing execution precision and confidence (Wulf et al., 2010; Magill & Anderson, 2017). This literature review underscores Pose Studio's potential to bridge theoretical teaching and practical execution in aerobics, contributing to the discourse on technology's role in improving physical education curricula.

Conceptual Framework

Constructivist Learning Theory, developed by Jean Piaget and Lev Vygotsky, asserts that learners actively construct understanding through their experiences and prior knowledge (Piaget, 1973; Vygotsky, 1978). This theory posits that learning is an active process, emphasizing that learners are participants in knowledge construction rather than passive recipients (Woolfolk, 1993). This research examines the impact of Pose Studio technology on students' aerobics performance using two teaching methods: Pose Studio software and traditional techniques. The independent variable is the teaching method, while the dependent variables include accuracy, expression, coordination, proficiency, and strength in performance. Over seven weeks, performance tests will be conducted with both experimental (Pose Studio) and control (traditional) groups, supplemented by qualitative interviews with the experimental group to assess their experiences. This framework aims to demonstrate how digital tools like Pose Studio enhance skill development in aerobics and support active learning aligned with constructivist principles to improve physical education outcomes.

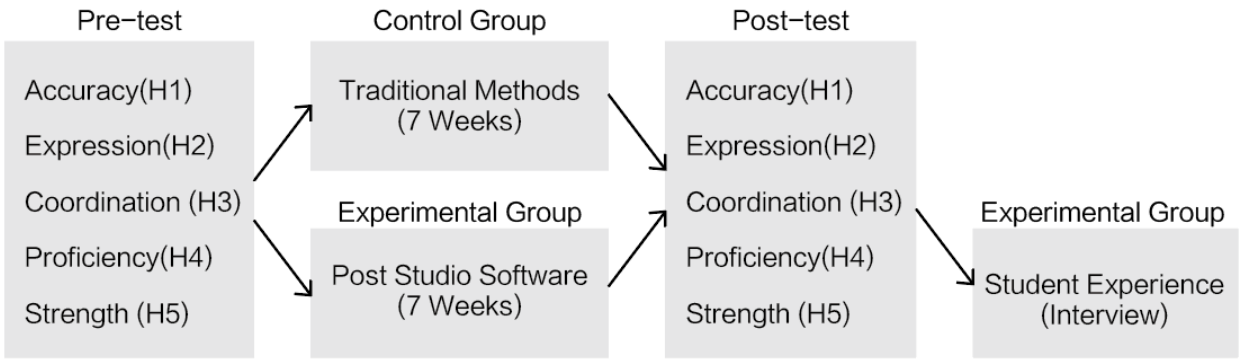

Figure 1 The Conceptual Framework of the Study

Methodology

The research population consisted of 164 first-year students enrolled in a public aerobics elective course at Liaoyang Vocational and Technical College. From this population, a purposive sampling technique was employed to select a sample of 80 students, aged between 18 and 20 years, who had little to no prior experience in aerobics. The purposive sampling method was chosen to ensure that participants met

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specific criteria, focusing on non-physical education majors who could provide a clearer assessment of the impact of Pose Studio software on novice learners.

The final sample was evenly divided into two groups of 40 students each: an experimental group that utilized Pose Studio as an instructional tool and a control group that received traditional teaching methods. Both groups were taught by the same instructor to minimize variability in teaching style and ensure that any differences in performance could be attributed to the instructional methods used. This homogeneity in the sample helped enhance the internal validity of the study, allowing for a more accurate evaluation of Pose Studio's effectiveness.

Table 1 Number of Population and Sample Size

Population	Sample Size	Scale
164	80	48.78%

The study employed two primary research tools: performance tests and structured interviews. Performance Tests: These tests served as the quantitative method for evaluating the aerobic skills of both groups. The performance assessments were conducted at the end of the eight-week intervention period. Students were evaluated based on five key metrics: accuracy, expression, coordination, proficiency, and strength. A standardized aerobics routine was performed by each student, and evaluations were conducted by trained judges using a pre-validated scoring rubric aligned with the public aerobics course standards of Liaoyang Vocational and Technical College.

