The Effects of Physical Education Learning Management Using the Flipped Classroom Teaching Model in Taijiquan Teaching in Ningbo Universities

[1]Ying Ying Zhang, [2*]Kreeta Promthep

[3]Jakrin Duangkam, and [4]Wiradee Eakronnarongchai

[*]*Corresponding author*

[1]Graduate School, Udon Thani Rajabhat University, Thailand

[2*, 3, 4]Faculty of Education, Udon Thani Rajabhat University, Thailand

E-mail: [1]741571636@qq.com, [2*]kreeta.pr@udru.ac.th, [3]jakrin.d@udru.ac.th, [4]wiradee.e@gmail.com

Received April 4, 2025; **Revised** May 28, 2025; **Accepted** June 10, 2025

Abstract

The purposes of this research were 1) to compare the learning achievement of first-year physical education students in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method; 2) to compare the learning achievements of first-year physical education students in Taijiquan lessons who were taught using the flipped classroom teaching model compared to the traditional teaching method; and 3) to evaluate students' satisfaction with instruction, classroom interaction, and psychological satisfaction in physical education, particularly in Taijiquan lessons taught using the flipped classroom teaching model. A quasi-experimental design was used in the study to compare the outcomes of teaching with the flipped classroom model. In this research, the sample consisted of 130 students, divided into two groups of 65 students each: one that used the flipped classroom model and the other that used the traditional teaching method. A particular random sampling method was used. The research results were as follows:

1. The learning achievements of both the experimental and control groups improved significantly after the instruction compared to before, at the 0.05 level of significance. The experimental group achieved higher post-learning scores than the control group, with an improvement of 3.76 points.

2. The experimental group had significantly better learning achievement than the control group, with a statistical significance level of 0.05 in both theory and practice. The experimental group achieved higher post-learning scores than the control group, with an improvement of 4.75 points.

3. Students reported the highest satisfaction with instruction, classroom interaction, and psychological satisfaction in physical education, particularly in Taijiquan lessons using the flipped classroom teaching model, showing the highest levels of satisfaction in all aspects.

Keywords: Flipped classroom teaching model; Taijiquan; Learning achievements; Students' satisfaction

Introduction

For centuries, people have used Taijiquan, as a traditional Chinese martial art to preserve their cultural heritage and enhance their health. Tai chi is typified by its fluidity, gentle, and relaxing movements that are timed with deliberate breathing. In order to balance the Yin-Yang energy within the body and stimulate both Intellectual and physiological potential, practitioners must maintain a constant awareness and observe the way their bodies move (Mańko et al., 2022). Taijiquan has therefore been incorporated into the field of program for physical education at numerous universities in an effort to promote students' Intellectual and physiological well-being while maintaining traditional Chinese culture. Institutions of higher education must improve their teaching and learning processes, as shown by the growing need for approved Tajiquan instructors.

Regardless of Tai Chi's many benefits (Taijiquan), Ningbo university students have shown lack of interest in and academic achievement in this course. A survey of 124 first-year students in 2023 found that they were not satisfied with the teaching method because it placed too much focus on theoretical material (39.09%), moved slowly and monotonously (33.64%), and covered too much history (23.64%). The ineffectiveness of the traditional lecture-based method of instruction was demonstrated by the low exam scores, which averaged 41.5% in the theoretical section and 57.15% in the practical section. In skill-based physical education classes, this method does not increase learning achievements or encourage engagement of students.

Innovative approaches of teaching such as the flipped classroom model, games-based learning, and questioning-based learning have been investigated in order to address these problems. Especially, the flipped classroom teaching model has been acknowledged for enhancing student-centered learning, promoting active participation, and advancing both theoretical

understanding and practical skills (Bergmann & Sams, 2012). According to previous studies, the flipped classroom model improves engagement of student, educational performance, attitudes, learning achievements, comprehension, self-reflection on the learning process, and overall performance in a variety of subject areas (Al-Samarraie et al., 2020).

This research investigates the effects of the flipped classroom model on learning achievement and student satisfaction in Taijiquan courses among 130 first-year students in Ningbo universities during 2023-2024 academic year. The results will be useful in raising participation of student and instructional strategies in physical education programs, particularly in Taijiquan education.

Research Objectives

1. To compare the learning achievements of first-year Physical Education students in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method.

2. To compare the learning achievements of first-year Physical Education students in Taijiquan lessons who were taught using the flipped classroom teaching model compared to the traditional teaching method.

3. To evaluate students' satisfaction with instruction, classroom interaction, and psychological satisfaction in Physical Education, particularly in Taijiquan lessons taught using the flipped classroom teaching model.

Literature Review

Physical Education Curriculum

In China, the curriculum for physical education has been continuously developed to raise students' physical health and general well-being. The "Physical Education and Health Standards (2022 Edition)" have been enforced by the Chinese Ministry of Education, requiring physical education a required subject in elementary and secondary education. It shows 10-11% of all classroom hours and comes in second only to Chinese language and math (China Ministry of Education, 2022). Taijiquan, water sports, and winter sports are among the six specialized sports categories offered in this curriculum, which also underlines basic sports skills, physical health, and health knowledge.

Learning Achievement

The term " learning achievement" describes the knowledge, abilities, and competencies that students gain during the course of their educational experiences; these are usually evaluated using educational performance indicators, standardized tests and practical evaluations. In physical education, learning achievement includes both theoretical understanding and abilities that are practical, allowing students to use what they have learned in real-life situations (Biwer et al., 2023). Learning achievement in the Taijiquan physical education course is defined as the success attained through teaching and learning activities. It is evaluated in two distinct aspects: theoretical understanding, which is evaluated through a 30-question multiple-choice test worth 30 points, and practical skills, which are measured by correctly performing 8 Taijiquan movements according to specified evaluation criteria, worth 20 points. A complete evaluation of both aspects ensures an accurate measurement of students' educational achievements and their ability to combine theoretical understanding with practical application.

