

Research on the influence of the teaching method of badminton elective courses in Guangxi A College, China, on the sense of self-efficacy of college students

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ABSTRACT

This study investigated the influence of an integrated innovative teaching model in badminton elective courses on college students' learning self-efficacy, skill mastery, and physical fitness at Guangxi A College, China. Grounded in Bandura's self-efficacy theory, a quasi-experimental, non-equivalent control group pretest-posttest design was adopted over a 16-week intervention. A total of 157 students were selected through cluster sampling and assigned to a control group (traditional teaching, $n = 40$) and an experimental group (integrated model, $n = 117$). The experimental group received a structured intervention combining game-based (Weeks 1–6), task-driven (Weeks 7–12), and competition-based (Weeks 13–16) teaching methods, while the control group followed the conventional explanation–demonstration–imitation–practice model. Research instruments included physical fitness tests, standardized badminton skill assessments, and a validated Physical Education Learning Self-Efficacy Scale. Data were analyzed using paired and independent samples t-tests and analysis of covariance (ANCOVA).

Results indicated no significant differences between groups at pretest ($p > 0.05$), confirming baseline equivalence. ANCOVA results indicated that, after the intervention, the experimental group demonstrated significantly higher scores in all three dimensions of badminton learning self-efficacy—learning competence, learning efficiency, and learning interest—compared with the control group ($p < 0.01$), with large effect sizes (Cohen's $d = 1.76$ – 1.95). Significant improvements were also observed in badminton skill mastery (total score: 26.70 ± 3.67 vs. 19.31 ± 2.98 , $p < 0.01$) and physical fitness ($p < 0.05$ – 0.01).

The findings suggest that integrating competition-based, task-driven, and game-based strategies can effectively enhance students' psychological confidence, technical performance, and physical development. The integrated teaching model provides empirical support for innovative, student-centered reform in university physical education.

Keywords: Innovative teaching model, Badminton elective course, Learning self-efficacy, Skill mastery, Physical fitness, College physical education.

Introduction

With the release of the Physical Education and Health Curriculum Standards for Compulsory Education in 2022, the educational philosophy of “Health First” has been further emphasized, advocating innovation in teaching methods and a shift from “knowledge- and skill-centered” instruction toward “student development-oriented” education. This reform highlights not only the mastery of sports skills but also students’ comprehensive development, including physical fitness, personality cultivation, and the formation of lifelong exercise awareness.

As the final stage of systematic school physical education, university physical education plays a critical role in shaping students’ physical literacy and exercise habits. The effectiveness of classroom teaching directly influences the overall quality of talent cultivation in universities. Recent studies have emphasized the importance of college physical education in promoting students’ physical health and comprehensive development, while highlighting the need for innovation and optimization of physical education teaching to improve instructional effectiveness (Wang & Lu, 2023; Wen & Guo, 2022).

However, current badminton elective courses in universities still face challenges, such as insufficient student participation, limited innovation in instructional design, and inadequate integration of psychological factors into teaching practice. Although badminton courses contribute positively to students’ health and well-being (Chen et al., 2022), traditional instructional approaches often emphasize technical drills while neglecting motivational and psychological dimensions. In this context, students’ learning self-efficacy is an important psychological factor influencing their engagement and performance in physical education.

In recent years, the application of diversified instructional models in badminton teaching has attracted increasing attention. Studies have shown that competition-based teaching methods can significantly improve students’ technical performance and engagement levels (Li, 2023), while task-driven instructional approaches are effective in enhancing students’ active participation and learning outcomes in badminton general courses for non-physical education majors (Su, 2024). These findings provide practical support for integrating innovative teaching strategies into university badminton elective courses.

Despite these advances, existing research has examined competition-based and task-driven teaching methods largely as separate instructional approaches, with limited attention to their systematic integration with game-based teaching and their potential to enhance students’ learning self-efficacy (Li, 2023; Su, 2024). Therefore, this study aims to integrate competition-based, task-driven, and game-based teaching methods into a comprehensive instructional framework tailored for non-sports major students in university badminton elective courses. By constructing a structured and operable teaching plan, this study seeks to enhance students’ learning engagement, improve instructional effectiveness, and promote their overall development.

