DEVELOPMENT OF FLIPPED CLASSROOM AND COOPERATIVE LEARNING INSTRUCTIONAL MODEL TO ENHANCE BADMINTON TECHNICAL SKILLS OF UNDERGRADUATE STUDENTS

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Thesis Title Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students

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Title	**Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students**
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ABSTRACT

The objectives of this research were 1) to study the factors to enhance undergraduate students' badminton skills of undergraduate students in Yulin Normal University, 2) to develop flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University, and 3) to study the results of implementing flipped classroom and cooperative learning Instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University. Phases were carried out to answer research objectives 1, 2, 3. The population of Phase 1 were 210 former students and 4 lecturers of the badminton technical skills and college badminton course in the semester 1 of the academic year 2022 from 4 Majors in Yulin Normal University. The target group of Phase 2 were 5 experts, and the sample group of Phase 3 are 40 students enrolled in the badminton technical skills and college Badminton Course of Yulin Normal University. The research instruments were 1) a set of questionnaires for students, and the questions to interview for lecturers. 2) a set of questionnaires for conformity instructional model, 3) lesson plans using flipped classroom and cooperative learning instructional model, and 4) scoring rubric form. Data analyzed by percentage, mean and , standard deviation.

The results revealed the following.

1.The factors to enhance undergraduate students' badminton technical skills from both group of informants, after combining the data from the two groups of respondents ,Internal factors supporting undergraduate students' badminton technical

skills include Learning attitude, academic motivation ,Learning interest and Study self-confidence factors; external factors refer to basic teaching abilities of lecturers, lecturer's classroom organization and implementation, lecturer's personal quality, lecturer teaching attitude, teaching mode innovation and physical education curriculum, etc.

2. Flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students include 5 components: 1) Principle and Rationale, 2) Objectives, 3) Contents ,4) Method of teaching & materials and 5) Evaluation. The model was 100% conformed to utility, feasibility, propriety, and accuracy standards as assessed by 5 specialists.

3. It was found that 90% of 40 students who enroll in the college badminton course students whose badminton technical skills is at good or excellent level while another 10% of them are assessed to be at Medium and Pass level. The result is consistent with the research hypothesis that 80% upwards of the participants will have badminton technical skills at good level after learning through flipped classroom and cooperative learning instructional model.

Keywords: Flipped Classroom, Cooperative Learning, Instructional Model, Badminton Technical Skill

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Contents

Contents (Continued)

List of Figures

List of Tables

List of Tables (Continued)

Chapter 1
Introduction

Rationale

University badminton teaching is one of the key contents of physical education teaching work in colleges and universities, it is an important part of the organization of quality education for college students and cultivation of high-quality talents with all-round development, its purpose is to effectively promote the improvement of students' physical fitness, cultivate students' lifelong awareness of physical education, physical exercise ability and the habit of consciously exercising, and the quality of badminton teaching is also directly related to the students' athletic ability and athletic level. At present, Yulin Normal College's badminton course teaching objectives are: 1) to exercise students' body comprehensively, and to promote the harmonious development of students' body and mind. 2) through the course of teaching, to enable students to master the basic knowledge of badminton, basic technology, skills. 3) in the teaching activities, to cultivate the students' subjective consciousness and the lively and pleasant, positive, courageous to explore as well as to overcome the difficulties of the spirit. 4) to develop students' physical fitness, physical exercise ability, physical fitness ability and conscious exercise habit, and the quality of badminton teaching is also directly related to the students' sports ability and sports level (Yulin Normal University, 2017).

In university badminton courses, college students' badminton skills are generally poor. Observations of college students' badminton teaching and related literature research show that the overall badminton skill level of college students is not high. Badminton is a sport dominated by net confrontation techniques, and badminton movement techniques are relatively complex and difficult to learn, requiring students to have a certain degree of coordination, control, and stroke speed (Lin, 2019). For example, in the body turn to in the forehand stroke, the rapid continuous force of the hip and waist, the use of centrifugal force to increase the strength of the swinging body to swing the racket to hit the ball, with the feet, legs, hips, waist, arms, elbows, wrists and coordinated force, so as to form an orderly chain

of force, hitting the ball of any one of the parts of the problem, will not be able to produce enough power and speed, so it is difficult to improve the badminton technology learning to improve effectively the badminton technique.

In badminton teaching facilities can not meet the badminton exercise needs of college students. Badminton sport has relatively high requirements for venues and equipment, the construction cost of badminton courts is large, and the management of badminton courts in some colleges and universities is also problematic, which makes it impossible for students to use the venues for training after school (Wang, 2022), and most of the colleges and universities are unable to satisfy the needs of the students, and it is impossible to form a continuous and effective badminton technical ability. College students' interest in badminton persistence time is not long also affects an important factor of college students' badminton skill level. Since college students nowadays live more freely, making more students spend more time on video games and videos in addition to completing the necessary courses in school, plus due to the influence of epidemics, class schedules, academic papers, employment pressure and many other aspects, college students' time in school is subject to a greater degree of pressure from all aspects, lack of sufficient practice time, and the poor level of badminton skills of college students has become the people's general consensus (Sun, 2022). In terms of badminton teaching, the teaching method mostly adopts the indoctrination teaching method, where lecturers repeat teaching many times and students imitate and practice, without digging deep into the fitness principle of the program itself, and analyzing the technical movements of the students is not thorough, and the theory of the students is detached from the reality. The traditional class lecture system still occupies a dominant position, and the indoctrination mode of lecturer speaking and student listening, which is lecturer-centered and ignores the students' subjective position, has not been changed, and the students' subjective position is neglected in teaching, which leads to low interest in learning and poor learning effect (Dai, 2023). Therefore, how to improve badminton teaching methods to improve students' learning interest and skill level has become a major challenge for physical education in colleges and universities at present.

Flipped classroom, as a new type of teaching mode, has been widely noticed and applied in the field of education at home and abroad. It is a teaching model based on information technology, which advocates "changing from teaching-centered to learning-centered" and "changing from knowledge and skill mastery to students' overall development". Chen (2017) believed that unlike imparting and practicing movements in a traditional classroom, the advantage of the flipped classroom teaching model is that the knowledge transfer session in a traditional classroom is shifted outside the classroom, and the classroom time is mainly used for students' discussion, practice, and interactions in order to increase students' interest in learning and deepen students' understanding. This has a certain positive effect on improving the teaching effect and teaching quality of badminton class. Wang (2016) believed the advantage of flipped classroom also lies in the fact that flipped classroom fully respects personalized teaching, which is a new type of personalized teaching mode of "learning to teach", for example, students can independently decide the time, place, speed, content and progress of learning before the class, and they can repeatedly learn the key points and difficulties of learning through online teaching resources until they are mastered.

Regarding the definition of cooperative learning, scholars have similar views. Cooperative learning is a classroom instructional technique in which students engage in learning activities in small groups and receive rewards or recognition based on the performance of the group as a whole. Cooperative learning is the pedagogical use of small groups in which students move together to maximize their own learning and that of others (Dong, 2018). This type of cooperative learning in small groups is a student-centered approach to teaching and learning where students interact and collaborate with each other to complete set tasks so that they can learn together. Advantage of cooperative learning in groups is firstly, mutual aid learning: cooperative learning in groups can promote mutual aid and cooperation among students, who observe, exchange and share skills with each other, and improve the technical level of badminton together; Advantage two is to improve the level of competitiveness: cooperative learning in groups can organize confrontational training and competitions among students, stimulate their competitive consciousness and improve their competitive level (Liu, 2021). Advantage three is to cultivate teamwork spirit:

cooperative group learning can cultivate students' teamwork spirit and communication and coordination ability to improve the fighting power of the whole team.

Flipped classroom and cooperative learning Instructional model can further enrich badminton teaching means and improve badminton technical ability. A series of researches and experiments on flipped classroom and cooperative learning teaching method have been conducted at home and abroad, and the results of the researches prove that flipped classroom and cooperative learning teaching method have significant effect on improving the technical ability of badminton. Stanford University did an experiment, using the flipped classroom as a teaching method, the attendance rate of students surged from 30% to 80% thus it can be seen that the flipped classroom has a positive effect on changing the existing teaching status quo (Wang, 2016). Li (2022) in "Experimental Research on the Application of Flipped Classroom in the Teaching of Badminton Elective Courses in Colleges and Universities" takes 45 students of badminton elective class 1 and 45 students of badminton elective class 2 as the research subjects. Through the flipped classroom teaching mode in teaching for the application of experimental application research, the conclusion shows that the application of the flipped classroom teaching mode in the teaching of college badminton elective course is feasible and effective. And through the teaching experiment close to three months, it was found that the badminton scores of students in the experimental class were significantly better than the scores of students in the control class. Hu, et *al*. (2020) in "Experimental Study of Flipped Classroom in Badminton Teaching" studied two classes of university badminton option course with 60 students as the research subjects, and the target teaching technical movements were chosen to be forehand serve backcourt overhead and forehand hit backcourt overhead, and the experimental period was 8 weeks. The results of the experiment showed that compared with the pre-experiment, the experimental group and the control group achieved a significant increase in the number of forehand backcourt shots and forehand backcourt shots, as well as the score of the technical evaluation. In the study of "Experimental research on cooperative learning" teaching mode to improve the learning effect of college students' physical education". Liu Jun et *al*. conducted an experiment on 168

students who took badminton beginner's class in the second semester of 2018-2019 in a double first-class key university. In the experiment, the average scores of badminton forehand high ball, return high ball and comprehensive assessment were evaluated, and the experimental results showed that the teaching mode of "cooperative learning" was indeed conducive to improving the students' physical education performance, not only the average scores of forehand high ball, return high ball and comprehensive assessment were higher than those of the traditional class, but also the average scores of return high ball and comprehensive assessment were higher than those of the traditional class, and the average scores of return high ball and comprehensive assessment were higher than those of the traditional class. The average scores of forehand high balls, return high ball and comprehensive examination were not only higher than those of the traditional teaching class, but also the return high ball and comprehensive examination scores were significantly improved ($P<0.05$) (Liu, 2021). This indicates that the cooperative learning Instructional model has a significant effect on the improvement of college students' badminton skills.

As the rationale shown above, the author realizes the Flipped Classroom and Cooperative Learning Instructional Model to improve students' Badminton Technical Skills.

Research Questions

1. What are the factors affecting badminton technical skills of undergraduate students at Yulin Normal University?

2. Is flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students at Yulin Normal University appropriate for further implementation and how?

3. What are the results of implementing flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students at Yulin Normal University?

Research Objectives

1. To examine the factors affecting badminton technical skills of undergraduate Students in Yulin Normal University.

2. To develop flipped classroom and cooperative learning instructional model toenhance badminton technical skills of undergraduate students kills in Yulin Normal University.

3. To study the results of flipped classroom and cooperative learning instructional model to enhance model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Research Hypothesis

After implementing flipped classroom and cooperative learning instructional model, students' badminton technical skills will be overall improved at 80% (Good Level).

Scope of the Research

Population and the Sample Group

Population

The total of 120 freshmen students from 3 sections of students who enrolled in the Badminton Course in semester 1 academic year 2023. Those sections involve the following.

41 students in class A, Literature major

40 students in class B, History major

39 students in class C, Chemistry major

The Sample Group

A simple random sample was obtained from 40 students who took the badminton course in class B.

Independent Variable

Flipped classroom and cooperative learning Instructional model

Dependent Variable

Badminton technical skills

Contents

There are 4 Units, 32 hours in Badminton Course. The content is shown below:

Unit 1: Basic Theory of Badminton (4 hours)

Unit 2: Basic Badminton Techniques (16 hours)

Unit 3: Badminton physical training (6 hours)

Unit 4: Badminton game and judging methods (6 hours)

Based on the technical skills of badminton in this study, the researcher chose the second unit (16 hours) for the experiment. The contents are as follows:

Chapter 1 Forehand serve technical skill (4 hours)

Chapter 2 Forehand Stroke technical skill (4 hours)

Chapter 3 Backhand serve technical skill (4 hours)

Chapter 4 Backhand stroke technical skill (4 hours)

Time frame

Semester 1 in Academic year 2023 (September -December 2023)

Advantages

1. To the students: They can improve badminton technical skills through the development of flipped classroom and cooperative learning Instructional model.