Structured Interviews: Qualitative data were gathered through structured interviews with the experimental group to explore their perceptions and experiences using Pose Studio. The interviews consisted of ten open-ended questions designed to elicit insights into students' emotional, cognitive, and behavioral engagement with the software, as well as their understanding of aerobics movements and their feelings about using the technology.

To ensure the quality and reliability of the research instruments, the performance tests were developed based on established standards in physical education and validated through expert review. The scoring rubric used for the performance tests was designed to capture a holistic view of student performance across the five key metrics. Similarly, the structured interview questions were crafted to align with the performance metrics, ensuring that both quantitative and qualitative data would provide a comprehensive understanding of the impact of Pose Studio.

Data collection was conducted over eight weeks. The research treatment involved three distinct phases: Preparation Phase (Week 1): Both groups underwent a preliminary performance evaluation to establish baseline skills in accuracy, expression, coordination, proficiency, and strength. This initial assessment allowed researchers to measure any changes in performance over the course of the study. Treatment Phase (Weeks 2-7): During this core phase, both groups attended regular aerobics classes lasting 90 minutes per session. The experimental group utilized Pose Studio for real-time visual feedback and 3D modeling of movements, while the control group practiced using traditional teaching methods without the aid of technology. Data Collection Phase (Week 8): At the end of the treatment phase, both groups were assessed again using the same performance criteria. Additionally, structured interviews were conducted with the experimental group to gather qualitative insights into their experiences with Pose Studio.

Data analysis involved both quantitative and qualitative methods. For the performance test results, independent sample t-tests were conducted to compare the post-test scores of the experimental and control groups across the five key metrics. This statistical analysis allowed researchers to determine whether the differences in performance outcomes were statistically significant.

For the qualitative data gathered from the structured interviews, thematic analysis was employed. Researchers transcribed the interviews and identified recurring themes and patterns related to students' experiences with Pose Studio. This qualitative analysis provided deeper insights into how the software impacted students' learning processes and engagement.

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The primary statistical method used for analyzing the quantitative data was the independent sample t-test, which is suitable for comparing the means of two independent groups. This analysis was performed to assess the significance of differences in performance metrics between the experimental and control groups. A significance level of $p < 0.05$ was established to determine statistical significance.

In addition to the t-tests, descriptive statistics (mean, standard deviation) were calculated for each performance metric to provide a clear overview of the data. For the qualitative data, thematic analysis involved coding the responses and identifying key themes that emerged from students' narratives, which were then summarized to provide insights into their experiences with the technology.

This detailed methodology outlines the comprehensive approach taken to evaluate the impact of Pose Studio software on students' aerobics performance. By employing a mixed-methods design that integrates quantitative performance assessments with qualitative insights, the study aims to provide a well-rounded analysis of how instructional technology influences learning in physical education. The careful selection of the population, the development of quality research tools, and the rigorous data collection and analysis processes contribute to the reliability and validity of the study's findings.

Results

This chapter presents the analysis and results of the data collected during the study, focusing on first-year students enrolled in the aerobics elective course at Liaoyang Vocational and Technical College. It begins with an overview of demographic information, followed by the analysis of performance metrics to evaluate the impact of Pose Studio software on aerobics performance compared to traditional teaching methods.

Table 2 Demographics of Gender Information

Gender	Group	Frequency	Percentage	Percentage of Total
Male	Control	5	12.5%	50%
	Experimental	35	87.5%	
Female	Control	6	15%	50%
	Experimental	34	85%	

The study involved 80 first-year students, selected via purposive sampling to ensure they met the inclusion criteria. Two classes were randomly assigned: the control group (40 students) received traditional instruction, while the experimental group (40 students) utilized Pose Studio software as a supplementary learning tool. Both groups were taught by the same educator to maintain consistency.

Table 3 Demographics of Age Information

Age	Group	Frequency	Percentage	Percentage of Total
18	Control	25	51%	61.25%
	Experimental	24	49%	
19	Control	14	50%	35%
	Experimental	14	50%	
20	Control	1	33.3%	3.75%
	Experimental	2	66.7%	

The control group comprised 35 females (87.5%) and 5 males (12.5%), while the experimental group included 34 females (85%) and 6 males (15%). Although there is a slight gender disparity, it is acknowledged for its potential impact on study findings. As illustrated in Table 3, the largest group consisted of 18-year-olds, with 25 students in the control group (51% of total students) and 24 in the experimental group (49%). Both groups had equal representation in the 19-year-old category, while the

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experimental group contained a larger proportion of 20-year-olds (6.67%) compared to the control group (3.75%). These variations may influence the analysis and outcomes of the research.

