RESEARCH ON THE IMPACT OF THE APPLICATION OF GUANGXI UNIVERSITY OF FOREIGN LANGUAGES AEROBICS COMPULSORY COURSE FLIPPED CLASSROOM ON TEACHING EFFECTIVENESS*

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Abstract

This study aimed to investigate the effectiveness of applying the Flipped Classroom teaching model in the Aerobics Compulsory Course at Guangxi University of Foreign Languages (GUFL). The specific objectives were: (1) to examine the impact on the accuracy and expressiveness of prescribed movements, (2) to assess the effect on choreography ability, (3) to evaluate changes in students' exercise attitudes, and (4) to determine the effect on students' physical fitness. A quasi-experimental design was conducted with 80 first-year students enrolled in the 2024 aerobics compulsory course. The students were divided into an experimental group (n = 40) taught using the Flipped Classroom model and a control group (n = 40) taught using the traditional model. Research instruments included: (1) an aerobics performance assessment, (2) a choreography evaluation rubric, (3) an exercise attitude questionnaire, and (4)

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physical fitness tests (sit-and-reach, 50m dash, 800m run). Data were analyzed using SPSS 22.0 with independent sample t-tests, ANOVA, and effect size (Cohen's d).

The findings showed that the Flipped Classroom significantly improved students' prescribed movement accuracy and expressiveness ($p < 0.05$, large effect) and enhanced choreography ability across multiple dimensions ($p < 0.01$). Exercise attitude, particularly in learning attitude and behavioral habits, improved significantly in the experimental group compared to the control group. However, there was no significant difference in physical fitness outcomes ($p > 0.05$). Overall, the Flipped Classroom model effectively stimulated students' motivation, improved movement accuracy and choreography skills, and fostered positive exercise attitudes, but demonstrated limited short-term impact on physical fitness.

Keywords: Flipped Classroom; Aerobics Compulsory Course; Teaching Effectiveness; Choreography Ability; Exercise Attitude; Physical Fitness

Introduction

Aerobics, as an integral component of college physical education, plays a vital role in enhancing students' physical fitness, cultivating healthy exercise habits, and fostering teamwork and creativity. In recent years, the scope of aerobics courses has expanded beyond physical training to include the development of aesthetic appreciation, rhythm, and expressive ability. However, traditional teacher-centered instructional methods in aerobics often rely primarily on demonstration and imitation, which may limit student engagement, reduce opportunities for personalized learning, and constrain the development of creativity and self-expression.

The Flipped Classroom model, first popularized by Bergmann and Sams (2012), offers an innovative alternative by shifting knowledge transmission from

in-class lectures to pre-class learning through digital resources such as instructional videos and online materials. Class time is then devoted to collaborative practice, peer discussion, and individualized feedback. This model emphasizes learner autonomy, peer interaction, and teacher–student cooperation, thereby creating a more dynamic and student-centered learning environment. Studies in physical education have demonstrated that flipped teaching can enhance students' motivation, improve technical performance, and stimulate creativity, although its application in aerobics courses has been relatively underexplored.

In the context of Guangxi University of Foreign Languages (GUFL), where aerobics is a compulsory course, the adoption of the Flipped Classroom model is particularly relevant. Students come from diverse educational backgrounds and demonstrate varying levels of physical ability, making it essential to employ teaching approaches that respect individual differences, increase learning initiative, and enrich the overall teaching–learning process. Nevertheless, the specific effects of this pedagogical approach on aerobics learning outcomes-such as movement accuracy, choreography ability, exercise attitude, and physical fitness-have yet to be empirically examined.

Therefore, this study aims to investigate the impact of the Flipped Classroom teaching model on the teaching effectiveness of the GUFL Aerobics Compulsory Course. By conducting a quasi-experimental study comparing an experimental group (Flipped Classroom) with a control group (traditional teaching), this research seeks to provide empirical evidence on the strengths and limitations of the model in aerobics education. The findings are expected to contribute to the reform of physical education teaching practices and to offer practical guidance for future curriculum design and pedagogy in Chinese universities.

Objectives

1. To examine the effect of the Flipped Classroom teaching model on students' accuracy and expressiveness of prescribed aerobics movements.

2. To analyze the impact of the Flipped Classroom teaching model on students' choreography ability, including movement orchestration, music selection, level variation, and route diversity.

3. To evaluate the influence of the Flipped Classroom teaching model on students' exercise attitudes, covering learning attitude, behavioral habits, emotional experiences, and subjective norms.