Flipped Classroom Teaching Model

One learning management approach that promotes active affiliation and fosters an interactive learning environment in the classroom is the model of flipped classroom teaching, which encourages students to study material before class. The concept was developed by Bergmann & Sams (2012), who separated the process of learning into two main sections: In-Class Activities, which emphasize group work, and Out-of-Class Activities, during which students study on their own, summarize what they have learned, and pose questions. These activities consist of the following: Warm-up (talking about topics from the pre-class study), Exploration (collaborating to solve problems), Explanation (presenting concepts under the guidance of the teacher), Elaboration (using knowledge in unfamiliar contexts), also Evaluation (self and peer evaluation). This systematic model enhances in-depth understanding and real-world application of knowledge, improving both independent and cooperative learning (Bergmann & Sams, 2012).

Satisfaction

Satisfaction with learning describes how students feel about their whole experience of learning, taking into consideration elements like engagement, interaction, teaching methods, and the efficiency of instructional management. In the field of physical education, enthusiasm, engagement, and educational success are all significantly impacted by satisfaction. According to research, by giving a personalized and interactive learning environment, model of active learning such as the flipped classroom teaching model increase student satisfaction (Cheng et al., 2019).

Conceptual Framework

A conceptual framework for "The Effects of Physical Education Learning Management Using the Flipped Classroom Teaching Model in Taijiquan Teaching in Ningbo Universities," as shown in Figure 1 below, was established by the researcher based on the literature review, documents, and related research studies.

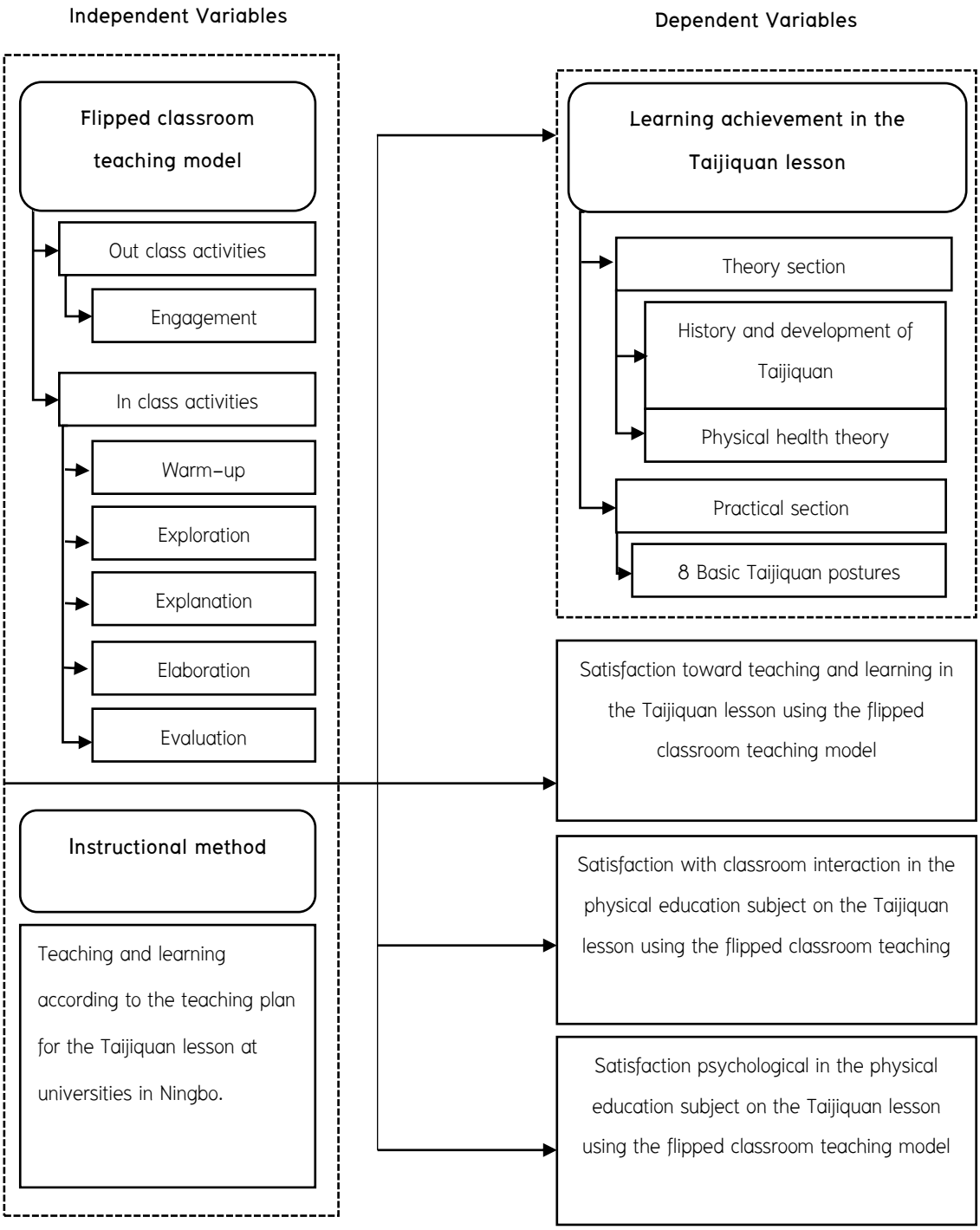

Figure 1 Conceptual Framework

Research Methodology

This research used a quasi-experimental design to compare first-year physical education students' learning achievement on the Taijiquan lesson before and after learning using the flipped classroom model and the traditional method in order to evaluate the effectiveness of the flipped classroom teaching model. In addition, it compared the learning achievement between the experimental and the control groups, and evaluated students' satisfaction with the instruction, classroom interaction, and psychological satisfaction in Taijiquan lessons using the flipped classroom teaching model.