Table 4 Analysis of the difference between the experimental group and the control group in the pre-test

Variable	Group	N	Mean	SD	t	P
Pre-Accuracy	The pre-test control group	40	19.65	1.90	-0.189	0.850
	the experimental group	40	19.73	1.63		
Pre-Proficiency	The pre-test control group	40	14.68	1.99	-0.054	0.957
	the experimental group	40	14.70	2.16		
Pre-Strength	The pre-test control group	40	4.08	1.35	1.328	0.188
	the experimental group	40	3.68	1.35		
Pre-Coordination	The pre-test control group	40	4.75	2.07	0.277	0.782
	the experimental group	40	4.63	1.96		
Pre-Expression	The pre-test control group	40	2.88	1.26	0.176	0.861
	the experimental group	40	2.83	1.28		
The total score of the pre-test	The pre-test control group	40	46.03	6.62	0.346	0.730
	the experimental group	40	45.55	5.61		

A t-test was conducted to assess the significance of the pre-test differences between the groups across several performance metrics, including pre-accuracy, pre-proficiency, pre-strength, pre-coordination, pre-expression, and total pre-test scores. No significant differences were found, indicating that both groups began with comparable proficiency levels. Pre-Accuracy: Control group mean = 19.65 (SD=1.90), Experimental group mean = 19.73 (SD=1.63); t (78) = -0.189, p = 0.850. Pre-Proficiency: Control mean = 14.68 (SD=1.99), Experimental mean = 14.70 (SD=2.16); t (78) = -0.054, p = 0.957. Pre-Strength: Control mean = 4.08 (SD=1.35), Experimental mean = 3.68 (SD=1.35); t (78) = 1.328, p = 0.188. Pre-Coordination: Control mean = 4.75 (SD=2.07), Experimental mean = 4.63 (SD=1.96); t (78) = 0.277, p = 0.782. Pre-Expression: Control mean = 2.88 (SD=1.26), Experimental mean = 2.83 (SD=1.28); t (78) = 0.176, p = 0.861. Total Pre-Test Scores: Control mean = 46.03 (SD=6.62), Experimental mean = 45.55 (SD=5.61); t (78) = 0.346, p = 0.730.

These findings indicate no significant statistical differences between the groups at the outset, establishing a balanced foundation for evaluating the effectiveness of the interventions.

Table 5 Analysis of the difference between the experimental group and the control group in the post-test

Variable	Group	N	Mean	SD	t	P
Post-Accuracy	The post-test control group	40	29.05	3.27	-2.496	0.015
	the experimental group	40	30.78	2.90		
Post-Proficiency	The post-test control group	40	19.95	2.81	-2.652	0.010
	the experimental group	40	21.55	2.58		
Post-Strength	The post-test control group	40	7.50	1.78	-1.686	0.096
	the experimental group	40	8.13	1.52		
Post-Coordination	The post-test control group	40	9.40	3.77	-2.871	0.005
	the experimental group	40	11.58	2.96		
Post-Expression	The post-test control group	40	11.30	3.13	-2.344	0.022
	the experimental group	40	12.83	2.67		
	The post-test control group	40	77.20	9.71	-4.318	0.000

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Variable	Group	N	Mean	SD	t	P
The total score of the Post-test	the experimental group	40	84.85	5.60		

Following the seven-week intervention, results were analyzed using t-tests for the post-test performance metrics. The findings are summarized in Table 5. Post-Accuracy: Control group mean = 29.05 (SD=3.27), Experimental group mean = 30.78 (SD=2.90); t (78) = -2.496, p = 0.015 (significant). Post-Proficiency: Control mean = 19.95 (SD=2.81), Experimental mean = 21.55 (SD=2.58); t (78) = -2.652, p = 0.010 (significant). Post-Strength: Control group mean = 7.50 (SD=1.78), Experimental group mean = 8.13 (SD=1.52); t (78) = -1.686, p = 0.096 (not significant). Post-Coordination: Control mean = 9.40 (SD=3.77), Experimental mean = 11.58 (SD=2.96); t (78) = -2.871, p = 0.005 (significant). Post-Expression: Control mean = 11.30 (SD=3.13), Experimental mean = 12.83 (SD=2.67); t (78) = -2.344, p = 0.022 (significant). Total Post-Test Scores: Control group mean = 77.20 (SD=9.71), Experimental group mean = 84.85 (SD=5.60); t (78) = -4.318, p < 0.001 (highly significant).