2. To the lecturers: They can improve teaching technical skills and enhance new teaching techniques through the study of Flipped Classroom and Cooperative learning Instructional model.

3. To the University: They can obtain more experience and suggestions on managing schools, which will help lecturers and students to teach and learn better.

Definition of Terms

The factors affecting students' badminton technical skills refers to the internal and external factors collected from students using questionnaire and interviews for lecturers designed by the researcher. The internal factors involve the information about students while external factors consist of information about the lecturer and circumstances. In addition, the factors will be obtained by structured interviews with the lecturers.

Development of flipped classroom and cooperative learning instructional model refers to a new instructional framework which consists of stable teaching activities and procedures. Such a developed instructional model with 5 components: 1) Principles & Rationale, 2) Objectives, 3) Contents, 4) Methods of teaching & Materials and 5) Evaluation, was confirmed by the experts in 4 aspects: 1) Utility Standards, 2) Feasibility Standards, 3) Propriety Standards and 4) Accuracy Standards as the following:

Utility Standards are intended to ensure that the developed instructional model will serve the information needs of intended users.

Feasibility Standards are intended to ensure that the developed instructional model will be realistic, prudent, flexible, and frugal.

Propriety Standards are intended to ensure that the developed instructional model will be conducted in conformity to teaching principles and provide positive results.

Accuracy Standards are intended to ensure that the developed instructional model shows a measure of closeness to a true value.

Flipped classroom teaching model refers to a teaching model that shifts the knowledge transfer aspect of traditional classroom teaching outside the classroom, where class time is mainly used for student discussion, practice, and interaction (Bergmann & Sams, 2012). The core concept of the flipped classroom model is to shift the classroom time from knowledge transfer to knowledge application in order to increase students' interest in learning and deepen their understanding (Bishop & Verleger, 2013). The flipped classroom teaching model consists of the following main steps: pre-study, class discussion, class practice and feedback and evaluation. The teaching steps are as follows:

Step 1: Pre-teaching, lecturers provide the course content in the form of video, audio, text, etc. to students, who study independently before class to complete the pre-teaching task.

Step 2: Class introduction, at the beginning of the class, the lecturer understands the students' pre-study, and answers and supplements the students' questions and problems.

Step 3: Classroom activities, lecturers organize students to carry out classroom discussions, group work, practical operations and other activities to deepen students' understanding and mastery of the course content.

Step 4: Classroom summary, lecturers comment and summarize students' performance in classroom activities, emphasize the key points and difficulties, and pave the way for the next stage of learning.

Step 5: Post-class homework, lecturers assign post-class homework, requiring students to consolidate and expand the classroom content to improve students' independent learning ability.

Group work (Co-Op Co Op) refers to a technique that focuses on collaborative work. By competent and able group members Different qualifications show the roles and responsibilities they are good at. Good students help the weak. This is an activity that involves higher level thinking, is both analytical and helpful, and is a teaching activity that can be used in any subject. The cooperative learning applied in this paper is Group work (Zhou, 2018). The main steps are as follows:

Step 1: Determine the scope or content of the problem based on the students' learning objectives.

Step 2: The class participates in a discussion to define the problem. or topic to be studied

Step 3: Assign subgroups Allow team members to have mixed abilities

Step 4: Each group chooses a topic to study.

Step 5: Members of each team work together to identify sub-topics. and divide responsibilities by giving.

Flipped classroom and cooperative learning refers to a teaching mode that integrates group cooperative learning into the flipped classroom, in which the lecturer can place the explanation and demonstration of badminton skills outside the classroom through online platforms and video tutorials, allowing students to study and preview independently before class. Classroom time is then mainly utilized for practice and discussion in cooperative group learning. lecturers can group students and divide group members according to their learning situation and guide students to learn cooperatively within the group. Through cooperative learning, students can help each other, learn from each other and improve their badminton skills. At the same time, lecturers can also provide timely feedback and evaluation of

students' learning process to help students find problems and make targeted improvements, so as to develop a new teaching mode of badminton courses (Wang, 2016). The steps are as follows:

Step 1: Pre-class teaching, the lecturer will provide the course content in the form of video, audio, text, etc., and the students will learn independently before class and complete the pre-class teaching tasks.

Step 2: Classroom introduction and grouping, at the beginning of the class, understand the students' pre-study, and divide the students into learning groups of 4-6 students according to their characteristics and needs.

Step 3: Classroom division of labor and cooperation, the lecturer will design the teaching task for group division of labor, group members learn from each other, everyone has the responsibility to do their own share of work.

Step 4: Classroom display and evaluation, after each group completes the task, they need to show the results to the class, the lecturer and the students in each group evaluate the process and results of cooperative learning, so as to adjust the learning strategy in time and improve the learning effect.

Step 5: After-class homework, the lecturer assigns after-class homework, requiring students to consolidate and expand the classroom content and improve students' independent learning ability.

Badminton technical skill refers to the technical ability that badminton learners need in badminton, and the level of badminton skill directly affects students' performance and achievement in teaching. This study focuses on the improvement of technical skills of beginner learners, and the badminton technical skills mainly include four aspects: forehand serve technical skill, forehand stroke technical skill, backhand serve technical skill, and backhand stroke technical skill, and each item has a corresponding scoring standard. For the badminton skills in this study, the following criteria were mainly used for evaluation (Zhang, 2007).

Item 1: Forehand Serve Technical Skill

Standard 1: Completeness of serve

Standard 2: Proficiency of the serving motion

Standard 3: Height of serve

Standard 4: Depth of serve

Item 2: Forehand Stroke Technical Skill

Standard 1: Completeness of stroke

Standard 2: Proficiency in batting maneuvers

Standard 3: Height of Stroke

Standard 4: Depth of stroke

Item 3: Backhand Serve Technical Skill

Standard 1: Completeness of serve

Standard 2: Proficiency of serving movement

Standard 3: Height of serve

Standard 4: Depth of serve

Item 4: Backhand Stroke Technical Skill

Standard 1: Completeness of stroke

Standard 2: Proficiency of Stroke

Standard 3: Height of Stroke

Standard 4: Depth of stroke

Undergraduate students refer to the first-year students majoring other majors enroll sports Course in the one semester academic Year 2023.

Yulin Normal University refer to an university is located in Yulin City, a thousand-year-old city in southeastern Guangxi, and is a full-time ordinary undergraduate institution of higher education under the Guangxi Zhuang Autonomous Region.

Research Framework

"Develop Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate students", in order to realize the development of this teaching model, firstly, the basic ideas and theories that support the model are applied, which are three aspects of the Flipped Classroom Teaching Model, Cooperative Learning, and Badminton Technical Skills, as well as the combination of the "Factors Influencing Badminton Technical Skills" and its consistency with the "University Badminton Curriculum" consistency. This suggests that the developed teaching model takes into account both internal and external factors that may influence students' learning of badminton technical skills. Next, the

pedagogical model and its components were broken down in more detail: 1) Principles and rationale; 2) Objectives; 3) Content; 4) Teaching methods and materials; and 5) Evaluation. This suggests that the model is comprehensive and aims to ensure its effectiveness through evaluation. Finally, the "results of the implantation of the developed pedagogical model" were used to find out whether the model achieved its objective of improving the technical skills of undergraduate badminton students.

Based on the research objectives, relevant theories were organized and examined, namely, flipped classroom(Wang,2016) and cooperative learning(Zhou, 2018) instructional model as well as badminton technical skills(Zhang, 2007). These ideas and principles are the basis of the following research framework as shown in Figure 1.1.

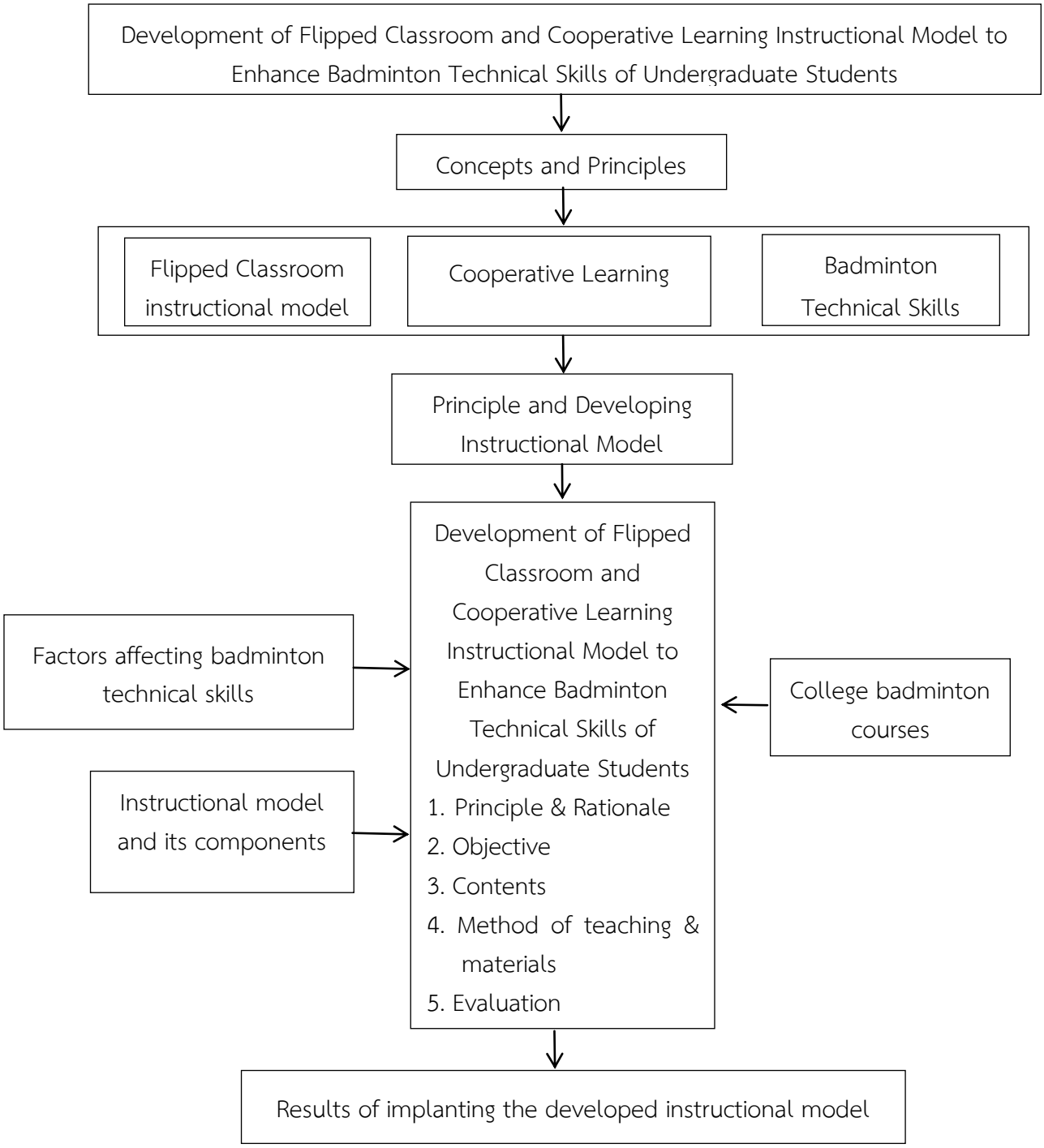

Figure 1.1 Research Framework

Chapter 2
Literature Review

In the study of “Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students”, the researcher studied the documents concerning the following.