The sample group, which included 130 students taking Taijiquan lessons, was selected using the purposive sampling method. A control group of 65 students studied using the traditional method, while the experimental group of 65 students studied using the flipped classroom teaching model.

Research Instruments

1. Two formats of lesson plans were developed for the Taijiquan lesson in physical education:

1.1 The flipped classroom model, which received 4.87 on the quality assessment. There are two parts to the instructional processes:

Part 1: Out-class activities (studying at home or outside the classroom)

Step 1: In the engagement stage, students review the content in advance, compile their understanding, and pose questions.

Part 2: In-class activities (working at school)

Step 2: In the warm-up, students share issues they have encountered from their prior study, and the teacher provides advice any questions they may have.

Step 3: During the exploration stage, students comprehend the questions and the teacher gives them collaborative tasks to complete.

Step 4: In the explanation period, students find possible answers. With the teacher acting as a mentor or advisor, students share their thoughts. To enhance comprehension, the teacher might pose thought-provoking questions.

Step 5: The stage of elaboration occurs when the teacher poses situations or issues pertaining to the topic, encouraging students to think more broadly or make connections between new and prior knowledge, which in turn leads to further research.

Step 6 : The evaluation phase gives students the chance to evaluate their own and their peers' learning process. Teachers can assess how well students are learning new material through analysis, discussion, questioning, and knowledge sharing. In order to enhance students' learning development, learning management places a strong emphasis on evaluating based on actual conditions.

1.2 The traditional instructional method received a quality score of 4.72.

Both lesson plans were validated for accuracy before being used in the research.

2. Learning achievement test on the theoretical section:

2.1 The range of Item–Objective Congruence (IOC) was from 0.80 to 1.00.

2.2 The range of difficulty index (p) was from 0.42 to 0.58.

2.3 The range of discrimination index (r) was from 0.36 to 0.76.

2.4 The range of reliability was 0.92.

3. Assessment Criteria for Practical Learning Achievement:

3.1 The Item–Objective Congruence (IOC) was 1.00 for all items.

4. Student satisfaction questionnaire, assessing:

4.1 Satisfaction toward instruction in physical education subject on the Taijiquan lesson using the flipped classroom teaching model

4.2 Satisfaction with classroom Interaction in physical education subject on the Taijiquan lesson using the flipped classroom teaching model

4.3 Satisfaction psychological in physical education subject on the Taijiquan lesson using the flipped classroom teaching model

The range of Item–Objective Congruence (IOC) was from 0.80 to 1.00.

During the 18–week experiment, pre–and post–tests, satisfaction surveys, and qualitative data from student reflections were used to collect data. T–tests and descriptive analysis were used for analysis. This methodology was designed to ensure reliable and verifiable outcomes when evaluating how well the flipped classroom teaching model enhances Taijiquan learning.

Research Results

The research findings and their discussion are as follows:

Compare the learning achievements of first-year Physical Education students in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method

The comparison of learning achievement of first-year Physical Education students in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method was conducted using a normal distribution test through the SPSS program, applying the Kolmogorov-Smirnov test. According to the analysis results, all of the data had Sig. values greater than .05, which means that the data had a normal distribution and satisfied the requirements for applying the t-test in statistical analysis.

Subsequently, the researcher compared learning achievements of first-year Physical Education students in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method. Table 1 reveals the findings from the assessment and comparison of learning achievement scores.

Table 1 The result of a comparison between the learning achievements of first-year Physical Education students in Taijiquan lessons before and after instruction using the traditional teaching approach and the flipped classroom model

Sample group	Descriptive statistics		Within – Subject analysis				Correlations	Effect size
	Pretest mean (SD)	Posttest mean (SD)	Mean difference (SD)	SE difference	t-value	p-value		
Theory section (30 points)								
Experimental Group (n=65)	14.18 (3.80)	23.85 (3.32)	9.67 (2.27)	.281	34.379	< .001*	.806	4.271
Control Group (n=65)	14.34 (3.69)	20.23 (3.90)	5.89 (1.87)	.232	25.379	< .001*	.880	3.149
Practical section (20 points)								
Experimental Group (n=65)	8.85 (2.30)	15.86 (2.58)	7.02 (1.56)	.193	36.346	< .001*	.802	4.499

Sample group	Descriptive statistics		Within – Subject analysis				Correlations	Effect size
	Pretest mean (SD)	Posttest mean (SD)	Mean difference (SD)	SE difference	t-value	p-value		
Control Group (n=65)	8.92 (2.24)	14.72 (2.24)	5.80 (1.69)	.209	27.699	< .001*	.716	3.436
The practical and theory sections (50 points)								
Experimental Group (n=65)	23.03 (5.20)	39.71 (5.20)	16.68 (2.62)	.325	51.266	< .001*	.877	6.470
Control Group (n=65)	23.26 (5.23)	34.95 (5.49)	11.69 (2.21)	.273	42.705	< .001*	.916	5.286

*Statistically significant at the .05 level

Table 1 indicates the comparison between the learning achievements of first-year Physical Education students in Taijiquan lessons before and after instruction using the traditional teaching approach and the flipped classroom model in both theoretical and practical sections before and after learning.

1. In the theoretical section (30 points), the experimental group improved from 14.18 (SD = 3.80) to 23.85 (SD = 3.32) with an effect size of 4.271, while the control group increased from 14.34 (SD = 3.69) to 20.23 (SD = 3.90) with an effect size of 3.149. The larger effect size in the experimental group shows that flipped classroom teaching model enhances theoretical understanding more effectively due to self-study before class and active discussions.

2. In the practical section (20 points), the experimental group improved from 8.85 to 15.86 with an effect size of 4.499, whereas the control group increased from 8.92 to 14.72 with an effect size of 3.436. The greater improvement in the experimental group indicates that flipped classroom teaching model enhances practical skills more effectively, as in-class time is spent on hands-on practice and teacher feedback.