Research Objectives

1. To verify the effectiveness of the innovative teaching methods (integrating the competition-based method, task-driven method, and game-based method) compared to traditional teaching methods in enhancing the three dimensions of badminton learning self-efficacy among college students at Guangxi A Institute, China.

2. To compare the differential effects between the innovative teaching methods group and the traditional teaching methods group on the level of badminton skill mastery and the degree of physical fitness improvement among college students at Guangxi A Institute, China.

Methodology

1. Population, Sample, and Key Informants

1.1 Population The population of this study consisted of students enrolled in badminton elective courses during the first semester of the 2025–2026 academic year at College A in Guangxi, China.

1.2 Sample A total of 157 students from four intact badminton elective classes were selected through cluster sampling. The four classes were retained as intact classes, and no individual-level randomization was conducted. To ensure baseline equivalence, students were assigned to the experimental and control groups at the class level based on a weighted composite score based on physical fitness (40%), learning interest (40%), and basic badminton skills (20%). Independent samples t-tests confirmed no significant differences between groups at pre-test ($p > 0.05$).

The final grouping was as follows:

Control Group (Traditional Teaching Method): Class A ($n = 40$)

Experimental Group (Integrated Innovative Teaching Model):

Class B ($n = 40$)

Class C ($n = 39$)

Class D ($n = 38$)

Total Experimental Group ($n = 117$)

Although Classes B, C, and D were administratively independent, they received the same integrated instructional intervention and were merged into one experimental group for statistical analysis. The unequal group sizes (40 vs. 117) were retained because the study used intact classes and did not involve individual-level randomization; this imbalance may limit statistical power and affect the assumption of homogeneity of variance.

1.3 Key Informants Three university physical education experts with teaching experience ranging from 10 to 30 years participated in reviewing and validating the research instruments. Two held the title of professor and one held the title of lecturer.

2. Research Instruments

The study employed four categories of instruments.

Physical Fitness Tests included the 400-meter run, four-corner run, and repeated side-to-side jumps.

Badminton Skill Tests included the backhand short serve, forehand high clear, and standardized technical performance assessments.

Questionnaire I: Badminton Elective Course Student Questionnaire was developed using a “classic item selection + self-constructed supplement” approach. It consisted of 20 items across four dimensions: Practicality and Combaticiveness, Goal Orientation and Efficiency, Interest and Emotional Arousal, and Standardization and Demonstration. A 5-point Likert scale was used. The pilot test ($n = 50$) showed an overall

Cronbach's alpha coefficient of 0.911, with subscale coefficients ranging from 0.877 to 0.938. IOC values ranged from 0.50 to 1.00, indicating acceptable content validity. Items with IOC values of 0.50 were retained based on the IOC criterion adopted in this study ($\text{IOC} \geq 0.50$) and were revised according to expert recommendations where necessary.

Questionnaire II: College Students' Physical Education Learning Self-Efficacy Scale was adopted from Luo Yanping (2012). The scale was adopted from Luo Yanping's (2012) Development and Related Analysis of the College Students' Physical Education Learning Self-Efficacy Scale. The overall Cronbach's alpha coefficient was 0.841, and subscale reliability ranged from 0.609 to 0.727. Confirmatory factor analysis demonstrated acceptable structural validity.

3. Research Hypotheses

H1: In the post-test, the total score and all dimensional scores of badminton learning self-efficacy of college students in the innovative teaching group will be significantly higher than those in the traditional teaching group.

H2: The improvement magnitude of the total badminton skill score and total physical fitness score of college students in the innovative teaching group will be significantly greater than those in the traditional teaching group.

4. Data Collection

This study adopted a non-equivalent control group pretest–posttest design.

The experimental period lasted 16 weeks from August to December 2025, and the experiment was conducted at the badminton courts of College A in Guangxi, China.

The control group followed the traditional “explanation–demonstration–imitation–practice” teaching model.