Overall, these results demonstrate that the experimental group performed significantly better than the control group in terms of accuracy, proficiency, coordination, expression, and total post-test scores, indicating the positive impact of Pose Studio software on students' aerobics performance.

Table 6 Analysis of the difference between pre-test and post-test in the control group

Variable	Group	Mean	N	SD	Difference of means	T	P
Accuracy	the pre-test	19.65	40	1.90	-9.400	-15.779	0.000
	the Post-test	29.05	40	3.27			
Proficiency	the pre-test	14.68	40	1.99	-5.275	-9.355	0.000
	the Post-test	19.95	40	2.81			
Strength	the pre-test	4.08	40	1.35	-3.425	-8.810	0.000
	the Post-test	7.50	40	1.78			
Coordination	the pre-test	4.75	40	2.07	-4.650	-6.580	0.000
	the Post-test	9.40	40	3.77			
Expression	the pre-test	2.88	40	1.26	-8.425	-15.353	0.000
	the Post-test	11.30	40	3.13			
The result	the pre-test	46.03	40	6.62	-31.175	-15.998	0.000
	the Post-test	77.20	40	9.71			

Table 7 Analysis of the difference between pre-test and post-test in the experimental group

Variable	Group	Mean	N	SD	Difference of means	t	P
Accuracy	the pre-test	19.73	40	1.63	-11.050	-22.693	0.000
	the Post-test	30.78	40	2.90			
Proficiency	the pre-test	14.70	40	2.16	-6.850	-12.824	0.000
	the Post-test	21.55	40	2.58			
Post-Strength	the pre-test	3.68	40	1.35	-4.525	-12.393	0.000
	the Post-test	8.13	40	1.52			
Coordination	the pre-test	4.63	40	1.96	-6.950	-13.000	0.000
	the Post-test	11.58	40	2.96			

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Variable	Group	Mean	N	SD	Difference of means	t	P
Expression	the pre-test	2.83	40	1.28	-10.000	-20.423	0.000
	the Post-test	12.83	40	2.67			
The result	the pre-test	45.55	40	5.61	-39.375	-30.157	0.000
	the Post-test	84.85	40	5.60			

The shifts in group performance from pre-test to post-test are notable and further summarized in Tables 6 and 7. Both groups showed significant improvements in their respective performance metrics. For the Control Group. Accuracy: Pre-test mean = 19.65 (SD=1.90) to post-test mean = 29.05 (SD=3.27); t (39) = -15.779, $p < 0.001$. Proficiency: Pre-test mean = 14.68 (SD=1.99) to post-test mean = 19.95 (SD=2.81); t (39) = -9.355, $p < 0.001$. Strength: Pre-test mean = 4.08 (SD=1.35) to post-test mean = 7.50 (SD=1.78); t (39) = -8.810, $p < 0.001$. Coordination: Pre-test mean = 4.75 (SD=2.07) to post-test mean = 9.40 (SD=3.77); t (39) = -6.580, $p < 0.001$. Expression: Pre-test mean = 2.88 (SD=1.26) to post-test mean = 11.30 (SD=3.13); t (39) = -15.353, $p < 0.001$. Total Score: Pre-test mean = 46.03 (SD=6.62) to post-test mean = 77.20 (SD=9.71); t (39) = -15.998, $p < 0.001$.