3. For overall learning achievement (50 points), the experimental group improved from 23.03 to 39.71 with an effect size of 6.470, while the control group increased from 23.26 to 34.95 with an effect size of 5.286. According to the findings, students actively participate in class and outside of it, which results in a more balanced and successful learning process. This means that the flipped classroom teaching model greatly improves both theoretical and practical learning.

Plotting the learning achievement results for both groups of students in physical education before and after studying yields the results displayed in Figure 2.

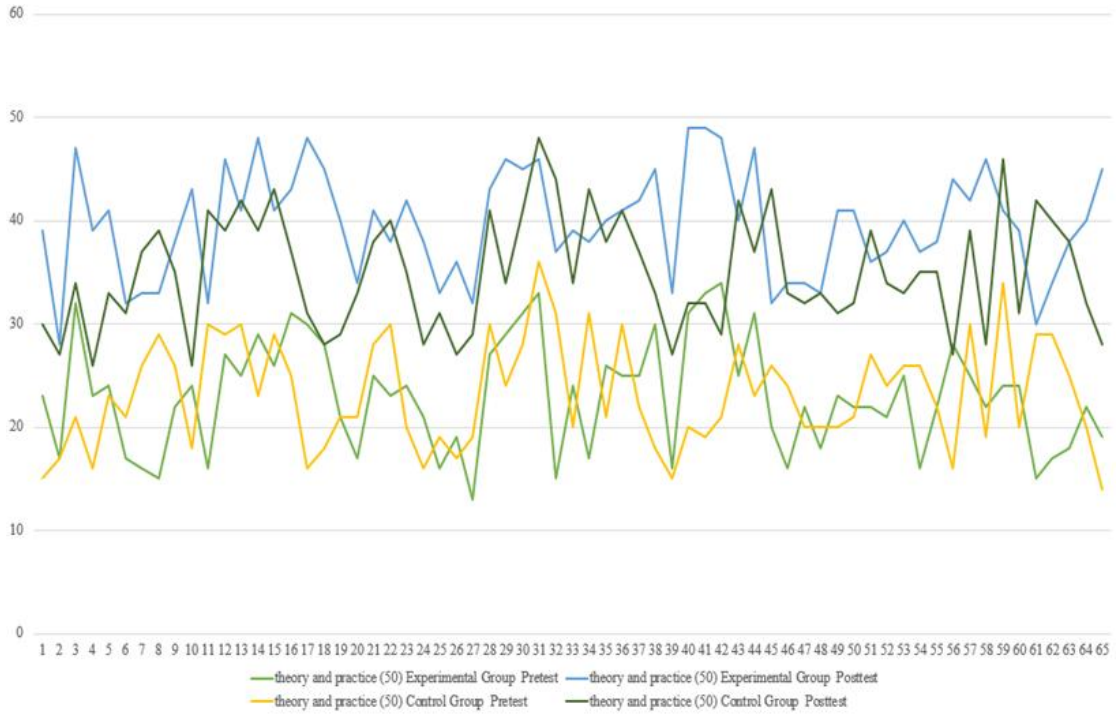

Figure 2 Graph showing the differences in learning achievement scores between the experimental and control groups.

The graph demonstrates that the experimental group showed greater improvement in both theoretical and practical components compared to the control group. Use of the flipped classroom model yielded a notable performance increase, particularly in the overall score.

Compare the learning achievements of first-year Physical Education students in Taijiquan lessons who were taught using the flipped classroom teaching model compared to the traditional teaching method

The researcher studied the learning achievement scores and compared the results of the experimental group, which used the flipped classroom teaching model, and the control group, which used the traditional teaching method, in order to compare the learning achievements of first-year Physical Education students in Taijiquan lessons, both theoretically and practically after learning. Table 2 indicates results of the study.

Table 2 A comparison of the learning achievements of first-year Physical Education students in Taijiquan lessons, in both the practical and theory sections, between the experimental group and the control group after instruction.

Sample group	Prescriptive Statistics		Between – Subject Analysis				
	Pretest mean (SD)	Posttest mean (SD)	Mean difference	SE difference	t-value	p-value	Effect Size
Theory section (30 points)							
Experimental Group (n=65)	14.18 (3.80)	23.85 (3.32)	3.615	.6351	5.693	< .001*	.899
Control Group (n=65)	14.34 (3.69)	20.23 (3.90)					
Practical section (20 points)							
Experimental Group (n=65)	8.85 (2.30)	15.86 (2.58)	1.138	.4236	2.687	< .001*	.472
Control Group (n=65)	8.92 (2.24)	14.72 (2.24)					
The practical and theory sections (50 points)							
Experimental Group (n=65)	23.03 (5.20)	39.71 (5.20)	4.754	.9375	5.071	< .001*	.890
Control Group (n=65)	23.26 (5.23)	34.95 (5.49)					

*Statistically significant at the .05 level

Table 2 shows the comparison of the learning achievements of first-year Physical Education students in Taijiquan lessons, in both the practical and theory sections, between the experimental group and the control group after instruction.

1. Theory section (30 points): The experimental group increased from 14.18 (SD = 3.80) to 23.85 (SD = 3.32) (Effect Size = .999), while the control group increased from 14.34 (SD = 3.69) to 20.23 (SD = 3.90). The larger effect size and post-learning score show that the flipped classroom teaching model enhances theoretical understanding more effectively through pre-class self-study and in-class discussions.

2. Practical section (20 points): The experimental group increased from 8.85 (SD = 2.30) to 15.86 (SD = 2.58) (Effect Size = .472), while the control group increased from 8.92 (SD = 2.24) to 14.72 (SD = 2.24). The results indicate that the flipped classroom teaching model

enhances skill development more successfully because students spend class time on practical practice and error correction, even though the effect size is smaller than in the theory section.