The experimental group implemented an integrated innovative teaching model in three structured phases. Weeks 1–6 applied the game-based teaching method. Weeks 7–12 applied the task-driven teaching method. Weeks 13–16 applied the competition-based teaching method.

Pre-tests were conducted before the intervention, and post-tests were conducted after the 16-week teaching period. A total of 157 questionnaires were distributed and recovered at both stages, resulting in a 100% response rate and 100% validity rate.

5. Data Analysis

Statistical analysis was conducted to process and examine the collected data. Descriptive statistics were reported as mean $\pm$ standard deviation ($M \pm SD$). Cronbach's alpha coefficient was calculated to assess the internal consistency reliability of the questionnaires. Paired samples t-tests were applied to analyze within-group differences between pre-test and post-test scores. Independent samples t-tests were used to compare differences between the experimental and control groups. Before conducting the t-tests and ANCOVA, the assumptions of normality and homogeneity of variance were examined, including Levene's test for equality of variances. The ANCOVA model was used to control for pre-test scores, and the corresponding degrees of freedom were reported in the statistical results. Given that the experimental group

consisted of three intact classes, the potential clustering of students within classes was recognized as a limitation of the study.

The level of statistical significance was set at $p < 0.05$, while $p < 0.01$ was considered highly statistically significant.

Research Framework



Figure 1 Research Content Framework Diagram

Results

Given that this study adopted a convergent intervention design, the experimental group ($n = 117$) consisted of three pooled classes implementing the Competition-Based Teaching Method (CBTM), Task-Driven Teaching Method (TDTM), and Game-Based Teaching Method (GBTM).

Two levels of statistical comparison were conducted:

1. Intra-group comparison: Paired samples t-tests were used to examine pre–post differences within each group.

2. Inter-group comparison: Independent samples t-tests were conducted to compare post-test results between groups, followed by ANCOVA controlling for pre-test scores.

All statistical analyses report Cohen's d effect sizes. For ANCOVA analyses, the F-statistic, adjusted means, and partial eta-squared (η^2) should be reported where available to provide additional information on the adjusted group effects.

1. Baseline Equivalence Between Groups (Pre-test)

1.1 Badminton Skills Before Intervention

Table 1 Comparison of Badminton Skill Pre-test Scores ($M \pm SD$)

Test Items	Control ($n=40$)	Experimental ($n=117$)	t	p
Backhand Low Serve	2.16 $\pm$ 0.13	2.15 $\pm$ 0.33	0.19	0.91
Forehand High Serve	3.47 $\pm$ 1.08	3.40 $\pm$ 1.09	0.35	0.67
Forehand Overhead Clear	4.21 $\pm$ 0.57	4.20 $\pm$ 0.72	0.08	0.95
Total Score	9.84 $\pm$ 1.78	9.75 $\pm$ 2.11	0.24	0.85

All p-values > 0.05 indicate no significant baseline difference. Cohen's d values ranged from 0.02–0.07 (trivial effect), confirming group homogeneity.

1.2 Physical Fitness Before Intervention

Table 2 Comparison of Physical Fitness Pre-test Scores (M±SD)

Test Items	Control (n=40)	Experimental (n=117)	t	p
400m Run (s)	93.12±4.88	92.95±5.18	0.18	0.85
Four-Corner Run (s)	8.16±0.80	8.27±0.70	-0.81	0.42
Repeated Lateral Jumps	24.85±3.92	24.97±4.21	-0.16	0.87
Total Score	254.08±17.31	255.21±18.88	-0.33	0.74

All indicators showed $p > 0.05$. Cohen's d values were below 0.10, confirming statistical equivalence.

1.3 Learning Self-Efficacy Before Intervention

Table 3 Comparison of Self-Efficacy Pre-test Scores (M±SD)

Dimensions	Control (n=40)	Experimental (n=117)	t	p
Learning Competence	15.45±2.04	15.26±1.98	0.52	0.60
Learning Efficiency	12.15±1.57	12.18±1.32	-0.11	0.91
Learning Interest	10.45±1.92	10.27±1.84	0.54	0.59
Total Score	38.05±5.53	37.71±5.13	0.36	0.72

No significant differences were observed ($p > 0.05$). Cohen's d ranged from 0.03–0.09 (small/negligible).