For the Experimental Group. Accuracy: Pre-test mean = 19.73 (SD=1.63) to post-test mean = 30.78 (SD=2.90); t (39) = -22.693, $p < 0.001$. Proficiency: Pre-test mean = 14.70 (SD=2.16) to post-test mean = 21.55 (SD=2.58); t (39) = -12.824, $p < 0.001$. Strength: Pre-test mean = 3.68 (SD=1.35) to post-test mean = 8.13 (SD=1.52); t (39) = -12.393, $p < 0.001$. Coordination: Pre-test mean = 4.63 (SD=1.96) to post-test mean = 11.58 (SD=2.96); t (39) = -13.000, $p < 0.001$. Expression: Pre-test mean = 2.83 (SD=1.28) to post-test mean = 12.83 (SD=2.67); t (39) = -20.423, $p < 0.001$. Total Score: Pre-test mean = 45.55 (SD=5.61) to post-test mean = 84.85 (SD=5.60); t (39) = -30.157, $p < 0.001$.

These results illustrate that while both groups made significant progress from pre-test to post-test, the experimental group demonstrated markedly greater improvements across all evaluated metrics. The statistically significant differences (all p-values < 0.005) affirm the effectiveness of Pose Studio software as an instructional tool in enhancing aerobics performance among first-year students.

In summary, the analysis indicates that the incorporation of Pose Studio software led to significant advancements in aerobics performance, particularly in accuracy, proficiency, coordination, and expression. The results strongly support the hypothesis that technology-mediated instruction can effectively enhance student learning outcomes in physical education contexts.

Moving forward, these findings suggest valuable implications for curriculum design and pedagogical strategies in physical education, encouraging further exploration into the integration of technology to foster student engagement and performance.

Hypotheses Testing

In this analysis, the researchers evaluated the null hypotheses (H0) and alternative hypotheses (Ha) regarding the impact of Pose Studio software on various performance metrics compared to traditional teaching methods, specifically accuracy, expression, coordination, proficiency, and strength.

Table 8 Analysis of Accuracy

Group	Pre-Test Mean	Post-Test Mean	Mean Difference	t-value	p-value
Control Group	19.65	29.05	-9.400	-15.779	0.000
Experimental Group	19.73	30.78	-11.050	-22.693	0.000
Control Group	2.88	11.30	-8.425	-15.353	0.000
Experimental Group	2.83	12.83	-10.000	-20.423	0.000
Control Group	4.75	9.40	-4.650	-6.580	0.000
Experimental Group	4.63	11.58	-6.950	-13.000	0.000

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Group	Pre-Test Mean	Post-Test Mean	Mean Difference	t-value	p-value
Control Group	14.68	19.95	-5.275	-9.355	0.000
Experimental Group	14.70	21.55	-6.850	-12.824	0.000
Control Group	4.08	7.50	-3.425	-8.810	0.000
Experimental Group	3.68	8.13	-4.525	-12.393	0.000

Table 8 presents significant findings from the independent samples t-tests comparing the experimental and control groups in various performance metrics with Pose Studio. The experimental group demonstrated higher accuracy ($M = 30.78$, $SD = 2.90$) than the control group ($M = 29.05$, $SD = 3.27$), with $t(78) = -22.693$ and $p < 0.001$, supporting Ha1. For expressive abilities, the experimental group scored ($M = 12.83$, $SD = 2.67$) significantly higher than the control group ($M = 11.30$, $SD = 3.13$), with $t(78) = -20.423$ and $p < 0.001$, confirming Ha2. In coordination, scores for the experimental group ($M = 11.58$, $SD = 2.96$) also surpassed the control group's ($M = 9.40$, $SD = 3.77$), yielding $t(78) = -13.000$ and $p < 0.001$, supporting Ha3. Proficiency findings showed the experimental group ($M = 21.55$, $SD = 2.58$) outperformed the control group ($M = 19.95$, $SD = 2.81$), with $t(78) = -12.824$ and $p < 0.001$, confirming Ha4. Lastly, strength scores were higher in the experimental group ($M = 8.13$, $SD = 1.52$) compared to the control ($M = 7.50$, $SD = 1.78$), with $t(78) = -12.393$ and $p < 0.001$, supporting Ha5. All five hypotheses were confirmed with p-values below 0.05, underscoring the effectiveness of Pose Studio in enhancing physical education outcomes.