1. Badminton Course at Yulin Normal University
2. Development of instructional model
3. Flipped Classroom
4. Cooperative Learning
5. Badminton Technical Skills
6. Related Research

The detail s are as follows:

Badminton Courses at Yulin Normal University

Principle

In 2022, the Ministry of National Education issued the Physical Education and Health Curriculum Standard, which stipulates that the physical education and health curriculum takes physical practice as the main means, physical education and health knowledge, skills and methods as the main learning content, and develops students' core qualities and promotes students' physical and mental health as the main purpose, which is characterized by fundamentals, fitness, practicability and comprehensiveness. Badminton teaching in higher education is an important part of school education. Guo (2021) believes that in the context of deepening teaching reform, colleges and universities should constantly innovate the education and teaching system of badminton courses, fully mobilize the subjective initiative of students' learning, and overall improve the education and teaching ability of lecturers as well as the comprehensive strength of schools. Therefore, the principles of badminton courses in colleges and universities should include the principles of individualization, gradualism, comprehensiveness, comprehensive development, and stimulation of interest, etc. These principles of the courses are designed to ensure that the students can obtain comprehensive development and improvement in

sports activities, and at the same time, cultivate their physical fitness, skill level and comprehensive ability. The principles of badminton courses in colleges and universities are as follows:

1. The principle of individualization: badminton courses should be tailored to the individual differences and characteristics of the students, tailor-made teaching content and methods.

2. Progressive principle: badminton courses should adopt progressive teaching methods, starting from the basic techniques to gradually improve, and gradually guide students to master more advanced techniques and tactics.

3. Principle of comprehensiveness: Badminton courses should give comprehensive consideration to technology, tactics, physical fitness, psychology and other aspects, so that students can develop comprehensively.

4. The principle of comprehensive development: badminton courses should focus on the overall development of students, including physical fitness, technical level, tactical application ability, psychological quality and other aspects.

5. Principle of stimulating interest: badminton courses should improve the initiative and enthusiasm of learning by stimulating the interest of trainees.

Objectives

In the process of badminton curriculum development can be set in accordance with the National Education Commission on the cultivation objectives of college students, in order to cultivate the overall development of students to develop educational objectives, which will help colleges and universities in the development and promotion of badminton sports. When formulating the objectives of badminton program, the concept and value of education should be presented. In the context of deepening teaching reform, formulate talent cultivation objectives according to social needs, organically blend curriculum and talent cultivation, and jointly realize the objectives of badminton courses in colleges and universities (Guo, 2021). The determination of badminton course objective setting is to refine the badminton course teaching, which is conducive to the curriculum setting as well as the preparation and implementation of the education and teaching fundamentals. The general badminton curriculum objectives include the following.

1. To develop students' interest and love for badminton. To stimulate students' interest through participation in lessons, competitions and knowledge of badminton.

2. To improve students' badminton skills and techniques. To improve students' skills through systematic training programs, individualized instruction and technical aids.

3. To develop students' physical fitness, coordination and reflexes. To improve students' physical fitness and coordination through a comprehensive physical training program and by incorporating badminton drills.

4. To develop students' cooperative spirit and team spirit. To develop students' sense of teamwork and ability to strategize through team games and cooperative training.

5. To develop students' health awareness and active lifestyle. To develop students' health awareness and active lifestyle habits by emphasizing the health benefits of badminton, providing health guidance and organizing health activities.

Curriculum Structure

The badminton course mainly introduces the development history of badminton, venues and equipment, basic techniques and tactics, competition rules, referee law and competition management. Chen et al. (2020) researchers believe that through the study of badminton courses, the basic techniques and basic theoretical knowledge of badminton are continuously improved, so that students with different bases can master the basic theoretical knowledge of badminton and can correctly use the basic techniques and tactics, and achieve a certain level of sports skills.

The badminton course of this study has a total of 32 hours and is divided into four units for teaching, Unit 1: Basic Theory of Badminton (4 hours); Unit 2: Basic Badminton Techniques (16 hours); Unit 3: Badminton Physical Training (6 hours); Unit 4: Badminton Competition and Judging Methods (6 hours).

Table 2.1 Class hours and curriculum of badminton courses

Unit	Chapters	Element	time
Basic theory of badminton	The history and basics of badminton	Introduction to the origins and development of badminton, and an introduction to the modern badminton sports program. Acquire knowledge of the safety of badminton.	4hrs
Badminton technical skills	2.1 Forehand serve technical skill	Through forehand grip, with correct arm movement and racket control, serve the ball to the opponent's court with appropriate speed and angle.	16hrs
	2.2 Forehand Stroke technical skill	Strike the ball accurately with correct body posture, arm movement and racket control through a forehand grip.	
	2.3 Backhand serve technical skill	To serve the ball to the opponent's court in a consistent manner through a backhand grip, using correct arm movements and racket control.	
	2.4 Backhand stroke technical skill	Stabilize and effectively stroke the ball through a backhand grip with proper body posture, arm movement and racket control.	
Badminton physical training	Training in sensitivity, speed, flexibility, coordination, etc.	Train in agility, endurance, speed and footwork to improve students' physical fitness and athleticism.	6hrs
Badminton game and judging methods	Badminton Rules, Organization and Practice	Introduction to the rules and judging of badminton matches. Students will practice organizing and playing badminton matches.	6hrs

Unit 2 is chosen by the research for implementing the developed model in the present study (Yulin Normal University, 2017).

Development of Instructional Model

Definition of Instructional Model

The history of the development of instructional models can be traced back to the early 20th century. John Dewey was an American educational philosopher and educational reformer in the early 20th century, who made important contributions to the development of teaching models. Dewey emphasized that students construct knowledge through practical experience and interaction, and put forward the concept of "experiential learning".

Bemadette (2016) in the article "The learning nexus: modelling the learning-teaching relationship in higher education" pointed out that the teaching model is an effective bridge between teaching and learning in higher education. The bridge between teaching and learning is often described as a conversation, however, many existing instructional models do not focus on how to unblock the relationship between lecturers and students, teaching and learning.

Zhao (2021), through a case study on the partnership between lecturers and students and the importance of cooperation in teaching-on-teaching effectiveness, concluded that improving cooperation in teaching requires lecturers to have certain teaching skills as support, and that if students have a good partner in the learning process, by cooperating with the partner can also improve students' comprehensive ability.

Wen (2002) believes that the teaching mode refers to the behavior and the way of thinking and attitude of lecturers and students in the learning process, and it is the basic behavior and the characteristics of teaching activities adopted by lecturers and students in teaching in order to complete the teaching task and achieve the teaching purpose, including both the outwardly obvious behaviors as well as the related ways of thinking and attitudes.

Hou (2005) in his article "Is the New Teaching Approach Just a New "Form"? A Psychological Doubt" collectively referred to the many new modes, methods, and strategies encountered in the practice of teaching change as the new teaching styles under his study.

Zeng, et al. (2014) regarded teaching mode as a relatively stable way of teaching and learning behaviors formed by teaching and learning subjects in the teaching process under a specific environment.

Thus, it seems that scholars also have some differences in understanding the teaching mode, and some understand it as the form of teaching organization and teaching method. Some understand it as the sum of modes, methods, and strategies. In this study, teaching and learning mode is considered as a structured instructional plan or instructional framework for designing and organizing instructional activities to facilitate student learning and development. It includes aspects such as curriculum objectives, instructional strategies, assessment methods, and the selection and use of instructional resources. An instructional model is a guiding tool for lecturers to use when delivering instruction and helps to ensure that instruction is effective and efficient.

Components of Instructional Model

The constituent elements of teaching mode are also objectively measured, not all teaching activities can form a fixed mode (Lou, 2016), and different scholars have different understandings of the constituent elements of teaching mode.

Cao et al. (2010) believe that different teaching theories, teaching objectives, teaching strategies and different arrangements for lecturer and student activities constitute different teaching models. The basic structure of a complete teaching model should contain the following six basic elements.

1. Teaching theory or teaching idea. Teaching models are established under the guidance of certain teaching theories or teaching ideas. "Every model has an inherent theoretical foundation."

2. Teaching function goal. Any teaching mode should point to a certain teaching goal, that is, the teaching mode is designed and constructed to accomplish a specific teaching goal.

3. Teaching structure and activity program. Any teaching mode has a unique teaching structure and a sequence of operation that reflects the logical process of teaching activities.

4. lecturer-student interaction system. In teaching, the different ways, methods, status, roles, relationships, and interactions of lecturer-student interactions are important elements that constitute a certain teaching mode.

5. Feedback mode. Feedback mode refers to how lecturers perceive students and how they respond to students' outward behavior.

6. Supporting conditions. Any teaching model must be effective under specific conditions.

Qu (2005) believes that a complete teaching model should have the following five elements:

1. Theoretical foundation. Any teaching model is constructed under the guidance of certain teaching ideas, teaching theories and teaching concepts.

2. Teaching objectives. Teaching goal here refers to the teaching effect that the teaching mode should achieve.

3. Teaching program. Teaching procedure refers to the operational process detailing the logical steps of teaching activities and accomplishing the characteristic functions.

4. Supporting conditions. Auxiliary conditions refer to the best combination or the best program of various conditions (lecturers, students, teaching content, teaching media, etc.) that contribute to the effectiveness of the teaching model.

5. Evaluation criteria. Evaluation standard refers to the evaluation scale and evaluation method of teaching mode.

Shang, et al. (2015) studied that in the problem-based learning teaching model, the composition of the teaching model includes the following four aspects:

1. Problems: the selection and design of problems should be maneuverable, and problems related to students' lives and interests should be selected.

2. Cooperative inquiry: Cooperative inquiry is usually carried out in the form of group communication and mutual discussion.

3. Learning resources: Learning resources can provide necessary help in the learning process of students.

4. Teaching evaluation: process rating and summative evaluation are combined with each other to form effective evaluation.

In summary, the teaching model used in this study involves five components consistent with the above theory, namely, principles and rationale, objectives, content, teaching methods and materials, and evaluation.

Confirmatory Factor Analysis

To ensure the appropriateness of developed instructional model before implementation, the developed instructional model is confirmed depending on program evaluation standards in 4 aspects: 1) Utility Standards, 2) Feasibility Standards, 3) Propriety Standards and 4) Accuracy Standards as the following:

Utility Standards are intended to ensure that the developed instructional model will serve the information needs of intended users.

Feasibility Standards are intended to ensure that the developed instructional model will be realistic, prudent, flexible, and frugal.

Propriety Standards are intended to ensure that the developed instructional model will be conducted in conformity to teaching principles and provide positive results.

Accuracy Standards are intended to ensure that the developed instructional model shows a measure of closeness to a true value.

Flipped Classroom Teaching

Background

In traditional classroom teaching, lecturers mainly play the role of knowledge transmitters while students passively accept knowledge, and classroom teaching tends to be lecturer-centered, focusing on the transmission of knowledge and passive acceptance of students. Flipped classroom teaching is a new teaching mode whose background originated from the reflection and improvement of traditional classroom teaching. Chen (2019) believes that the rapid development of information technology, the traditional teaching mode has produced an increasing impact, a variety of information technology electronic tools are increasingly used in modern education and teaching mode, resulting in a diversified and innovative development of the teaching mode. Flipped classroom, as a kind of teaching mode that makes full use of information technology tools, has been widely used in education and teaching in recent years and has played a positive role. With the rapid development of the Internet and digital technology, students can easily access a large number of learning resources and knowledge content. In the information age, the role of lecturers needs to be changed to that of guides and instructors to help students better cope with information overload and knowledge application. In

addition, students have different learning styles and needs. Some students may already have a good grasp of certain knowledge, while others may be confused about certain knowledge. Flipped classroom teaching can provide personalized learning resources and support based on students' learning needs and levels. Flipped classroom teaching can devote classroom time to interaction and practice, such as group discussion, case study, and laboratory operation, etc., to improve students' participation and learning effect (Wang, 2016).