These results confirm baseline homogeneity.

2. Objective 1 Effectiveness of Innovative Teaching Methods on Self-Efficacy

2.1 Within Experimental Group (Pre–Post)

Table 4 Self-Efficacy Changes in Experimental Group (M±SD)

Dimensions	Pre-test	Post-test	t	p	Cohen's d
Learning Competence	15.26±1.98	23.38±1.75	-21.15	<0.01	1.78
Learning Efficiency	12.18±1.32	19.78±1.42	-24.42	<0.01	1.95
Learning Interest	10.27±1.82	18.62±1.63	-21.22	<0.01	1.81
Total Score	37.71±5.13	61.78±4.79	-22.98	<0.01	1.89

All dimensions improved significantly ($p < 0.01$) with large effect sizes ($d > 0.80$).

2.2 Post-test Comparison Between Groups

Table 5 Post-test Comparison of Self-Efficacy (M±SD)

Dimensions	Control	Experimental	t	p	Cohen's d
Learning Competence	16.12±1.85	23.38±1.75	-22.54	<0.01	1.76
Learning Efficiency	12.68±1.42	19.78±1.42	-27.32	<0.01	1.95
Learning Interest	11.15±1.78	18.62±1.63	-23.85	<0.01	1.84
Total Score	39.95±5.05	61.78±4.79	-24.62	<0.01	1.89

ANCOVA controlling for pre-test scores confirmed significant group effects ($p < 0.01$). Where available, the ANCOVA results should also be reported using the F-statistic, adjusted means, and partial eta-squared (η^2) to clarify the magnitude of the adjusted group effect.

Interpretation: The integrated innovative teaching model produced a statistically and practically significant enhancement in all three dimensions of badminton learning self-efficacy.

3. Objective 2 Comparison of Skill Mastery and Physical Fitness Improvement

3.1 Badminton Skill Mastery (Post-test)

Table 6 Post-test Comparison of Badminton Skills (M±SD)

Test Items	Control	Experimental	t	p	Cohen's d
Backhand Low Serve	5.32±0.95	8.65±1.20	-16.24	<0.01	1.63
Forehand High Serve	6.85±1.15	9.12±1.35	-9.62	<0.01	1.28
Forehand Overhead Clear	7.14±0.88	8.93±1.08	-9.65	<0.01	1.24
Total Score	19.31±2.98	26.70±3.67	-11.85	<0.01	1.57

All indicators showed highly significant differences ($p < 0.01$) with large effect sizes.

3.2 Physical Fitness Improvement (Post-test)

Table 7 Post-test Comparison of Physical Fitness (M±SD)

Test Items	Control	Experimental	t	p	Cohen's d
400m Run (s)	91.85±4.62	88.55±4.41	4.12	<0.05	0.72
Four-Corner Run (s)	8.06±0.71	7.45±0.52	5.98	<0.01	0.95
Repeated Lateral Jumps	25.13±3.25	31.15±3.80	-8.92	<0.01	1.41
Total Score	257.92±14.02	281.08±16.53	-7.85	<0.01	1.32

Agility and coordination indicators showed large effect sizes, while endurance showed moderate-to-large improvement.