4. To compare improvements in physical fitness between the Flipped Classroom model and the traditional teaching model, with a focus on flexibility, speed, and endurance (sit-and-reach, 50-meter dash, and 800-meter run).

Literature Review

Aerobics is an important component of physical education in higher education, aiming to improve students' physical fitness, coordination, teamwork, and lifelong exercise habits. Traditional teaching methods, however, often rely on demonstration and imitation, limiting student engagement and creativity. The emergence of the Flipped Classroom model offers a new pedagogical alternative that emphasizes learner autonomy, peer collaboration, and active participation. By shifting knowledge acquisition to pre-class learning through videos and digital resources, and devoting class time to practice, interaction, and feedback, the Flipped Classroom has been shown to enhance technical performance, motivation, and creativity- making it particularly suitable for skill-based courses such as aerobics.

This study is grounded in several key educational theories that support the application of the Flipped Classroom in aerobics teaching:

Constructivism

Constructivist theory emphasizes that students actively construct knowledge through interaction and experience. The Flipped Classroom facilitates this by allowing students to engage with instructional materials before class and apply knowledge in collaborative, in-class activities.

Behaviorism

Behaviorist principles stress stimulus–response mechanisms and reinforcement, which are particularly relevant in motor learning. In aerobics, demonstration videos, immediate feedback, and repeated practice help students form correct movement patterns and strengthen motor habits.

Bloom's Taxonomy

Bloom's hierarchical model of cognitive learning suggests that lower-order tasks such as memorization and comprehension can be handled in pre-class learning, while higher-order skills such as analysis, evaluation, and creation are best practiced in class. This aligns well with the Flipped Classroom approach in aerobics, where basic movements can be learned independently, and choreography creativity can be developed through in-class practice.

Motor Skill Learning Theories

Theories such as Fitts' three-stage model (cognitive, associative, autonomous) and Adams' closed-loop theory provide a framework for understanding skill acquisition in aerobics. The Flipped Classroom supports these stages by offering structured pre-class resources (cognitive), in-class guided practice (associative), and opportunities for independent refinement (autonomous).

Related Research

International studies have demonstrated the effectiveness of applying the Flipped Classroom model in physical education and skill-based learning. For

instance, Wang and Yang (2023) applied instructional design models to aerobics courses, showing improvements in engagement and performance. In China, Liu Huanhuan (2020) found that blended and flipped instruction enhanced students' technical skills and classroom efficiency, while Chen Lixia (2021) argued that Flipped Classroom strategies could significantly improve aerobics teaching quality. Similarly, Hou Yuanyuan (2023) and Ma Hui (2023) emphasized the role of cooperative learning and innovative evaluation in motivating students and improving learning outcomes.

Collectively, these studies highlight that the Flipped Classroom not only improves skill acquisition and choreography ability in aerobics but also fosters positive learning attitudes and motivation. However, gaps remain in systematically examining its effects across multiple outcomes—including movement accuracy, creativity, attitudes, and physical fitness—particularly in the Guangxi context.

Conceptual Framework

Based on the theoretical foundations and literature, this study adopts the Flipped Classroom model as the central pedagogical approach influencing four key outcomes in aerobics education:

Prescribed movement accuracy and expressiveness

Choreography ability (movement orchestration, music use, variation, and creativity)

Exercise attitude (learning motivation, behavior habits, and emotional engagement)

Physical fitness (flexibility, speed, endurance).