The application of flipped classroom teaching model is becoming a necessity. Jing (2021) believes that the application of the flipped classroom teaching mode is in line with the development trend of modern informationized teaching. New technologies and new media are constantly emerging, prompting an increasing abundance of modern teaching methods. lecturers can integrate network resources such as boutique courses, catechism classes, and even short video APPs such as "Shake" according to teaching needs, providing students with rich, high-quality physical education resources. In the process of physical education, the flipped classroom focuses on the individual differences of students, is not subject to the limitations of time and space, and students can choose the learning time and adjust the learning progress completely according to their own time and ability, so that students can see their own progress, and gradually gain confidence, which fully reflects the students' subjectivity and autonomy, and it has a stronger promotion effect on the students' learning interest and the cultivation of lifelong sports. In terms of course evaluation, diagnostic evaluation, formative evaluation and summative evaluation are adopted, and mutual evaluation between lecturers and students is implemented, which fully embodies the characteristics of diversified and scientific teaching evaluation (Hu, et al., 2021). It truly realizes mutual evaluation between lecturers and students and improves the teaching evaluation system.

In general, the background of the flipped classroom teaching mode is based on the reflection and improvement of traditional classroom teaching, and it is the demand for teaching in the development of information society. It emphasizes students' active participation and the cultivation of critical thinking, provides personalized learning support, and optimizes the use of classroom time to meet the needs and characteristics of student learning in the information age.

Theory

The theoretical basis of the "flipped classroom" teaching model is traced back to the fact that "flipped classroom" teaching requires students to engage in active and personalized learning outside the classroom, and it can be concluded that one of the theoretical foundations of the "flipped classroom" teaching model is the theory of active learning. One of the theoretical foundations of the "flipped classroom" teaching mode is active learning theory. The active learning theory is constructed on the basis of constructivism, which emphasizes "learning by doing" and "learner-centered learning". The second theoretical foundation of the "flipped classroom" teaching model is Bloom's goal classification theory, in which students engage in low-level cognitive work (such as knowing and understanding) at home, while focusing on high-level cognitive work (such as applying, analyzing, synthesizing, and evaluating) in the classroom with the interaction and help of peers and lecturers. According to the "flipped classroom" teaching requirement of group-based interactive learning in the classroom, it can be concluded that the "flipped classroom" teaching model is also based on the theory of peer-assisted learning, cooperative learning theory and other theories. Therefore, the "flipped classroom" teaching model is also based on the problem-based learning theory (Bao, 2017). Therefore, the theoretical foundations of the flipped classroom teaching mode are mainly as follows:

1. Cognitive load theory: proposed by scholars such as John Sweller, Paul Ayres and Slava Kalyuga. The theory emphasizes the cognitive load management in the learning process, and believes that by transferring the knowledge transfer from the classroom to the stage of independent learning before class, the cognitive load of students in the classroom can be reduced, so that they can better process and understand the new knowledge.

2. Constructivist learning theory: put forward by Jean Piaget, Lev Vygotsky and other scholars. Constructivist learning theory emphasizes that students combine new information with existing cognitive structures through active participation and constructing knowledge. Flipped classroom provides students with the opportunity to construct knowledge structures in the pre-study stage in order to explore and apply them more deeply in the classroom.

3. Socio-cultural theory: proposed by Lev Vygotsky. Socio-cultural theory recognizes that learning is the result of social interaction, and that by participating in activities and exchanges in social and cultural environments, students can acquire new knowledge and skills. Flipped classrooms provide opportunities for students to interact and collaborate with lecturers and peers in the classroom to promote knowledge co-construction and deep learning.

4. Learning theories: including behaviorist learning theory and constructivist learning theory. Behaviorist learning theory was proposed by B.F. Skinner, emphasizing that learning is habitual behavior formed through stimulation and feedback mechanisms. Constructivist learning theory is put forward by Jean Piaget and Seymour Papert and other scholars, emphasizing that students realize learning by actively constructing knowledge. Flipped classroom integrates these two learning theories to promote deep learning and conceptual understanding by acquiring basic knowledge through pre-study before class and then practicing and applying it in class with the lecturer and classmates.

Yang (2013) suggests that the "flipped classroom", as a "disruptive and innovative" teaching method, has changed the roles of lecturers, students, teaching and learning time allocation, and knowledge carriers, and brought great impact and challenges to the traditional classroom, which mainly include: the following: "Flipped classroom" is the first classroom in the world to be used as a teaching and learning center. These impacts and challenges mainly include: higher requirements on lecturers' pedagogical knowledge, subject knowledge and network technology knowledge integration ability, impact on the degree of acceptance by schools and families, and requirements on the network support environment and learning conditions. In addition to the basic theoretical research on the flipped classroom teaching model, some scholars have conducted corresponding theoretical research on the instructional design of the flipped classroom. Shao (1983) analyzes the complete teaching process from the perspective of educational technology and proposes that the instructional design process includes four basic elements: formulating learning objectives, analyzing learning tasks, selecting learning methods and carrying out learning evaluation.

1. Formulating learning objectives. Emphasize the knowledge, skills and attitudes that students should master through learning activities.

2. Analyzing learning tasks. Focus on clarifying the abilities and hierarchical relationships between students' existing learning abilities and the achievement of learning objectives.

3. Select learning methods. Focus on teaching media and methods, organization and design of activities.

4. Conducting learning assessment. Focus on examining the achievement of students' learning objectives.

Wang, et al. (2020) combined with the nature and characteristics of the flipped classroom, elaborated on the four phases in the process of specific model design:

1. Learning objectives stage, focusing on planning learning guide. lecturers need to develop appropriate guiding materials based on learning objectives, learner needs and other factors. For example, a course introduction video makes it clearer for learners to start learning new knowledge. This kind of guiding material is highlighted in the pre-course learning.

2. In the learning task stage, efforts are made to develop learning resources. The flipped classroom transforms part of the knowledge and skills into high-quality video resources, and lecturers should combine the characteristics of different types of knowledge with the actual needs of learners to carry out targeted resource design.

3. At the stage of learning methods, efforts are made to organize learning activities. The organization of activities in the classroom is the main way to achieve teaching results. The classification of college courses shows a diversified development trend, different types of courses, so the design and organization of learning activities should also focus on the category.

4. In the stage of learning evaluation, we focus on process evaluation. Process assessment is mainly throughout the classroom learning activities in each part of the classroom, the lecturer of the classroom students' learning activities for dynamic analysis and adjustment. The outcome assessment is mainly the assessment after students learn new knowledge before class and the assessment after students finish learning in the flipped classroom.

Therefore, compared with the "didactic" traditional teaching mode of teaching first and learning later, a truly flipped classroom should have the following three aspects (Ji, et al. 2017).

1. The flip of the spatial and temporal structure of teaching and learning, i.e., the flip from teaching first and then learning to learning first and then teaching. Self-study outside the classroom, turning the classroom from a "course explanation" to a place for "cooperative learning that solves problems and develops students' deep cognitive abilities".

2. The flip of the teaching subject relationship. Flip the students as the main body of classroom teaching, that is, the "teaching-oriented" flipped to "learning-oriented". lecturers from the "podium to instill knowledge of the authority" into "students around the guide".

3. Learning responsibility and autonomy transfer. The responsibility and autonomy of learning is handed over to students in the "learning first" section, and testing and implementation are carried out in the "teaching later" section.

These theories provide a theoretical basis for the flipped classroom, and guide lecturers in the design and implementation of the flipped classroom teaching mode methods and strategies. At the same time, the flipped classroom is constantly developing and evolving in practice, combining a variety of theories and teaching methods to meet students' learning needs and promote effective learning experiences.

Methods of Teaching

In 1996, Maureen J. Lade and Glenn J. Platt first proposed the idea of "flipped classroom", and implemented it in the course "Principles of Microeconomics" at the University of Miami. The implementation of the principles of microeconomics" course at the University of Miami in the United States. Until 2000, their article "Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment" was published in The Journal of Economic Education. The paper introduces three lecturers from the University of Miami, Maureen Lage, Glenn Platt and Michael Treglia, who try to innovate a way to improve the learning environment in the classroom by addressing the common problem of "lecturer-initiated and student-passive" in classroom teaching. They tried to innovate a teaching method to increase students' interest in learning, i.e., adopting the "flipped classroom" mode in the course of "Introductory Economics", transferring the knowledge that the lecturer needs to transfer in classroom teaching to the students before class, and transferring the traditional "lecture method" to the students before class. The "flipped classroom"

model is used in the course of "Introduction to Introductory Class", which transfers the knowledge that the lecturer conveys in classroom teaching to the students before class, and reverses the content that the students need to complete outside the classroom in traditional "lecture method" teaching to the classroom through the guidance of the lecturer and the peer support to complete the content. Finally, the paper also introduces the achievements of the "flipped classroom" model, and the study also proves that the flipped classroom can stimulate students' interest in learning more than the traditional lecture method of classroom teaching. (Guo, 2020) Since then, the term "invert" has been introduced.

In the United States, the emergence of the term "invert" and its theory and practice sprouted in colleges and universities. In 2000, Baker formally proposed the concept of classroom flipping in a paper presented at the 11th International Symposium on Teaching and Learning in Universities (Zeng, 2014). In 2004, Salman Khan uploaded the information technology micro classes as a means of flipping on the Internet (Chen 2015), which made it more widely disseminated.

Lage et al. define "flipped classroom" as "an inverted classroom means that events that normally take place inside the classroom now take place outside the classroom and vice versa" (Lage, 2000). Several other researchers have defined "flipped classroom" similarly. However, although this interpretation captures the validity of the use of the term "Flipped", it does not fully characterize the practice of what researchers call the "flipped classroom".

Bergmann and Sams state: "Basically, the concept of the flipped classroom is this: things that have always been done in the classroom are now being done at home; and things that have always been done at home as homework are now being done in the classroom" (Bergmann, 2012).

Ganapathy suggests that the flipped classroom has become the latest fashionable concept in western academia, but there is no uniformity in defining the flipped classroom, a mode of teaching that facilitates interest and enhances learning, is an innovative method of teaching and is viewed as a very effective way of learning (Ganapathy, 2014).

Bao, et al. (2017) believe that the "flipped classroom" teaching mode absorbs the theories of active learning, peer-assisted learning, cooperative learning, problem-based learning as the theoretical basis, and combines the concepts of

blended learning design and course podcasting, and its value lies in turning the classroom into a place where students can explore the content of the teaching, test their ability to apply knowledge, and interact with others in hands-on activities.

In summary, the flipped classroom can be defined as a teaching mode that uses materials suitable for local learners as the medium of flipping, and flips the face-to-face "knowledge teaching" in the previous classroom to allow students to learn on their own outside the classroom, while the classroom serves as a place for lecturers and students to communicate, collaborate, complete assignments, and internalize knowledge.

After clarifying the definition of flipped classroom, domestic scholars have also conducted relevant research in badminton flipped classroom teaching. Zhang (2019) believes that badminton flipped classroom teaching methods should be carried out according to the following steps:

1. Enrich the curriculum resource system and cultivate the habit of self-study and self-practice. In badminton teaching, lecturers should follow the teaching concept of flipped classroom and provide students with pre-course teaching guide videos, focusing on highlighting the main points, difficulties and standardized operation skills of badminton movements.

2. Create communication and Q&A activities to strengthen students' badminton skills. lecturers using the flipped classroom teaching mode for badminton teaching should create a communication and Q&A activities to strengthen the quality of students' badminton learning and solve problems for students in a timely manner.

3. Create test evaluation module to stimulate students' learning motivation. To strengthen the effectiveness of flipped classroom teaching in badminton teaching, it is necessary to create a test and evaluation module for the students' badminton learning situation, using the students' competitive spirit to stimulate the students' motivation to learn badminton.

4. lecturers improve their professionalism to improve the quality of the flipped classroom. lecturers should continuously improve their professionalism with the reform of the teaching mode, design high-quality pre-course teaching guide videos, improve the efficiency and quality of the application of the flipped classroom in badminton teaching, and improve students' badminton skills.