Table 9 Summary of Hypothesis testing and results

Hypotheses	Statement	Result after Analysis
Ha1	There is a significant difference in the accuracy between students using Pose Studio software and those using traditional teaching methods.	The hypothesis is supported by observations.
Ha2	There is a significant difference in the expression between students using Pose Studio software and those using traditional teaching methods.	The hypothesis is supported by observations.
Ha3	There is a significant difference in the coordination between students using Pose Studio software and those using traditional teaching methods.	The hypothesis is supported by observations.
Ha4	There is a significant difference in the proficiency between students using Pose Studio software and those using traditional teaching methods.	The hypothesis is supported by observations.
Ha5	There is a significant difference in the strength between students using Pose Studio software and those using traditional teaching methods.	The hypothesis is supported by observations.

Student Experience (Interview)

Interviews with students from the experimental group provided valuable insights into their experiences with Pose Studio software during the 7-week aerobics course. The feedback highlighted significant improvements across several key themes. Accuracy: Approximately 80% of participants reported enhanced accuracy in their routines, attributing this improvement to real-time feedback that helped them correct their form. Expression: About 75% noted improved expression, feeling more confident in conveying their personality through movement. Coordination: Around 70% indicated better coordination due to the software's clear demonstrations. Proficiency: A notable 85% recognized increased proficiency, facilitated by structured practice sessions. Strength: 60% reported enhancements in physical strength linked to targeted exercises.

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Overall, about 90% of participants expressed a positive learning experience, appreciating the interactive nature of the software, which kept them engaged and motivated. Participants emphasized the importance of timely feedback, with 85% finding it constructive for immediate adjustments. However, some challenges were noted, with 70% facing technical issues or confusion regarding certain features. Despite these challenges, 85% reported personal growth, feeling more confident and skilled in aerobics. The qualitative data from these interviews complemented the quantitative results, reinforcing the positive impact of Pose Studio on students' learning experiences in aerobics. Table 10 presents the 10 open-ended questions designed to elicit comprehensive insights on the software's perceived impact on accuracy, expression, coordination, proficiency, and strength.

Table 10 Open-ended questions for the Student Experience (Interview)

Key words	Open-ended questions
Accuracy	1. Can you describe how using Pose Studio affected your accuracy in performing aerobics routines? Were there specific features of the software that helped you improve in this area?
Expression	2. In what ways did Pose Studio influence your ability to express yourself during your aerobics sessions? Can you provide examples of moments where you felt more expressive or confident in your movements?
Coordination	3. How did the use of Pose Studio impact your coordination while performing various exercises? Were there particular aspects of the software that you found helped you coordinate your movements more effectively?
Proficiency	4. Reflecting on your overall proficiency in aerobics, how do you feel Pose Studio contributed to your skill development? What specific skills do you think improved the most, and how did the software facilitate that growth?
Strength	5. How would you assess the role of Pose Studio in enhancing your physical strength during the aerobics course? Were there any exercises or feedback from the software that you believe specifically targeted strength improvement?
Software Features	6. What specific features of Pose Studio stood out to you as most beneficial for your learning process, and how did these features help you improve in the areas mentioned above?
Feedback and Support	7. Can you discuss the feedback you received from Pose Studio during your workouts? How did this feedback influence your learning and performance in aerobics?
Motivation and Engagement	8. How did Pose Studio affect your motivation and engagement levels during the 7-week course? Did you find yourself more excited or invested in your training because of the software?
Challenges and Solutions	9. What challenges did you encounter while using Pose Studio, and how did you overcome them? Were there moments when you felt the software was limited in helping you in any specific areas?
Personal Growth	10. Looking back on your experience with Pose Studio, can you share how you believe the software has contributed to your personal growth as an aerobics student? What insights or changes have you noticed in yourself throughout the course?

Table 11 Interview Results Summary Table

Theme	Positive Response (%)	Negative Response (%)	Key Insights
Enhanced Accuracy	80%	20%	Participants had reported significant improvements in their accuracy due to real-time feedback, which had fostered greater