3. Overall learning achievement (50 points): The experimental group increased from 23.03 (SD = 5.20) to 39.71 (SD = 5.20) (Effect Size = .890), while the control group increased from 23.26 (SD = 5.23) to 34.95 (SD = 5.49). According to the results, the flipped classroom teaching model encourages active student participation both inside and outside of the classroom and greatly improves theoretical and practical learning. Plotting the learning achievement results for both groups of students in physical education before and after studying yields the results displayed in Figure 3.

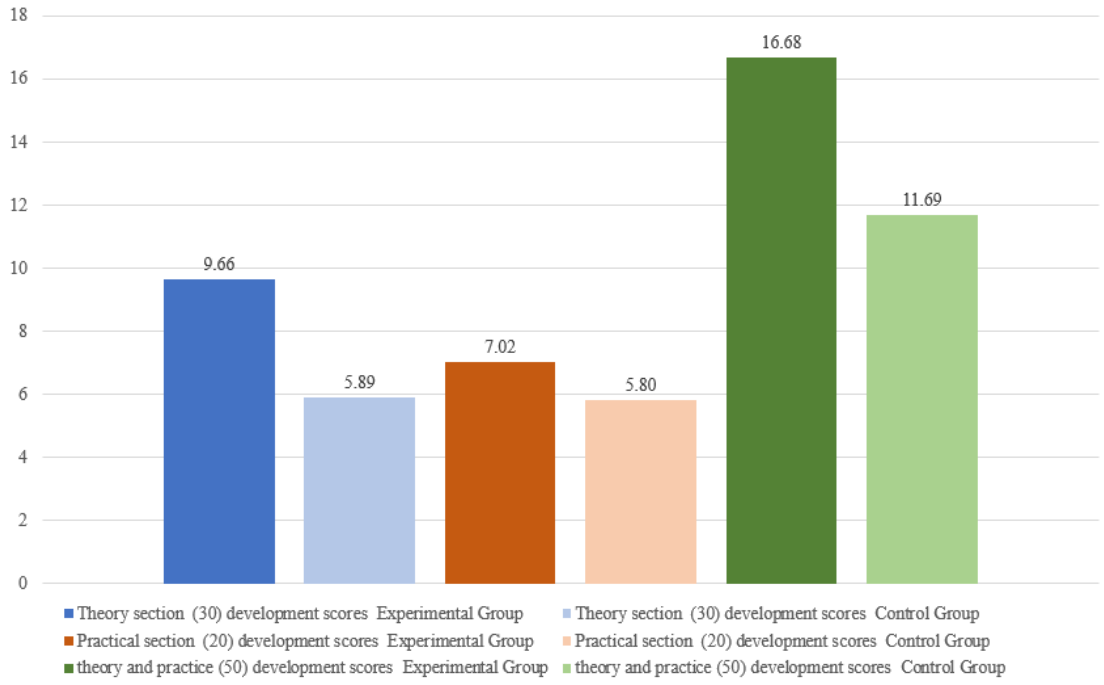

Figure 3 Graph comparing the development average scores of learning achievement in the theory and practice sections between the experimental group and the control group.

This Figure 3 shows the improvement in overall learning outcomes in both groups after instruction. The experimental group outperforms the control group, especially in the practical component, indicating the flipped classroom model's effectiveness in skill-based learning.

Evaluate students' satisfaction with instruction, classroom interaction, and psychological satisfaction in Physical Education, particularly in Taijiquan lessons taught using the flipped classroom teaching model

In order to assess student satisfaction with the Taijiquan lessons using the flipped classroom model, the researcher distributed questionnaires following the experiment. There were three sets of questionnaires, each covering four aspects. The mean and standard deviation of the collected data were calculated with the specifics as follows.

1. Four aspects were covered in the questionnaire used to assess student satisfaction with the instruction in the Physical Education lesson on Taijiquan using the flipped classroom teaching model: learning activity management, evaluation of learning management, benefits obtained from learning activities, and the teacher. The mean and standard deviation were calculated from the collected data, and the results are shown in Figure 4.

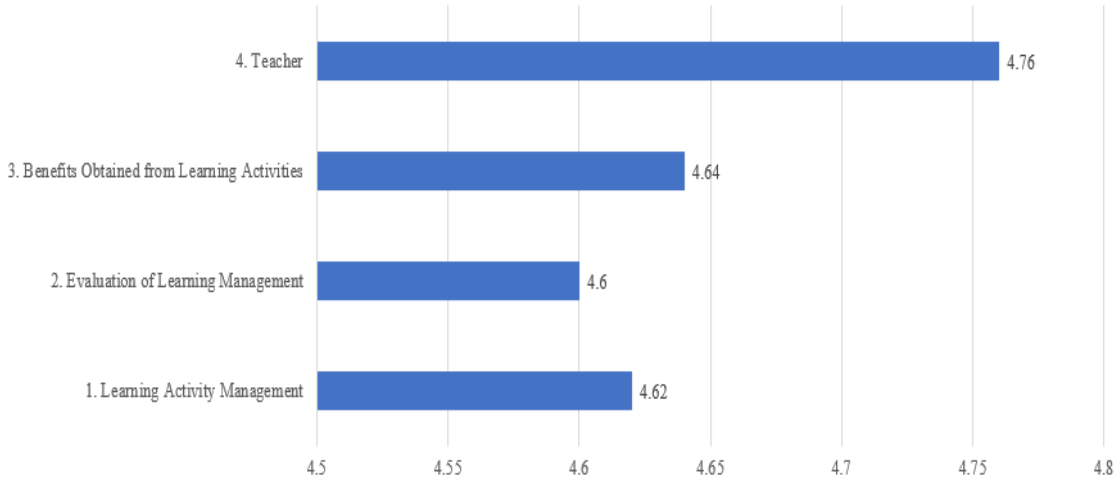

Figure 4 A comparison of satisfaction with the instruction in the Physical Education lesson on Taijiquan using the flipped classroom teaching model.

The Figure 4 presents student ratings across four instructional aspects: activity management, instructional evaluation, learning benefits, and instructor performance. High satisfaction was reported across all components, reflecting positive reception of the model.