Yang (2018) believes that the application of the flipped classroom teaching mode in college badminton teaching is not only an art, but also a study.

1. Review and question of teaching video. In order to arouse students' memory, badminton lecturers should guide students to watch the teaching video again during the formal class.

2. Active guidance for independent learning. In order to enhance the effectiveness of the use of the flipped classroom teaching mode, badminton lecturers should also actively guide students to independent learning on specific badminton learning content.

3. The active organization of cooperative learning. In the flipped classroom, badminton lecturers should also actively guide students to carry out cooperative learning on the basis of independent learning.

4. Give students scientific teaching evaluation. Badminton lecturers should give students scientific evaluation. Badminton lecturers can guide students to carry out self-assessment first, so that students can self-evaluate their own learning performance in the whole flipped classroom.

To summarize, flipped classroom is a teaching mode carried out through three phases: before, during and after class, students can better understand and apply their knowledge and skills in the classroom through pre-class videos and other means of pre-study and independent learning, and in the classroom, the lecturer plays a role of guidance and direction, and provides learning support and feedback. At the end of the class, students consolidate their knowledge and skills and continue to improve their abilities through reflection.

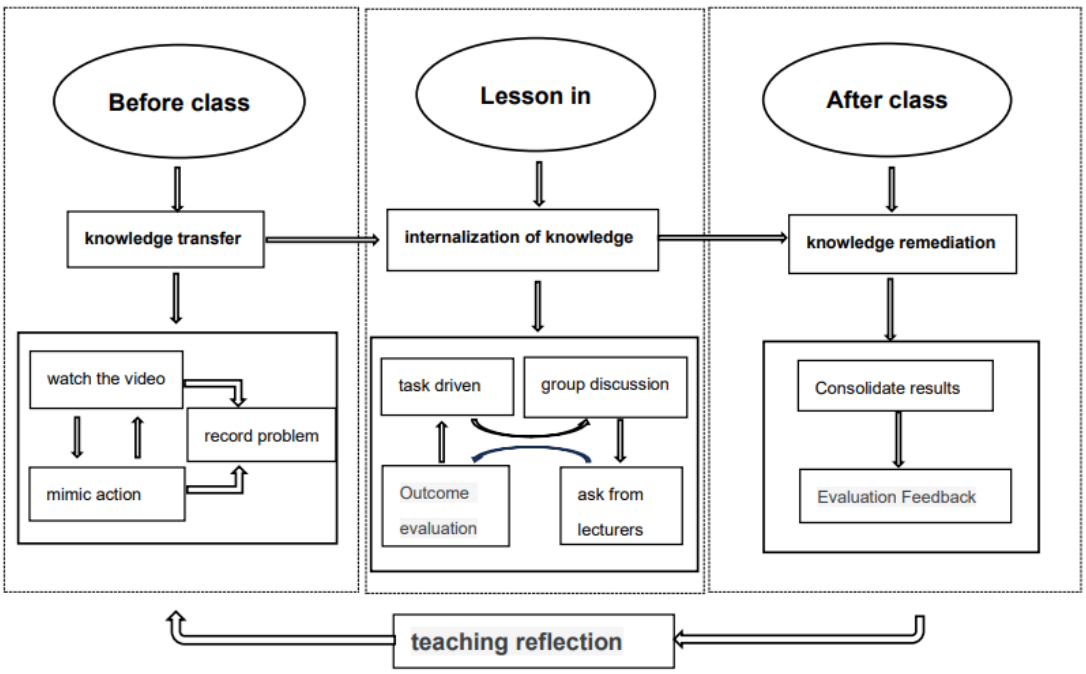

Figure 2.1 Flipped classroom teaching model (Jing, 2021)

Roles of Lecturers and Students

In flipped classroom teaching, the roles of lecturers and students are different:

Roles of lecturers

1. Design learning tasks and resources: lecturers need to design appropriate learning tasks, including videos and exercises, according to the subject content and students' learning needs.

2. Guiding students to learn: lecturers need to guide students on how to effectively utilize learning resources to improve learning effectiveness and help them overcome learning difficulties and problems.

3. Provide feedback and evaluation: lecturers need to provide timely feedback and evaluation to help students understand their learning and motivate them to continue learning and improve.

4. Guiding students to cooperate and interact: lecturers need to guide students to cooperate and interact in learning through group discussions, demonstrations, and practice.

Roles of students

1. Independent learning: Students need to learn independently and make full use of learning resources to improve their learning. Learning

2. Cooperative learning: Students need to actively participate in group discussion, practice and other activities, cooperate with classmates in learning, and share learning outcomes and experiences.

3. Self-evaluation: Students need to evaluate and reflect on their own learning, adjust learning strategies and methods in time, and improve learning effect and quality.

In general, in flipped classroom teaching, the roles of both lecturers and students have changed. lecturers are no longer the knowledge transmitters in the traditional sense, but play the role of instructors and guides; students are no longer passive recipients, but become the main body of learning, and this role change helps promote students' interest in learning and improve the quality of learning.

Strengths and Weaknesses of the flipped classroom teaching

Strengths of the flipped classroom teaching

Domestic scholars are also studying the application of the flipped classroom teaching mode in physical education, and Wang, et al. (2016) also discussed the value and advantages of the application of the flipped classroom in physical education in the "Research on the Value and Implementation Strategies of Flipped Classroom Introduced into Physical Education Teaching".

1. Flipped classroom makes the process of physical education teaching more personalized and human-centered; education is an important place to cultivate and develop people, and flipped classroom embodies the educational concept of "student-oriented" (Michelle, 2014), education should be different from person to person, which is the prerequisite for realizing human-centeredness.

2. Flipped classroom has always possessed a student-centered focus, which can provide students with a stimulating and enjoyable learning environment (Zhu, et al., 2013), fully embodying the characteristics of student-centeredness.

3. flipped classroom activates differentiated teaching and promotes students' individualized and cooperative learning through the coordinated

arrangement of learning space and time inside and outside the classroom (Tian, et al., 2013), and it makes physical education teaching more personalized.

4. The evaluation of physical education teaching under the flipped classroom mode is more scientific and reasonable. The subject of evaluation under the flipped classroom mode includes lecturers, members of each learning group and students themselves, and the content and mode of evaluation also show diversified characteristics.

Weaknesses of the flipped classroom teaching

1. Students need to learn independently: for students who lack the ability to learn independently, they may face learning difficulties.

2. A large amount of learning resources are required: lecturers need to invest a lot of time and effort in design and preparation.

3. Students may lack cooperation: the lack of cooperation and communication opportunities requires lecturers to guide and promote interaction among students in the classroom.

4. Technical support is needed: lecturers and students need to master certain technical skills.

Overall, the advantages of flipped classroom are to improve the learning effect and quality, to promote students' participation and personalized learning, and to improve classroom interaction; the disadvantages are that it requires students' independent learning and a large number of learning resources, it will lack of cooperation and communication opportunities, and it needs technical support.

Cooperative Learning

Background

Since the introduction of the Action Plan for the Revitalization of Education for the 21st Century, the state has issued a series of policy documents to comprehensively promote quality education and deepen the reform of the basic education curriculum, and has advocated that school education should be based on "educating people" from different perspectives and at different levels, emphasizing the all-around development of students and focusing on students' ability to think, innovation consciousness, the ability to acquire new knowledge, the ability to collect and process information, and the ability to analyze and solve problems(Dang, 2017),

and put forward new requirements for the reform of teaching methods and approaches.

In recent years, as the physical health level of students in China has been declining, how to improve the physical health of students has become a major concern of the whole society. In order to improve the physical health level of students, the Ministry of Education in 2016 issued the "Guidance on Further Promoting the Reform of the Examination and Enrollment System of High School Stage Schools", which for the first time proposed to make "physical education as a scoring subject for admission to the secondary school examination" (Ministry, 2016). Some people believe that this will be an "inflection point" for school sports, which will make schools and parents pay attention to sports, while others worry that sports will be subjected to the same test because of the unified assessment index.

Cooperative learning emerged in the United States in the early 1970s as a creative and effective teaching theory and strategy, and has subsequently received attention and popularity in many countries (Wang, 2005). Cooperative learning experience is the learners' cognition and emotion gained through cooperation, and is embedded in the students' judgment of the effectiveness and satisfaction of cooperative learning (Liu, et al., 2016). Most of the existing cooperative learning research is based on students as a whole, ignoring the differences in cooperative learning experiences and their influencing factors among students at different levels (Zhang, et al., 2021), and therefore lacks relevance in terms of improvement strategies. Educational researchers have begun to question the traditional teaching model, arguing that the traditional one-way lecturer-teaching model cannot meet students' learning needs and development. In this context, cooperative learning was proposed as a new way of learning, i.e., a process that promotes learning through cooperation and mutual assistance among students. The theory of cooperative learning holds that by cooperating with others, students can communicate and share knowledge with each other, solve problems together, and promote their own learning and development.

Theories

Cooperative learning refers to students' efforts to achieve common learning goals (Johnson, 1974). The research on cooperative group learning that has been carried out mainly centers on two aspects: theory construction and teaching practice.

Since the middle of the 20th century, international efforts have been devoted to the construction of a theoretical system (Johnson, 1989) and the study of the basic factors of cooperative learning (Slavin, 1988). In the 1970s and 1990s, researchers began to focus on the effective strategies of group cooperation (Slavin, 1982). Subsequently, attention began to be paid to the impact of cooperative group learning on the quality and ability of learners (Ellis, 1993). Domestic research on cooperative group learning has been carried out by drawing on the results of foreign countries, exploring the basic concepts and factors of cooperative group learning (Sheng, 1992). With the application of cooperative group learning in teaching practice, researchers began to pay attention to the teaching effect of cooperative group learning in the English classroom (Chen, 2020).

Cooperative learning involves related basic theories as follows:

1. The research results of social learning theory and cognitive development theory provide an important theoretical foundation for the formation of cooperative learning. Social learning theory emphasizes that individual learning is achieved through interaction with others and participation in the social environment. Cognitive development theory, on the other hand, focuses on the process of students' thinking and cognitive development, and believes that students can promote the development of their own thinking and cognitive abilities through cooperation and communication with others.

2. Socio-cultural theory: Lev Vygotsky puts forward the socio-cultural theory that learning is the result of social interaction and cultural environment, and that students acquire knowledge and develop cognitive abilities through participation in social activities and cooperative interaction.

3. Social Interdependence Theory: proposed by scholars such as David W. Johnson and Roger T. Johnson. The theory emphasizes the influence of interdependence between individuals and groups on cooperative learning.

4. Collaborative Learning Theory: Robert Slavin proposed the collaborative learning theory which emphasizes the collaboration and cooperation of members in a group, working together to achieve common learning goals, and promoting learning effectiveness through formal structured cooperative learning activities.

5. Interactive Cognitive Theory: Ann Brown and other scholars propose that interaction and cooperation between students and lecturers promote learning through mutual teaching, explaining, predicting and clarifying.

In addition to the research on the basic theory of cooperative learning, some scholars have also conducted relevant research on the concept and components of cooperative learning. Wang (2002) summarized cooperative learning into six concepts in On the Basic Concepts of Cooperative Learning:

1. Interactive conception. Among the many concepts of cooperative learning, the most striking is its interactive view. This interactive view is different from the traditional view of teaching in both content and form, which is no longer limited to the interaction between lecturers and students, but extends the teaching interaction to the interaction between lecturers and lecturers, students and students.

2. Goal view. The objective system of cooperative learning can be divided into two parts: academic objectives and cooperative objectives. In the past teaching process, lecturers usually attach great importance to academic objectives, and often ignore the students' cooperative interaction. Skill training and development and in the cooperative learning classroom, the teaching and training of cooperative skills is a very important part of the students (Dong,2019), otherwise students will not be able to cooperate because of the lack of necessary cooperative skills.