Discussion

1. To verify the effectiveness of the innovative teaching methods in enhancing badminton learning self-efficacy. The findings of this study indicate that the integrated innovative teaching model significantly improved students' badminton learning self-efficacy across three dimensions: learning competence, learning efficiency, and learning interest. Compared with the traditional teaching group, the experimental group demonstrated highly significant gains ($p < 0.01$), suggesting that the integration of competition-based, task-driven, and game-based strategies effectively enhanced students' confidence and perceived capability in badminton learning. This result is consistent with the findings of Li (2023), who reported that the competition teaching method significantly improved students' technical performance and psychological engagement in college badminton elective courses. Competitive elements stimulate participation, strengthen goal awareness, and enhance students' confidence through achievement experiences. Furthermore, the significant improvement in self-efficacy aligns with the study of Su (2024), which demonstrated that the task-driven teaching method promotes active learning engagement and strengthens students' sense of accomplishment in badminton general courses. By setting clear tasks and progressive objectives, students experience mastery and autonomy, which contribute to increased learning motivation and confidence. The effectiveness of the integrated model may be explained by the progressive structure of its three stages. The game-based stage (Weeks 1–6) increases interest and reduces participation anxiety, the task-driven stage (Weeks 7–12) develops competence through structured challenges and successful task completion, and the competition-based stage (Weeks 13–16) allows students to apply their skills in authentic performance situations, reinforcing mastery experiences and confidence. This progression from participation to competence development and performance demonstration may create a psychological synergy that is less evident in the traditional explanation–demonstration–imitation–practice model. Therefore, the integration of these innovative methods appears to create a supportive and motivating learning environment that effectively strengthens badminton learning self-efficacy among college students.

2. To compare the differential effects on badminton skill mastery and physical fitness improvement. The results showed that the experimental group achieved significantly higher improvements in badminton skill mastery and physical fitness compared to the traditional teaching group ($p < 0.01$). This indicates that the integrated teaching approach not only enhances psychological outcomes but also produces substantial improvements in technical performance and physical development. The improvement in skill mastery is consistent with the research of Lei and He (2023), who found that the competition teaching method enhances students' technical proficiency and practical application ability in badminton classes. Structured competitive situations encourage repeated practice under realistic conditions, thereby improving skill accuracy and tactical awareness. In terms of physical fitness, the findings support the conclusions of Wu (2023), who emphasized that optimized physical education models focusing on active participation and structured activity intensity significantly promote college students' physical health development. The integration of competitive tasks and game-based activities increases movement frequency and exercise load, contributing to improvements in endurance, agility, and coordination. Overall, the results demonstrate that the innovative integrated

teaching model yields stronger instructional effects than traditional teaching methods in improving badminton skills and physical fitness. These findings provide empirical support for reforming college badminton teaching through diversified and student-centered instructional strategies. However, the findings should be interpreted in light of the unequal group sizes, the potential clustering effect resulting from the use of intact classes, the single-institution study setting, the absence of long-term follow-up, and the potential for self-report bias in the measurement of learning self-efficacy.

Summary of research results

This study examined the effects of an integrated innovative teaching model on college students' badminton learning self-efficacy, skill mastery, and physical fitness. The model produced clear educational advantages over traditional instruction. Students exposed to competition-based, task-driven, and game-based strategies not only developed stronger badminton skills but also demonstrated enhanced physical fitness and higher confidence in their learning abilities.

The findings suggest that structured interactive teaching approaches can simultaneously promote technical mastery, physical development, and psychological engagement. Compared with conventional teaching, the integrated model created a more effective and motivating learning environment for college badminton instruction.

Recommendation

1. Policy Recommendations

1.1 Universities should adopt a stage-based instructional model in physical education courses that aligns teaching strategies with students' psychological needs for relatedness, autonomy, and competence.

1.2 Curriculum reform in college physical education should emphasize the systematic integration of competition-based, task-driven, and game-based teaching methods rather than the isolated use of a single method.

1.3 Professional development programs for physical education teachers should incorporate training on psychological need diagnosis and adaptive instructional planning.

1.4 Evaluation systems should include indicators of learning self-efficacy and motivational development alongside technical skill assessment to promote holistic student growth.

2. Recommendations for Future Research

2.1 Future studies should expand the research sample to multiple universities to improve generalizability and external validity.

2.2 Longitudinal research designs are recommended to examine the long-term sustainability of improvements in self-efficacy, skill mastery, and physical fitness.

2.3 Further research may investigate the applicability of a self-efficacy-based integrated teaching model across different sports disciplines and educational levels.

2.4 Mixed-method research combining quantitative analysis with qualitative interviews or classroom observations is suggested to gain deeper insight into psychological and behavioral mechanisms underlying the intervention effects.

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