2. Four aspects were covered in the questionnaire used to assess student satisfaction in the classroom interaction in the Physical Education lesson on Taijiquan using the flipped classroom teaching model: participation in class, student cooperation, communication with the teacher, and classroom atmosphere. The mean and standard deviation were calculated from the collected data, and the results are shown in Figure 5.

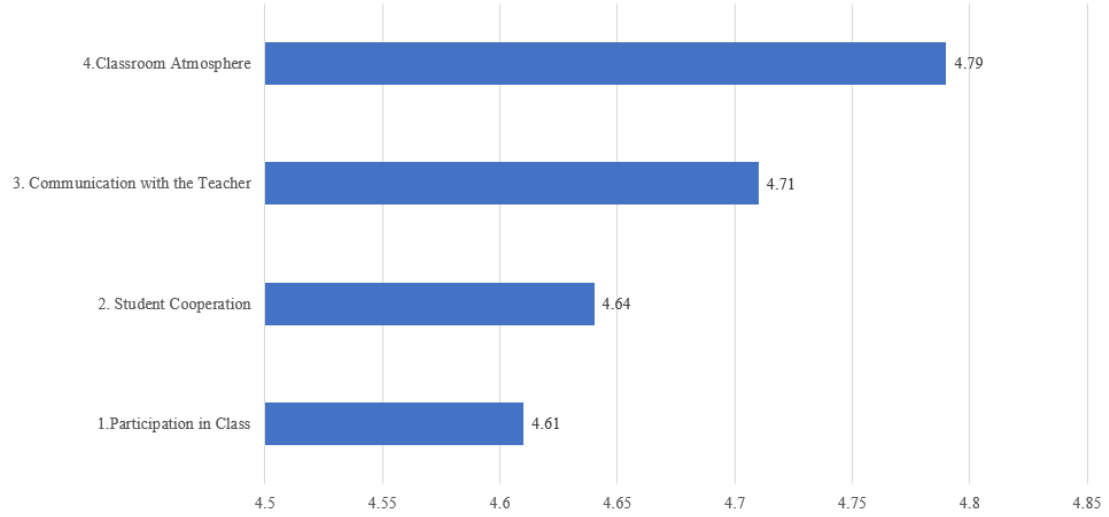

Figure 5 A comparison of satisfaction with the classroom interaction in the Physical Education lesson on Taijiquan using the flipped classroom teaching model.

This bar chart illustrates students' satisfaction levels regarding participation, peer collaboration, communication with the teacher, and class atmosphere. Results indicate enhanced engagement and interpersonal dynamics under the flipped classroom model.

3. Four aspects were covered in the questionnaire used to assess student satisfaction in the psychological aspects in the Physical Education lesson on Taijiquan using the flipped classroom teaching model: psychological safety, motivation to learn, sense of belonging to the class, and sense of achievement. The mean and standard deviation were calculated from the collected data, and the results are shown in Figure 6.

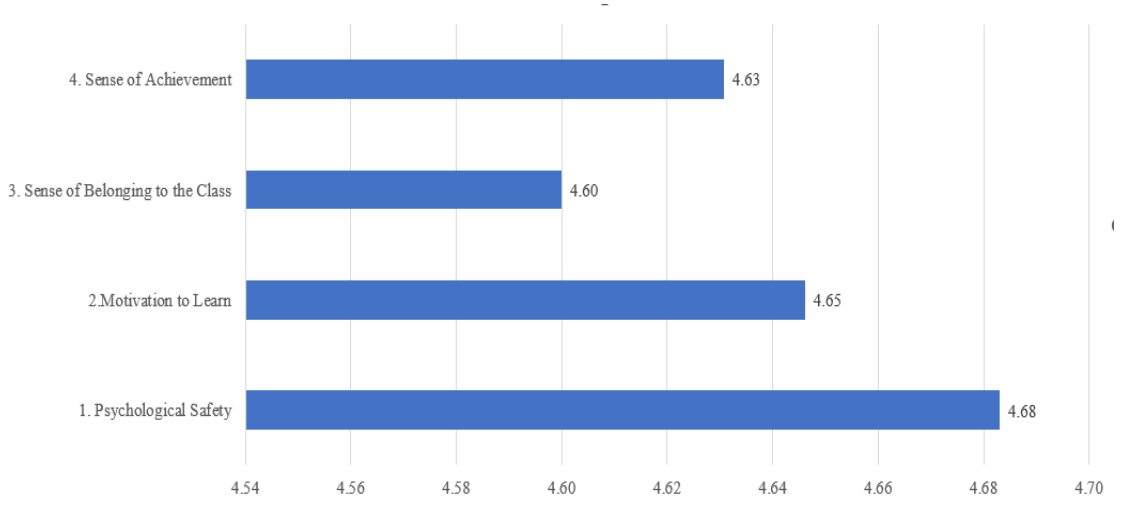

Figure 6 A comparison of satisfaction with the psychological aspects in the Physical Education lesson on Taijiquan using the flipped classroom teaching model.

The Figure 6 shows strong positive responses in psychological safety, motivation, sense of belonging, and achievement. The flipped classroom environment fostered emotional support and increased learner confidence.

Discussions

The following intriguing findings from the study on the effects of physical education learning management using the flipped classroom teaching model in Taijiquan Teaching at Ningbo Universities call for more discussion to shed more light:

1. The findings of the study show that following the instruction, learning achievement significantly improved in both the experimental and control groups. In contrast, the experimental group that used the flipped classroom model outperformed the control group in both the theoretical and practical sections. This result is consistent with Bloom's (1956), which highlights the value of higher-order thinking skills and active learning in understanding and applying knowledge. The flipped classroom teaching model allows students to engage with the content in advance, leading to a profound comprehension during classroom activities and discussions. Furthermore, (Vygotsky, 1978). Social constructivism theory, which emphasizes the importance of social interaction in the construction of knowledge, is in line with this active learning environment. Cabi's, (2018) study, "The Impact of the Flipped Classroom Model on Students' Academic Achievement," which looked at how the flipped classroom model affected student learning outcomes, lends further support to these conclusions. The study found that this approach of instruction has a positive impact on students' performance in a variety of subject areas. Likewise, the meta-analysis in "A Meta-Analysis Study on the Effectiveness of Flipped Classroom Learning on Students' Academic Achievement" by Kazu and Kurtoğlu (2022) revealed that the flipped classroom model significantly improved students' educational performance.