3. lecturer-student view. Cooperative learning advocates that lecturers act as "directors" and students act as "actors", and no longer as traditional teaching emphasizes, the lecturer in order to maintain the so-called authority, on the contrary, the lecturer should act as a "manager", "facilitator" and "lecturer". ", "facilitator", "counselor", "advisor" and "participant the lecturer has to act as a "manager", "facilitator", "counselor", "advisor" and "participant".

4. Form view. Cooperative learning uses a combination of classroom instruction and group activities in the organization of teaching, group grouping is required to the overall level of the group is basically the same, each group should be a microcosm or cross-section of the class (Wang, 1999). The basic process of cooperative group learning can be summarized as follows: cooperative design a goal presentation - - group lecture - - cooperative group activities - - quiz - - feedback and remediation.

5. Contextual view. Cooperative learning believes that there are three main contexts for organizing students' learning: one is a competitive context, the second is a somatic context, and the third is a cooperative scenario. Among them, cooperative learning is the most important one of the three learning situations.

6. Evaluation. Cooperative learning "does not seek success for all, but seeks progress for all" as a realm pursued by the teaching, and at the same time

Clarifying the basic elements that make up cooperative learning is one of the centers of gravity of theory construction. Lavin (1988) argues that cooperative learning consists of two basic elements: group goals and individual responsibility. Kagan (2008) proposes four basic elements of cooperative group learning, namely, active interdependence, individual responsibility, equal participation, and simultaneous interaction. Gao, et al. (2022) argued that effective cooperative learning does not happen automatically when students are grouped together. lecturers have to create the conditions for effective cooperative learning to occur. According to David Johnson, a professor at the University of Minnesota and a researcher in cooperative learning, and others, there are five additional conditions needed for effective cooperative learning.

1. Positive interdependence; meaning that all students recognize that they are interdependent on each other and enjoy and support that interdependence.

2. A sense of personal responsibility; meaning that although the work is collaborative, each person is willing to take responsibility for his or her own work as a member of the group.

3. Facilitative interaction; meaning that when interacting with each other everyone has the attitude of contributing to the development and success of the group work.

4. Social Skills; means that students have social skills that enable cooperative interactions to be successful.

5. Group work; meaning that students have the ability to ultimately make the group successful.

These five conditions indicate that for cooperative learning to work, each group member needs to uphold a positive, collectivist, and group-responsible attitude as well as good social communication skills techniques. Students need to

learn and master these attitudes and skills in order to make effective cooperative learning possible.

Methods of cooperative learning

Wilbert McKeachie, a renowned scholar of university teaching, once said, "What is the most effective pedagogy, if you ask? It has to do with goals, content, students, and lecturers. But if you ask what is the next most effective pedagogy, it is student teaching student" (Wilbert, 2021), and the method of "student teaching student" is a cooperative learning method. Different scholars have different opinions about the definition of cooperative learning method.

According to Slavin (1990), no matter what cooperative learning method is used, it can be considered from the following six characteristics: group goals, accountability, fair chance of success, competition among groups, task specialization, and adaptation to individual needs.

According to Dang (2017), cooperative learning is the pedagogical use of small groups to enable students to work together in activities that maximize their own learning as well as that of others.

Wang (2022) defines it as, "Cooperative learning is a teaching activity that uses heterogeneous learning groups as the basic form, systematically utilizes the interaction between teaching dynamics to promote students' learning, and uses group performance as the evaluation standard to achieve teaching goals together."

Li, et al. (2004) believe that "cooperative learning is a teaching activity that takes learning groups as the basic form of organization, uses group performance as the evaluation standard, and uses the interaction between lecturers and students, especially the students, to promote learning and reach the teaching goals together".

Although the above scholars define cooperative learning differently, the core ideas expressed are basically the same, namely: Cooperative learning is to take the group as the basic learning unit; each group has a common goal; and each individual can contribute his or her own strength to the success of the team (Dang, 2017). In this paper, cooperative learning is defined as a learning style in which the group is the basic learning unit and all group members can contribute to the team to accomplish the common goal.

Gao, et al. (2022) discussed many methods of cooperative learning in the article "Concepts, Principles, Methods and Suggestions of Cooperative Learning Methods". Cooperative Learning Techniques: A Handbook for Undergraduate lecturers (2nd edition) by American scholar Elizabeth Barkley et al. is well known among university lecturers in the United States and is the main reference book used by many university faculty development centers in the United States (Elizabeth, 2014). The first edition of the book was published in 2004, followed by a 2nd edition in 2014. The book divides cooperative learning problems into six categories: discussion, students teaching each other, problem solving, information organization, writing, and games. Thirty-five cooperative learning methods are introduced around these six categories of problems, with related operational approaches and case studies.

According to the theory of cooperative learning to form cooperative learning types, the main aspects are as follows:

1. Johnson Cooperative Learning: Johnson Cooperative Learning is a cooperative learning method proposed by the Johnsons (David W. Johnson and Roger T. Johnson). The method emphasizes cooperation and interaction among students and promotes learning and development through group work.

2. Jigsaw Cooperative Learning: Jigsaw Cooperative Learning is a cooperative learning method proposed by Elliot Aronson. In Jigsaw Cooperative Learning, students are divided into small groups and each member of the group is responsible for learning and mastering a specific area of knowledge.

3. Stad Cooperative Learning: Stad Cooperative Learning is a cooperative learning method proposed by Robert E. Slavin. In Stad Cooperative Learning, students are divided into small groups and students within the group teach and learn from each other in order to work together to achieve learning goals.

4. Johnson and Johnson Cooperative Learning: Johnson and Johnson Cooperative Learning is a further development and refinement of the cooperative learning method proposed by the Johnsons.

5. Group Cooperative Learning: Students are divided into small groups where they work together to learn and solve problems. Group Cooperative Learning can use different structures and strategies, such as complementary roles, common goals, and teaching each other.

6. Cooperative Learning vs Competitive Learning: Cooperative Learning emphasizes cooperation and mutual support among students, while Competitive Learning emphasizes competition and individual performance among students. These two learning styles differ in terms of goals, task structure, and student interaction.

7. Peer Learning: Peer Learning refers to mutual learning and mutual assistance among students. Students can promote learning and development through peer teaching, peer assessment and peer support.

8. Collaborative Learning: Collaborative Learning refers to the cooperation and collaboration among students to accomplish learning tasks. Students can realize mutual learning through division of labor, discussion and sharing of resources.

9. Expert Teams: Students are divided into groups and each group member becomes an expert responsible for mastering a specific area of knowledge. They then share their knowledge with other team members to promote comprehensive mastery.

10. Learning Circles: Students are organized into a ring-shaped learning group, with each member taking turns to be the person in charge of learning, while the other members play the roles of supporters and facilitators of learning, and work together to learn.

11. Reciprocal Teaching: Students are divided into small groups, with members of the group taking turns to act as tutors, guiding other members to understand and master the material and providing feedback and guidance.

12. Peer Tutoring: Students are divided into small groups, and members of the group teach and learn from each other and provide mutual help and support.

13. Cooperative Learning Games: Students develop teamwork and problem-solving skills by engaging in cooperative learning games to solve problems, develop strategies, and reach goals.

Based on these theoretical foundations, cooperative learning is an umbrella term for a range of approaches to organizing and facilitating classroom instruction.

According to Wang (1999), cooperative learning is a system of instructional strategies designed to promote students' mutual cooperation in heterogeneous groups to achieve common learning goals and to be rewarded on the basis of the group's overall performance. From the above definitions, it can be seen that

cooperative learning refers to students' mutual supportive learning in groups in order to accomplish a common task.

In recent years, as the scope of application of group cooperative learning is expanding, group cooperative learning has achieved some theoretical results in physical education teaching:

Liu, et al. (2021) believe that cooperative learning teaching methods should be classroom evaluation-based, teaching methods are as follows:

1. classroom grouping: it is suggested that the whole class should freely choose teammates and establish cooperative learning relationship according to the relationship of classmates, fellow countrymen, and dormitory, etc., which should be confirmed and recorded by the lecturer.

2. In-class division of labor: Assign class tasks, determine role assignments of team members, and form a cooperative group classroom pattern.

3. Requirements within the lesson: group students instruct each other and learn cooperatively, for example, to teach the technique of hand-held shooting, one student is required to practice and his/her teammates will instruct him/her.

4. Assessment: The individual student's assessment score = his/her own assessment score × 60% + teammate's assessment score × 40%. At the same time, it is required that students in each team practice cooperatively after class and take videos or photos as an important reference basis for the end-of-class assessment.

Su (2022) believes that the process of badminton teaching based on the concept of "cooperative learning" should be implemented from the following perspectives:

1. Emphasize the collective participation of teaching content. Higher vocational physical education lecturers in leading students to carry out badminton learning, to help students in the emotional relief on the basis of a more effective way to promote students to recognize the importance of teamwork and their own in the collective activities of the scientific positioning.

2 The effective introduction of group competition mechanism. Cooperative behavior stems from cooperative consciousness, sports should be a course of centripetal force and challenging spirit, the main source of this fun and challenge is the competitive events based on a variety of sports.

3. Emphasize the application of mutual aid practice mode. In badminton teaching, lecturers should know how to return the classroom to the students, should guide the students to further practice and consolidation in the way of group mutual assistance, so that the group members cooperate with each other and improve together.

4. Emphasize the shaping of sportsmanship. lecturers should introduce students to the excellent badminton sports figures and their deeds by means of guiding students to comprehend the spirit of sports from the inner level, and establish the students' understanding and feelings of attaching importance to cooperation, pursuing cooperation, and being good at cooperation.

In general, the teaching method of cooperative learning emphasizes the cooperation and mutual assistance among students in the group and focuses on students' active participation and interaction. lecturers need to guide students in cooperative learning by organizing group cooperation, mutual learning and interactive discussion. This learning method can stimulate students' interest and motivation in learning, and promote students' cognitive thinking and skill level.

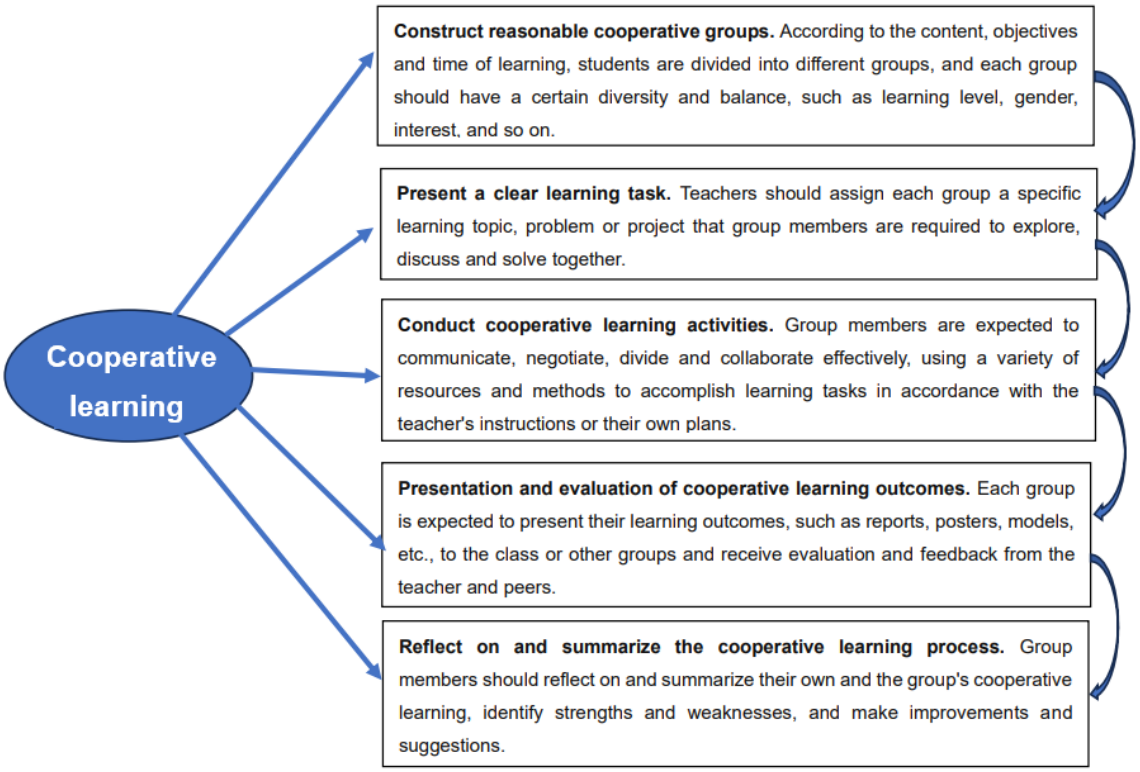

Figure 2.2 Schematic diagram of cooperative group learning (Zhou, 2018)

Roles of Lecturers and Students

Roles of lecturers

1. Designing tasks and lessons: lecturers need to design appropriate tasks and lessons to facilitate cooperation and interaction among students.