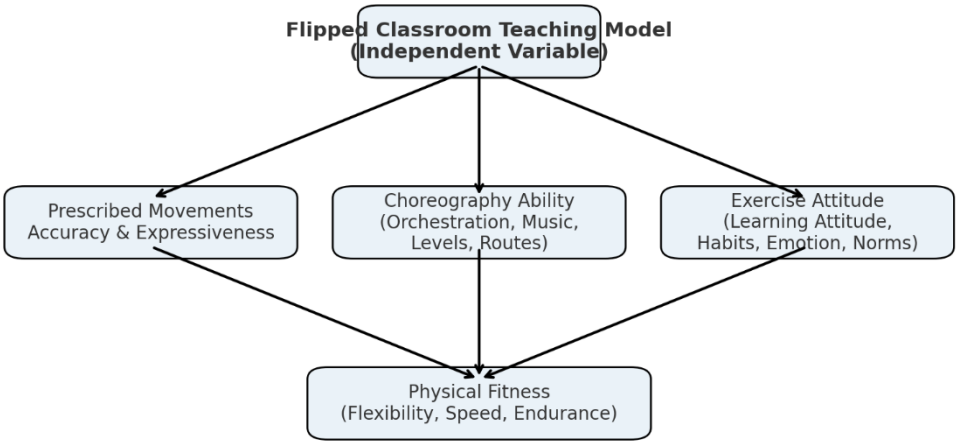

Figure 1: Conceptual model

Methodology

This study adopted a quasi-experimental design to examine the impact of the Flipped Classroom teaching model on teaching effectiveness in the Aerobics Compulsory Course at Guangxi University of Foreign Languages (GUFL). The participants were 80 first-year students enrolled in the 2024 aerobics compulsory course. They were randomly assigned into two groups: an experimental group (n = 40), which received instruction through the Flipped Classroom model, and a control group (n = 40), which was taught using the traditional teaching model.

The intervention lasted for 16 weeks (one academic semester), during which both groups followed the same aerobics curriculum, but with different instructional approaches. The experimental group engaged in pre-class learning through instructional videos and online resources, followed by in-class practice and peer collaboration, while the control group relied on teacher-centered demonstration and imitation in class.

Research instruments included:

Aerobics performance assessment – to evaluate the accuracy and expressiveness of prescribed movements.

Choreography evaluation rubric – to measure students' ability in choreography design, including movement orchestration, music selection, level variation, and route diversity.

Exercise attitude questionnaire – covering learning attitude, behavioral habits, emotional experience, and subjective norms.

Physical fitness tests – including sit-and-reach (flexibility), 50-meter dash (speed), and 800-meter run (endurance).

Data analysis was conducted using SPSS 22.0. Independent sample t-tests were employed to compare post-test differences between the two groups. One-way ANOVA was applied to analyze within-group and between-group differences across multiple indicators. Additionally, effect sizes (Cohen's d) were calculated to determine the magnitude of observed differences. Statistical significance was set at $p < 0.05$.

Results

This section presents the findings of the quasi-experimental study conducted over a 16-week period, comparing the effects of the Flipped Classroom teaching model and the traditional teaching model in the Aerobics Compulsory Course at Guangxi University of Foreign Languages. The results are reported in alignment with the four research objectives, namely: (1) prescribed movements, (2) choreography ability, (3) exercise attitude, and (4) physical fitness. Statistical analyses were conducted using independent sample t-tests and ANOVA, with effect sizes calculated through Cohen's d.

Objective 1: Prescribed Movements

Table 1: Comparison of Prescribed Movements (Accuracy & Expressiveness)

Group	Mean ± SD	t-value	p-value
Experimental (n=40)	85.62 ± 4.23	6.891	0.012*
Control (n=40)	79.15 ± 3.95		

Note: $p < 0.05$ indicates statistical significance; Cohen's $d > 0.8$ = large effect.

The results demonstrate that students in the experimental group (Flipped Classroom) achieved significantly higher scores in prescribed movement accuracy and expressiveness than those in the control group. The p-value of 0.012 confirmed statistical significance, while the large effect size (d = 1.62) indicated a substantial practical difference. These findings suggest that the use of pre-class videos and in-class corrective feedback enabled students to better internalize and perform technical movements with precision and expressive quality.

Objective 2: Choreography Ability

The second objective was to analyze the impact of the Flipped Classroom model on students' choreography ability, including movement orchestration, music selection, level variation, and route diversity.

Table 2: Comparison of Choreography Ability

Group	Mean ± SD	t-value	p-value	Cohen's d
Experimental (n=40)	88.24 ± 5.12	7.203	0.008**	1.68
Control (n=40)	81.46 ± 4.75			

*Note: *p < 0.01 indicates high statistical significance.*

The experimental group demonstrated markedly higher choreography scores than the control group. With a p-value of 0.008 and a large effect size (d = 1.68), the results confirm that the Flipped Classroom approach provided students with more opportunities for creativity and independent exploration. Exposure to digital resources and peer collaboration encouraged students to experiment with diverse movements, integrate music effectively, and demonstrate more innovative routines compared to the traditional model.

Objective 3: Exercise Attitude

The third objective focused on evaluating the influence of the Flipped Classroom model on students' exercise attitude, including learning attitude, behavioral habits, emotional experience, and subjective norms.