2. The findings of the study indicate that the flipped classroom teaching model has a greater impact on learning achievement than traditional teaching methods. In both theory and practice, the experimental group performed better than the control group. Students gained a more thorough and well-rounded understanding of the material when they were given the opportunity to prepare ahead of time and actively participate in class discussions and problem-solving. These results are consistent with Kolb's Experiential Learning Theory (Kolb, 1984), which highlights the significance of reflective thinking and active engagement in real-world experiences in order to enhance comprehension. Furthermore, flipped learning offers benefits over lecture-based

instruction in terms of academic results, intrapersonal and interpersonal skills, and student satisfaction, according to a meta-analysis conducted (Bredow et al., 2021). According to the study, this model greatly improved students' educational performance and level of engagement. Furthermore, these results are consistent with the meta-analysis by Hew and Lo (2018) that looked at the impact of flipped classrooms in higher education and came to the conclusion that the model improves student satisfaction and overall lesson comprehension.

3. The study also found that the experimental group was very satisfied with the flipped classroom teaching model. Students expressed greater psychological security, a more collaborative learning environment, and increased motivation to learn. These results are consistent with Maslow's Hierarchy of Needs Theory (Maslow, 1943), especially when it comes to psychological needs including self-actualization, safety, and belonging. Students felt appreciated and accepted, which raised their level of engagement and confidence because of the flipped classroom model's supportive atmosphere. The study "The Effect of Flipped Classroom Model on Students' Classroom Engagement in Teaching English," conducted by Ayçiçek and Yanpar (2018), provides additional support for this conclusion. The study looked at how the flipped classroom model affected students' involvement in English language instruction.

Knowledge from Research

As a result of this research, the Flipped Classroom Teaching Model—which is based on the idea of Bergmann and Sams (2012)—was developed for the Physical Education Taijiquan course. The model was created particularly for the students at China's Ningbo University of Finance and Economics. The structure of this instructional model is illustrated in Figure 7.

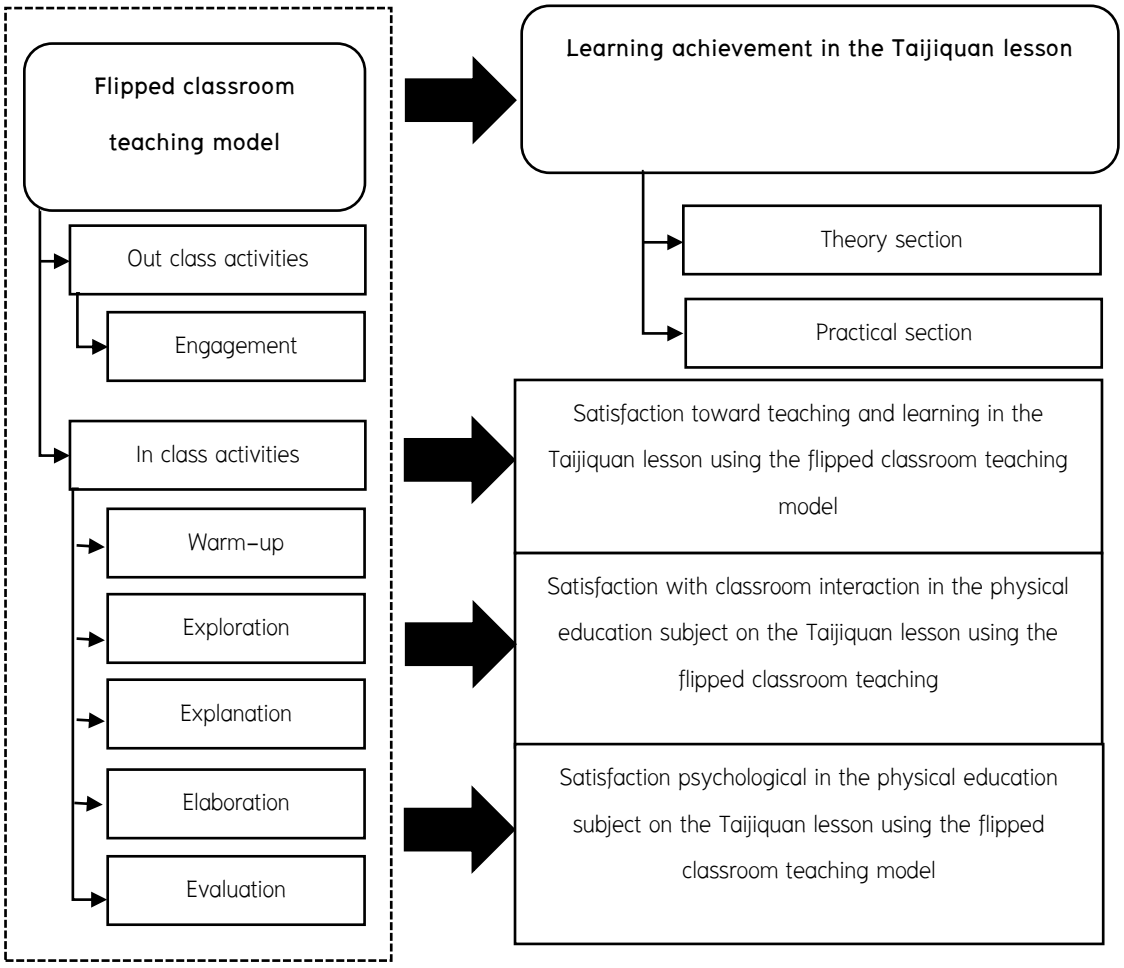

Figure 7 The impact of the flipped classroom teaching model on learning achievement and student satisfaction in Taijiquan lessons.