2. Provide guidance and support: lecturers need to provide students with the necessary guidance and support to help them understand the tasks and complete them.

3. Facilitating communication among students: lecturers need to facilitate communication and cooperation among students and encourage them to share their knowledge and experience.

4. Monitoring and assessing the learning process: lecturers need to monitor and assess the learning process of students and give timely feedback and guidance.

Roles of students

1. Active participation and cooperation: Students need to participate and cooperate actively in communicating and sharing knowledge with others.

2. Learning and helping each other: Students need to learn and help each other to solve problems and accomplish tasks together.

3. Independent Learning and Inquiry: Students need to learn and inquire independently to utilize their creativity and imagination.

4. Taking responsibility and obligation: students need to take their responsibility and obligation to finish the tasks and submit the assignments on time.

In general, both lecturers and students play important roles in cooperative learning teaching methods. lecturers need to provide students with necessary guidance and support, and promote communication and cooperation among students, while students need to actively participate and cooperate, learn from each other and help each other, and give full play to their creativity and imagination.

Strengths and Weaknesses of cooperative learning

Strengths of cooperative learning

Cooperative learning embodies the learning atmosphere of mutual help and has a positive correlation with students' later efforts to learn. Bao (2022) categorized students based on the average ranking of majors and analyzed the commonalities and differences in the influencing factors of cooperative learning experience of different student groups. The results of the analysis show that there are significant

group differences in the cooperative learning experience of college students in China, and there are heterogeneity and homogeneity in the influencing factors of cooperative learning experience of different types of students. Among them, the view of learning by acquired effort and peer support have significant positive effects on different students; learning autonomy and grading fairness have significant predictive effects on the cooperative learning experience of top students; learning initiative plays a significant role for basic level students; and intermediate level students are significantly and positively affected by the critical view of knowledge and instructor support in addition to the above factors. The study concluded that students should be encouraged to maintain their level of participation and motivation in a differentiated manner based on group specificity, and that an all-encompassing, multi-level evaluation mechanism should be constructed to achieve complementary win-win situations for cooperative groups.

1. Improving learning effect: cooperative learning can promote interaction and communication among students and expand their thinking and cognition. It helps to improve the learning effect.

2. Cultivate teamwork ability: cooperative learning can cultivate students' teamwork and collaboration ability. It helps to cultivate students' team consciousness and cooperation ability.

3. Stimulate learning interest and motivation: cooperative learning can stimulate students' learning interest and motivation. It helps to increase the fun and motivation of learning.

4. Cultivate problem-solving ability: cooperative learning can stimulate the collision of thinking and innovation and cultivate students' problem-solving ability by discussing and communicating with each other.

Weaknesses of cooperative learning

1. Different degrees of participation of different students: In cooperative learning, there may be differences in the degree of participation of different students. Some students may be more active while others may be relatively passive.

2. Difficulty in time management: The time arrangement among group members is not reasonable, which may lead to difficulties in time management and affect the learning effect.

3. Individual difference problems: some students may have high learning ability while others may have relatively low learning ability. This may lead to some students being limited in cooperative learning.

To summarize, cooperative learning Instructional model has the advantages of improving learning effect, cultivating teamwork ability, and stimulating learning interest and motivation. However, attention also needs to be paid to the issues of participation and individual differences of different students.

To serve the purpose of this study, the teaching methods of flipped classroom and cooperative learning are integrated as follows:

1. Designing pre-study tasks: Before the class, students are assigned some pre-study tasks related to badminton, such as watching some badminton game videos, understanding the rules and technical points of badminton, and so on.

2. lecturer-led discussion: In the classroom, the lecturer can guide the students to discuss, share their own preview results, and answer students' questions.

3. Group cooperative learning: In the classroom, the lecturer can divide students into groups and let them practice badminton and confrontation in groups. To promote students' cooperative learning and skill enhancement.

4. Evaluation and feedback: In the classroom, lecturers can observe students' performance and give timely evaluation and feedback. To help students correct technical movements and improve the level of play. At the same time, students are allowed to evaluate and give feedback to each other in order to promote learning exchange and progress among students.

5. Consolidation and guidance after class: After class, the cooperative learning group can consolidate what they have learned in the classroom by completing the practice homework after class, and the lecturer will give timely guidance to the problems raised by the students to help them improve their skills.

By integrating the teaching mode of flipped classroom and cooperative learning, badminton teaching can be more flexible and diversified. Students can learn and master the technical and tactical knowledge of badminton in depth in the preview, discussion, cooperation and evaluation, and also cultivate students' teamwork and competitive spirit. This teaching mode can stimulate students' learning interest and motivation, and improve their learning effect and performance in the field of badminton.

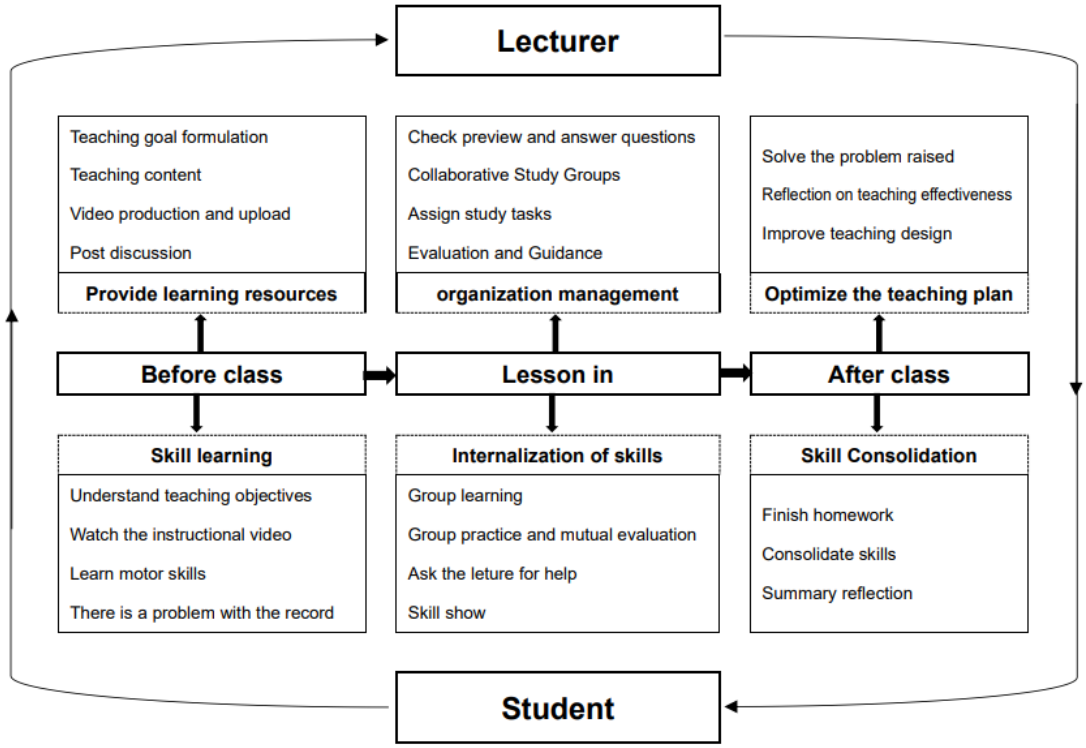

Figure 2.3 Flipped classroom and cooperative learning teaching model (Wang, 2016)

Badminton Technical Skills

Definition of Badminton Technical Skills

Wang (2000) on the definition of badminton technology refers to: the completion of badminton hitting action, in line with the principles of human movement based on the scientific, within the scope of the competition rules allow, give full play to the body's potential ability to effectively complete the action of the reasonable method, badminton technology is a badminton game for a certain purpose of the general term of the specialized action method.

Tang (2006) believes that the technical system is based on the individual body, character and technical characteristics, according to the requirements of "comprehensive technology, outstanding specialties", design and cultivate a certain technology as the main means of scoring, a reasonable configuration of other technologies, give full play to the individual athletic ability in order to win the system.

Tian (2012) on the definition of technology is to complete the sports action method, that sports technology and other disciplines referred to the most important difference between the technology is that the sports technology and sports action of the inseparability of sports technology, there is no separation from the body action and the existence of sports technology, sports technology can only be expressed through the body action. Athlete's technology has two main aspects, one is the technology must be in line with the standards and norms stipulated by the principle of human movement mechanics, and the second is the individual technology must be based on the unique characteristics of the individual, master and individual characteristics compatible with the individual differences in technology.

To summarize, badminton technology refers to the basic skills that people show when they are engaged in badminton, mainly including two parts of the technique and footwork technology, of which the technique consists of racket grip, serve, serve receiving and hitting technology; footwork technology consists of the net footwork, backward footwork and both sides of the mobile footwork (Lin, 2009). In badminton, the upper and lower limb techniques complement each other to form an organic whole, and athletes not only need to have skillful maneuvers, but also need to have excellent lower limb mobility in order to ensure the quality of the return (LI, 2022).

Badminton technical skills consists of the following components:

1. Basic hitting skills: including the mastery and skills of basic hitting movements such as forehand stroke, backhand stroke, forehand push, backhand push, forehand pick, backhand pick.

2. Footwork and movement skills: including the flexible use of footwork and movement skills such as forward and backward movement, left and right movement, turning, as well as the ability to judge and anticipate the position and speed of the ball.

3. Techniques at the net: including the mastery of technical movements such as pumping, picking and pushing, as well as the ability to control the height, angle and strength of the ball.

4. Behind-the-net skills: including mastery and skills of technical movements such as long ball, flat ball, downward ball and kill ball, as well as the ability to judge and respond to the speed, rotation and landing point of the ball.

5. Serve and receive skills: including the mastery and skills of forehand serve, backhand serve, long serve, flat serve, as well as the ability to anticipate and respond to the opponent's serve.

6. Coordination and tactics: including the mastery and application of doubles coordination, singles tactics and other skills, as well as the ability to analyze and utilize the opponent's weaknesses and strengths.

7. Psychological quality and physical fitness: including the psychological quality of the game, such as self-confidence, calmness and persistence, as well as the physical requirements for the intensity and durability of the game.

Therefore, the content of badminton skills is relatively broad, for this study, the main curriculum for freshmen and sophomores, badminton skills mainly include six aspects: (1) Racket grip technology: forehand grip, backhand grip, racket grip to hit the ball; (2) Forehand serve technology: serve position, forehand serve backcourt high ball; (3) Forehand Striking technique: Striking stance, backhand high ball; (4) Backhand serve technology: serve position, backhand serve net ball; (5) Backhand striking technique: Striking stance, backhand net ball; (6) Basic footwork: side step, pad step, cross step.

Cognitive Theory of Badminton Skills

Fitts and Posner proposed the Cognitive-Motor Learning Stages Model in 1967, which describes the cognitive processes that learners go through when acquiring new skills, including three stages: the cognitive stage, the associative stage, and the automatization stage (Fitts, et al., 1967).