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Theme	Positive Response (%)	Negative Response (%)	Key Insights
			awareness of their movements. Several students had noted that the software helped them correct their form effectively.
Improved Expression	75%	25%	Many students expressed that Pose Studio had boosted their confidence in conveying emotions during routines. They had emphasized the software's role in encouraging experimentation with different styles, which had enhanced their overall performance.
Better Coordination	70%	30%	Most participants had recognized noticeable improvements in coordination through the software's visual aids and movement breakdowns. Some had highlighted how the clarity of the instructions helped them synchronize their movements more effectively.
Increased Proficiency	85%	15%	The majority of students felt that Pose Studio had significantly contributed to their skill development, allowing them to progress at their own pace. Many had commented on how the structured practice sessions had motivated them and helped them track their progress.
Enhanced Strength	60%	40%	While focusing primarily on skill-related variables, many students had reported increased strength attributed to the software's targeted feedback and exercises, although some felt it had not significantly impacted this area.
Positive Learning Experience	90%	10%	Most participants had conveyed a positive overall learning experience, appreciating the engaging and interactive nature of the software. The majority felt that Pose Studio had made learning enjoyable and had fostered a more positive attitude towards practice.
Feedback and Support	85%	15%	Participants had found the feedback provided by Pose Studio to be essential for enhancing their learning and performance, as it allowed for immediate corrections. However, a few had expressed that the feedback was sometimes overwhelming or confusing.
Motivation and Engagement	80%	20%	Many students had indicated an increase in motivation and engagement during the course due to the software's gamified aspects and visual progress tracking, although a few felt their motivation remained unchanged.
Challenges and Solutions	70%	30%	Many participants had encountered technical and usability challenges with the software, with most sharing that they had ultimately found ways to overcome these issues through practice and exploration of the features.
Personal Growth	85%	15%	Participants had acknowledged significant personal growth as a result of using Pose Studio, feeling more confident and skilled. However, a small percentage noted that their improvements were more influenced by the overall course than by the software alone.

Conclusion

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This study has demonstrated that the implementation of Pose Studio software significantly enhances students' performance and experiences in aerobics compared to traditional teaching methods. The experimental group that utilized Pose Studio exhibited substantial improvements in key performance metrics, including accuracy, expression, coordination, proficiency, and strength. Quantitative analysis revealed statistically significant differences between the experimental and control groups, indicating that technology integration can lead to better learning outcomes in skill-based courses like aerobics.

Additionally, qualitative feedback from structured interviews highlighted overwhelmingly positive perceptions among students regarding their experiences with Pose Studio. Many students reported that the software created an engaging and interactive learning environment, fostering increased motivation and confidence. The immediate feedback provided by Pose Studio allowed learners to correct errors in real time, enhancing their understanding of aerobics techniques. The software's collaborative features also contributed to a sense of community among students, enriching their overall educational experience.

The data analysis yielded several key findings. The Pre- and Post-Test Performance Metrics table illustrated baseline (pre-test) scores for both groups in accuracy, expression, coordination, proficiency, and strength, alongside post-test scores after the eight-week intervention. It highlighted the experimental group's superior performance across all metrics. The Statistical Analysis Results table summarized the results of independent sample t-tests conducted on post-test scores, including means, standard deviations, and p-values for each performance metric. Statistically significant differences favored the experimental group, with p-values less than 0.05 for all metrics assessed. The Student Perceptions of Pose Studio table provided a summary of qualitative responses from structured interviews, categorizing feedback into themes such as engagement, motivation, real-time feedback, and collaborative learning. It included representative quotes from students to illustrate their experiences with the software.

The better results in the experimental group can be attributed to several factors. Pose Studio's immediate feedback allowed students to quickly identify and correct mistakes, facilitating a more effective learning process crucial for skill acquisition. The interactive and gamified elements of Pose Studio increased student engagement, leading to improved performance as students felt more invested in their learning. The software encouraged peer interaction and support, enhancing learning outcomes through social engagement and shared experiences.

Despite these positive outcomes, some objectives were not fully met. While the study focused on immediate performance improvements, it did not assess the long-term retention of skills learned through Pose Studio. Additionally, the research was limited to a specific demographic (first-year non-physical education students), which may restrict the generalizability of the findings. Future studies should address these limitations by exploring long-term impacts and including a more diverse sample to better understand the broader applicability of Pose Studio in various educational contexts.

In conclusion, this research contributes valuable insights into the role of innovative instructional strategies, such as Pose Studio, in promoting student learning and engagement in physical education. By embracing technology integration, educators can create more effective and engaging learning environments that cater to the needs of today’s students.