Table 3: Comparison of Exercise Attitude

Dimension	Experimental (n=40)	Control (n=40)	t-value	p-value	Cohen's d
Learning Attitude	22.16 ± 2.60	18.43 ± 1.56	6.732	0.015*	1.74
Behavior Habits	30.56 ± 2.48	26.20 ± 2.55	6.713	0.039*	1.73
Emotional Experience	21.73 ± 3.02	18.00 ± 2.75	4.996	0.262	0.69
Subjective Norms	7.13 ± 1.59	7.33 ± 1.51	-0.576	0.566	-0.13

The results revealed significant improvements in the experimental group's learning attitude and behavior habits, with large effect sizes (d > 1.70). These outcomes highlight the effectiveness of the Flipped Classroom in promoting positive attitudes toward exercise and reinforcing good exercise behaviors. However, emotional experience and subjective norms did not show

significant differences between the two groups. While students in the experimental group reported slightly richer exercise experiences, their sense of behavioral control and external influences remained largely unchanged. This may indicate that short-term interventions are insufficient to transform deeper psychological or social dimensions of exercise attitude.

Objective 4: Physical Fitness

The fourth objective was to compare the improvement in students' physical fitness (flexibility, speed, and endurance) between the Flipped Classroom and traditional teaching models.

Table 4: Comparison of Physical Fitness

Test	Experimental (n=40)	Control (n=40)	t-value	p-value	Cohen's d
Sit-and-Reach (cm)	21.85 ± 4.26	20.93 ± 4.12	1.052	0.296	0.25
50m Dash (sec)	9.84 ± 0.73	9.95 ± 0.68	-0.721	0.473	-0.18
800m Run (sec)	236.42 ± 18.26	238.11 ± 17.95	-0.412	0.681	-0.10

The analysis showed no statistically significant differences between the experimental and control groups in flexibility, speed, or endurance ($p > 0.05$). Effect sizes were small to negligible, suggesting that while both groups experienced slight improvements in physical fitness, the Flipped Classroom did not provide additional short-term benefits over traditional methods. This result can be attributed to the relatively short 16-week intervention, as improvements

in physical fitness typically require more sustained and intensive training to manifest measurable differences.

In summary, the study found strong evidence supporting the effectiveness of the Flipped Classroom in enhancing prescribed movement accuracy, expressiveness, choreography ability, and selected aspects of exercise attitude. The experimental group consistently outperformed the control group in these domains, with large effect sizes indicating meaningful educational and practical impact. However, the intervention did not significantly affect physical fitness within the limited duration of the study. These results underscore the value of the Flipped Classroom in improving technical and attitudinal learning outcomes in aerobics education, while also highlighting the need for longer-term or more intensive interventions to influence physical fitness.

Discussion

The purpose of this study was to evaluate the effectiveness of the Flipped Classroom model in the Aerobics Compulsory Course at Guangxi University of Foreign Languages. The findings revealed that the model had significant impacts on three key dimensions- movement accuracy, choreography ability, and exercise attitude- while showing limited short-term influence on physical fitness. These outcomes provide important insights into the pedagogical potential and practical limitations of adopting the Flipped Classroom in physical education.

1. Prescribed Movement Accuracy and Expressiveness

The results confirmed that students in the experimental group achieved significantly higher scores in prescribed movements compared to those taught with the traditional model. This improvement can be attributed to the integration of pre-class video resources and repeated self-paced practice, which allowed students to internalize movement details more effectively. Constructivist learning

theory explains this outcome: by watching instructional videos multiple times, students actively constructed their understanding of correct movement techniques, rather than passively imitating teacher demonstrations in class. Moreover, behaviorist principles suggest that immediate feedback- both from teachers and peers during class- served as reinforcement, leading to more accurate and expressive performances. These findings are consistent with previous research in physical education (Qiao & Deng, 2021), which highlighted the role of flipped teaching in enhancing technical precision and motivation.

2. Choreography Ability

The Flipped Classroom group demonstrated stronger creativity in aerobics choreography, including movement orchestration, music selection, level variation, and route diversity. This result highlights the effectiveness of allocating classroom time to higher-order skills, as proposed in Bloom's Taxonomy. Lower-level tasks such as memorization of basic steps were accomplished outside class, enabling in-class activities to focus on analysis, evaluation, and creation. Peer collaboration and cooperative learning further encouraged innovative thinking and diversified movement design. According to motor skill learning theories, especially Fitts' three-stage model, students were able to progress from cognitive understanding to associative practice more quickly, reaching higher levels of autonomy in choreography. This aligns with Liu Huanhuan (2020), who found that blended and flipped models improved students' creative output in performance-based courses.