Figure 7 illustrates how the flipped classroom teaching model greatly improves learning achievement in the Taijiquan lesson, which is divided into two main parts: the theory section, in which students gain knowledge of the philosophy, history, and physical health principles of Taijiquan, and the practical section, which concentrates on teaching basic postures and movement techniques. The flipped model encourages participation in in-class discussions and activities by letting students study theoretical material prior to class. This approach makes the most of the practical training time, allowing students to improve their performance through peer collaboration and instructor feedback. The flipped classroom teaching model improves student satisfaction in three ways in addition to learning achievements. As students encounter a more dynamic and student-focused learning environment, their satisfaction with teaching and learning increases. Teacher-student engagement, teamwork, and active affiliation all contribute to increased

classroom interaction satisfaction. Additionally, as students become more self-assured, feel a sense of accomplishment, and experience less anxiety during the learning process, psychological aspects of satisfaction are strengthened. For Taijiquan students, this instructional model not only maximizes academic achievement but also cultivates a positive and supportive learning environment.

Conclusion

The findings of this research can be summed up as follows:

1. The experimental group and the control group both had significantly higher learning achievement at 0.05 after class, according to a comparison of first-year Physical Education students' learning achievement in Taijiquan lessons before and after instruction using the flipped classroom teaching model and the traditional teaching method. Nevertheless, the experimental group improved in both the theory and practice sections of Taijiquan and had higher post-class scores, demonstrating the effectiveness of the flipped classroom teaching model in raising learning achievement when compared to the traditional method.

2. The experimental group had significantly higher learning achievement than the control group in both the theory and practical sections. The flipped classroom teaching model provided students with the opportunity to practice, participate in class discussions, and prepare in advance, which effectively fosters a deeper understanding and application of Taijiquan concepts.

3. The experimental group's students expressed the highest level of satisfaction with the flipped classroom teaching model, according to the results, stating that it improved their motivation, psychological safety, and classroom interaction while also fostering an engaging and encouraging learning environment. The students appreciated the innovative approach of teaching because it offered them the opportunity to practice in advance, collaborate with classmates, and get teacher guidance-all of which increased their confidence and enthusiasm for learning Taijiquan.

Suggestions

1. It is recommended to broaden the implementation of the flipped classroom teaching model to other physical education subjects, such as team sports, individual sports, or fitness-related subjects, by creating resources beforehand, such as videos, articles, or online exercises, for students to study independently before class.

2. Enhance psychological support and classroom interactions with adaptable activities. It is advised to add adaptable activities to improve interactions and offer more psychological support in order to build on the study's findings, which show that students are highly satisfied with classroom interactions and psychological safety under the flipped classroom model.

3. It is recommended to extend the Taijiquan learning period beyond one semester, as the current scope is limited

References

Al-Samarraie, H., Shamsuddin, A., & Alzahrani, A. I. (2020). A flipped classroom model in higher education: A review of the evidence across disciplines. *Educational Technology Research and Development, 68*(3), 1017–1051. https://doi.org/10.1007/s11423-019-09718-8

Ayçiçek, B., & Yanpar, Y. T. (2018). The effect of flipped classroom model on students' classroom engagement in teaching English. *International Journal of Instruction, 11*(2), 385–398. https://doi.org/10.12973/iji.2018.11226a

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day* (pp. 120–190). Washington, DC: International Society for Technology in Education.

Biwer, F., de Bruin, A., & Persky, A. (2023). Study smart – impact of a learning strategy training on students' metacognitive knowledge, strategy use, and academic performance. *Advances in Health Sciences Education: Theory and practice, 28*(1), 147–167. https://doi.org/10.1007/s10459-022-10149-z

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals*. New York: Longmans.

Bredow, C. A., Roehling, P. V., Knorp, K. B., & Sweet, M. S. (2021). To flip or not to flip? A meta-analysis of the effectiveness of the flipped classroom model in higher education. *Review of Educational Research, 91*(6), 878–918. https://doi.org/10.3102/00346543211019122

Cabi, E. (2018). The impact of the flipped classroom model on students' academic achievement. *The International Review of Research in Open and Distributed Learning, 19*(3), 202–221. https://doi.org/10.19173/irrodl.v19i3.3482

Cheng, L., Ritzhaupt, A. D., & Antonenko, P. (2019). Effects of the flipped classroom instructional strategy on students' learning outcomes: A meta-analysis. *Educational Technology Research and Development, 67*, 793–824. https://doi.org/10.1007/s11423-018-9633-7

China Ministry of Education. (2022). *Physical education and health standards for primary and secondary schools (2022 edition)*. Retrieved from https://www.moe.gov.cn

Hew, K. F., & Lo, C. K. (2018). Flipped classroom improves student learning in health professions education: A meta-analysis. *BMC Medical Education, 18*(1). https://doi.org/10.1186/s12909-018-1144-z

Kazu, İ. Y., & Kurtoğlu Yalçın, C. (2022). A meta-analysis study on the effectiveness of flipped classroom learning on students' academic achievement. *e-International Journal of Educational Research, 13*(1), 85-102. https://doi.org/10.19160/e-ijer.1033589

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice Hall.

Mańko, G., Jekiełek, M., Ambroży, T., Rydzik, Ł., Ambroży, D., Cech, P., Perliński, J., Litwiniuk, A., & Jaszczur-Nowicki, J. (2022). Effectiveness of Tai Chi elements for improving balance and functional efficiency of elderly patients: Preliminary reports. *Archives of Budo, 18*, 251-258.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370-396. https://doi.org/10.1037/h0054346

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Massachusetts: Harvard University.