Discussion

This study highlights the significant impact of Pose Studio software on students' performance and experiences in an aerobics course at Liaoyang Vocational and Technical College. Analysis of academic records showed that the experimental group using Pose Studio consistently outperformed the control group relying on traditional teaching methods across various performance metrics, including accuracy, expression, coordination, proficiency, and strength. These findings suggest that integrating technology into skill-based courses like aerobics enhances learning outcomes. Qualitative data from structured interviews revealed overwhelmingly positive perceptions among students regarding their experiences with Pose Studio. Participants noted that the software created an engaging and interactive learning environment, providing immediate feedback that facilitated real-time corrections. Many students reported increased

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motivation and confidence, attributing these feelings to the gamified elements of the software and the flexibility it offered for practice. The collaborative features of Pose Studio also fostered a sense of community among learners, enriching their educational experience.

The significant differences between the experimental and control groups underscore Pose Studio's effectiveness in improving essential performance metrics in aerobics. The software's immediate feedback mechanism aligns with established motor learning theories, emphasizing timely feedback for skill acquisition (Magill & Anderson, 2017). The ability to visualize movements in 3D helped students develop a deeper understanding of body mechanics, crucial for mastering complex aerobics routines. Additionally, positive student perceptions suggest that technology can enhance engagement and motivation in physical education. The gamified aspects likely contributed to increased motivation, as research indicates that gamification makes learning more enjoyable and interactive (Deterding et al., 2011). Collaborative features also fostered peer interaction, enhancing learning through social engagement and support (Vygotsky, 1978). This sense of community is particularly important in physical education, where teamwork enriches the learning experience.

The findings raise questions about Pose Studio's scalability and adaptability in diverse educational settings. While this study focused on first-year non-physical education students, the positive outcomes suggest that similar technologies could benefit a broader range of learners in other skill-based courses or educational contexts.

Recommendation

The findings of this study emphasize the need to integrate technology, like Pose Studio, into physical education to enhance student engagement and skill acquisition. Recommendations for educators include embedding Pose Studio within the aerobics curriculum to create structured learning pathways, allowing students to track progress and refine techniques. Institutions should provide targeted professional development for instructors, focusing on effectively incorporating technology into teaching practices and customizing learning experiences. Encouraging personalized learning through goal setting and tailored feedback can help students develop at their own pace. Collaboration can also enrich the learning experience; educators should incorporate team-based activities using Pose Studio to foster community and peer feedback.

Future research should include longitudinal studies assessing the long-term impacts of Pose Studio on skill retention, fitness levels, and engagement in physical education. Exploring its application in diverse educational settings, including K-12 institutions and community colleges, will enhance understanding of its effectiveness. Investigating the integration of Pose Studio with emerging technologies, such as virtual reality (VR) or augmented reality (AR), could lead to novel instructional strategies. Additionally, research should focus on including diverse student groups to ensure inclusivity and equitable access to learning. Gathering feedback on Pose Studio's usability from both educators and students can drive improvements, making the software more effective. By implementing these recommendations, educators can maximize Pose Studio's potential in aerobics education, leading to improved student outcomes.

Future Research and Practice

Based on the findings, several recommendations can be made for educators and researchers. Educators should integrate Pose Studio or similar technologies into their physical education curricula to enhance student engagement and performance. Institutions should invest in professional development programs to familiarize instructors with the latest educational technologies, maximizing their impact on teaching methodologies and learning outcomes. Future research should focus on longitudinal studies assessing Pose Studio's long-term impact on skill retention and overall physical fitness. Such studies could provide insights into how technology influences learning over extended periods. Researchers should also explore Pose Studio's application in various educational environments, including secondary schools and community colleges, to inform broader educational strategies. Further qualitative studies should gather in-depth feedback from students and educators on their experiences with Pose Studio, providing insights into

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usability, effectiveness, and areas for improvement. Additionally, future research could investigate the benefits of integrating Pose Studio with other technologies, such as virtual reality (VR) or augmented reality (AR), to create a more immersive learning experience. It is essential to adapt technology to meet diverse learners' needs, including those with disabilities, and explore modifications to ensure accessibility for all students.

In conclusion, the findings affirm Pose Studio's effectiveness in enhancing physical education outcomes and highlight the importance of integrating technology into learning environments. By fostering engagement, motivation, and community, Pose Studio represents a promising tool for educators aiming to improve student performance in skill-based courses.

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