3. Exercise Attitude

Exercise attitude, measured across learning attitude, behavioral habits, emotional experience, and subjective norms, showed significant improvements in the experimental group, particularly in learning attitude and behavior habits. Students exposed to the Flipped Classroom displayed higher motivation, greater engagement, and more consistent participation in aerobics practice. This reflects

the model's ability to create a more equal and interactive classroom environment, reducing teacher dominance and fostering student autonomy. From a behaviorist perspective, the continuous reinforcement of positive exercise habits contributed to these improvements. However, emotional experience and subjective norms did not show significant differences. This suggests that while the model enhanced observable behaviors and learning attitudes, it was less effective in reshaping deeper psychological dispositions such as intrinsic emotional satisfaction or peer-driven norms. These findings echo Chen Lixia (2021), who noted that flipped teaching improved external engagement but required additional strategies to influence deeper affective dimensions.

4. Physical Fitness Outcomes

In contrast to the other dimensions, no significant differences in physical fitness were observed between the experimental and control groups after 16 weeks. Both groups improved slightly in flexibility, speed, and endurance, but the gains were not statistically significant. This result highlights an important limitation: physical fitness is cumulative and requires sustained training intensity over longer periods to achieve measurable progress. The relatively short experimental duration (64 class hours across one semester) was insufficient to produce substantial changes in physical fitness indicators. Similar findings were reported by Liu Huanhuan (2020), who observed limited short-term fitness improvements despite the adoption of blended or flipped instructional strategies. It is reasonable to infer that while the Flipped Classroom enhances skill acquisition and motivation, its effect on physical fitness requires extended application and consistent supplementary training.

Limitations and Implications

Several limitations must be acknowledged. First, the study was limited to one university and a relatively small sample size, which restricts generalizability. Second, the experiment covered only one semester, which may explain the absence of significant differences in physical fitness. Third, while the instruments

used (performance assessments, rubrics, questionnaires, and fitness tests) were valid and reliable, they primarily measured observable outcomes and may not have fully captured deeper psychological or social changes. Despite these limitations, the study contributes valuable empirical evidence for the role of the Flipped Classroom in aerobics teaching. It demonstrates that this model can effectively improve technical performance, choreography creativity, and exercise attitudes, while also highlighting areas-such as long-term physical fitness-that require further exploration.

Conclusion

This research confirms that the Flipped Classroom model significantly enhances teaching effectiveness in aerobics education across three core areas:

Prescribed Movements: Students' accuracy and expressiveness improved markedly, reflecting the effectiveness of pre-class video learning and in-class corrective practice.

Choreography Ability: Students demonstrated greater creativity and diversity in aerobics routines, benefiting from collaborative learning and higher-order in-class activities.

Exercise Attitude: Improvements were evident in learning attitudes and behavioral habits, though emotional experience and subjective norms showed limited change.

Physical Fitness: No significant short-term improvements were found in flexibility, speed, or endurance, suggesting that longer interventions are necessary to affect physical outcomes.

Overall, the Flipped Classroom stimulated motivation, supported skill mastery, and fostered positive attitudes, but its impact on physical fitness was constrained by the short experimental duration.

Recommendation

Based on the findings, the following recommendations are proposed to optimize the use of the Flipped Classroom in aerobics and physical education:

Develop High-Quality Pre-Class Materials: Universities should invest in producing clear, structured, and engaging instructional videos and learning guides to ensure students are well-prepared before class.

Strengthen Individual Accountability: Mechanisms such as reflection logs, self-practice reports, or short quizzes should be introduced to ensure that students engage meaningfully with pre-class materials and reduce overreliance on group work.

Design Progressive Skill Training: Training programs should be structured step-by-step to gradually develop body control, technical precision, and integration of music. This approach ensures balanced skill development across students with varying abilities.

Extend the Intervention Period: Applying the Flipped Classroom model across a full academic year will provide sufficient time for cumulative improvements in physical fitness to emerge.

Provide Professional Development for Instructors: Teachers should receive training in Flipped Classroom pedagogy, classroom management, and the use of digital tools to enhance teaching quality and sustainability.

Enhance Emotional and Normative Engagement: Supplementary strategies such as motivational workshops, peer role models, or gamified activities could help improve emotional experience and subjective norms, which were less influenced in this study.

Encourage Long-Term Adoption: Universities should incorporate Flipped Classroom principles into broader curriculum reform, aligning with national policies on sports-education integration to promote lifelong fitness awareness and innovation in teaching models.

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