1. Cognitive Stage (Cognitive Stage): in this stage, the learner is required to perform a large number of cognitive activities in order to understand the requirements and goals of the task. Learners rely on external feedback and guidance to perform tasks and often make mistakes. In this stage, time and accuracy are usually the most important performance indicators.

2. Associative Stage: In this stage, learners gradually acquire the basic skills of the task and begin to practice autonomously. They begin to transform cognitive processes into faster and more fluid movements. Learners improve their skills and gradually reduce their errors through continuous practice in the Associative Stage. Performance is focused on the balance between speed and accuracy.

3. Autonomous Stage: In this stage, learners' skills are largely embedded in automated behaviors. They can perform tasks accurately, quickly, and with few errors. Performance is focused on speed and efficiency.

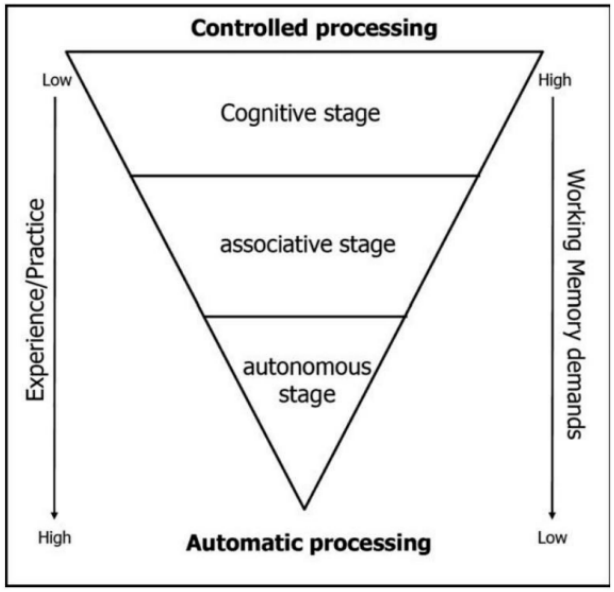

Figure 2.4 The "Cognitive-Motor Learning Stages Model" proposed (Fitts and Posner, 1967)

When you are in an intense game and want to focus on the game to win, it becomes critical to choose the right moment and what information to pay attention to. Gao (2020) conducted a relevant study on selective attention and visuomotor tracking in sports.

1. Selective attention. Attention is the pointing and focusing of mental activity or consciousness on certain objects (Peng, 2012). Selective attention refers to the phenomenon that an individual chooses one of the multiple stimuli presented at the same time to pay attention to while ignoring the others (Yan, 2010), which simply means that an individual prioritizes specific information from external stimuli for processing. The directionality of attention refers to the process by which an individual transfers awareness from one stimulus to another, which ensures that the individual is able to select the target stimulus autonomously; concentration refers to the ability of the individual to place attentional resources on the selected stimulus

in a stable and continuous manner. For example, in badminton, the practitioner has to focus his attention on the badminton ball.

2. Visual motion tracking. When a moving object successfully attracts an individual's attention, the individual's eyes begin to follow the target object, which forms visuomotor tracking (Liu, et al. 2018). Similarly, in badminton, the badminton ball is the object of our visuomotor tracking during the badminton movement. Regarding visual motion tracking, most of the existing studies start from the processing mechanism of visual motion tracking as a whole, which mainly includes shape, size, position, speed, semantic and non-semantic information. Abrams (2005) pay more attention to the motion information of the tracked object, such as the sudden change of the background motion information (motion direction, speed) will attract the attention of the individual, which will affect the individual's acquisition of the tracked target.

These research theories provide researchers with the cognitive process in badminton skills. Through further research and experimentation, the cognitive activities of learners in skill acquisition can be better understood, thus providing more specific guidance and effective strategies for training and teaching practices.

Evaluation of Badminton Technical Skills

The evaluation indexes of badminton technical ability cover a number of aspects, including serving, receiving, hitting, footwork, tactics and so on. Some common badminton technical ability evaluation indexes are accuracy of serve, height of serve. There are also accuracy of hitting, power and speed control of hitting and so on. For the technical ability of this study, the following five evaluation criteria were taken.

Movement Integrity: Whether the badminton players can complete the whole movement process according to the correct movement flow and steps without omitting or missing key steps when performing specific movements (e.g., hitting, moving, etc.).

Movement Proficiency: The ability of a badminton player to demonstrate a smooth, natural performance without appearing stiff or awkward when performing specific skill movements. Movement proficiency includes several aspects of movement such as accuracy, fluidity, speed, power, and coordination.

Ball Height: The height of the flight of the ball relative to the court when hitting or serving in badminton. For a serve, the right height of the ball enables the ball to go over the net and at the same time is difficult to be intercepted by the opponent.

Depth of the ball: The distance of the ball from the boundary line of the opponent's court when the badminton ball is hit or served. The proper depth of the ball enables the ball to land deep in the opponent's court, increasing the opponent's reaction time and difficulty.

The scoring criteria for each category of the evaluation are detailed in the table below:

Table 2.2 Badminton skills evaluation form

Rating scale	**5**	**4**	**3**	**2**	**1**
Completeness of movement	Movements are complete, smooth, without interruption, and coordinated in all segments.	The movement is basically complete, with slight interruptions.	Movement is flawed, with noticeable breaks or coordination problems.	Movements are noticeably incomplete, with major interruptions or coordination problems.	Movement is grossly incomplete, unable to complete the movement.
Proficiency of movement	The movement is skillful and comfortable, with high stability.	Movement is basically proficient, with slight experimentation.	Movement needs to continue to be proficient and consistency needs to be improved.	Movement is not proficient enough and performance is inconsistent.	Movement is extremely unskilled and difficult to complete.

Table 2.2 (Continued)

Rating scale	5	4	3	2	1
Height of stroke	The height of the stroke is moderate and stable.	Stroke height is good, with occasional variations.	Strike height is average and needs to be adjusted.	Strike height is inconsistent and problematic.	The height of the stroke is not reasonable.
Depth of stroke	The depth of the stroke is ideal and stable.	Depth of stroke is good, with occasional variation.	Depth of stroke is average and needs to be adjusted.	Depth of stroke is inconsistent and problematic.	Unreasonable depth of stroke.

Related Research

Learning Pyramid Theory

In 1946, the American scholar Edgar Dale put forward the theory of "Learning Pyramid (Cone of Learning)", which graphically shows the proportion of knowledge retained in the brain of a student after an average of 2 weeks through different learning modes. The knowledge retention rate of the way the lecturer lectures and the students listen to the lecture is 5%; the knowledge retention rate of the way of only visual reading is 10%, and the knowledge retention rate of the way of combining visual and auditory is 20%; the knowledge retention rate of the way of the lecturer's demonstration is 30%; the knowledge retention rate of the way of discussing through the small group is 50%; the knowledge retention rate of the way of the student's hands-on practice is 75%; and the knowledge retention rate of the way of explaining to others and passing on knowledge is 90%. it can be learned that the three efficient learning styles of group discussion, practice, and teaching to others comprehensively invoke students' sensory organs, and are the styles that we should focus on comprehensively using in our teaching.

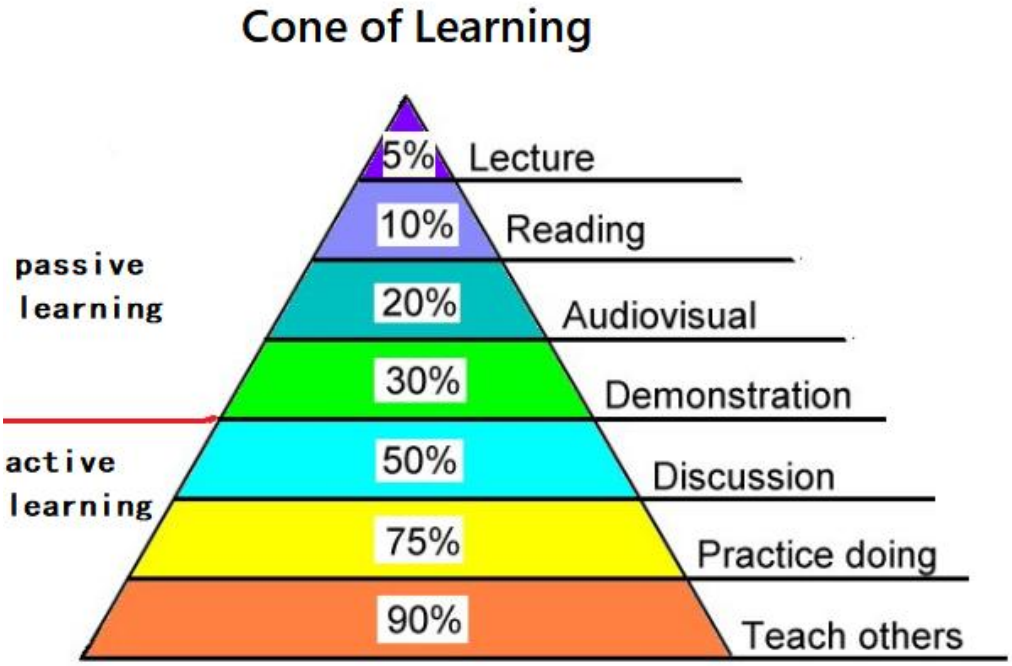

Figure 2.5 Schematic of the learning pyramid (Gui, 2023)

Analysis of factors affecting badminton skill of undergraduate students

In recent years, there has been a growing interest in research aimed at the development of badminton skills among undergraduate students. Students' interest and motivation in badminton are influenced by personal preferences, social and cognitive factors, as well as challenges in the development of students' teamwork and coordination skills. These related factors influence the effectiveness of improving the development of students' technical skills in badminton.

Zhu, et al., (2017) Interest and motivation: research shows that students' interest and motivation in badminton may be influenced by personal preferences, social factors and cognitive factors. Students' interest and motivation in badminton may be inconsistent. Some students may be uninterested in badminton, lack motivation and initiative, and find it difficult to maintain lasting motivation.

Lei, (2022) learning pressure: Undergraduate students usually face learning pressure from academics and other activities, and the allocation of time and energy may become a challenge. They need to balance between academics and badminton training and may need to face problems such as lack of time, fatigue and anxiety. Research could focus on students' coping strategies and time management skills in

different contexts to help them better balance their academics and badminton training.

Zhang, et al., (2023) Differences in the starting point of skill levels: undergraduate students may have a wide range of starting points for badminton skill levels. Some students may already have some basic knowledge of badminton, while others may have no relevant experience at all. This difference may lead to inconsistent learning progress and students' lack of confidence in learning badminton, and lecturers need to develop different teaching plans for different students' levels and provide individualized instruction and training.

Mo, et al. (2022) teamwork and coordination: badminton is a team sport, and students need to cooperate and coordinate with their teammates to achieve the goal of the game. However, teamwork and coordination skills may take a longer time to develop and practice and may be a challenge for some students. Research could focus on students' performance in teamwork, as well as methods and strategies to develop students' teamwork and coordination skills.

In conclusion, a number of studies have been conducted to explore and provide some relevant theoretical and practical guidance on badminton students' interest and motivation, learning pressure, differences in starting points of skill levels, and teamwork and coordination. These studies provide an understanding of the students' situation in badminton learning and training so that teaching methods can be applied in a targeted way to improve students' badminton skill levels.

Chapter 3
Research Methodology

In the study of “Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students” the researcher used Mixed Method of Research. This research is divided into 3 phases.

Phase 1 was conducted to answer research objective 1: To examine the factors affecting badminton technical skills of undergraduate students in Yulin Normal University.

Phase 2 was conducted to answer research objective 2: To develop flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students kills.

Phase 3 was conducted to answer Research Objective 3: To study the results of flipped classroom and cooperative learning instructional model to enhance model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

The details are as follows.

Phase 1 was conducted to answer research objective 1: To examine the factors affecting badminton technical skills of undergraduate students in Yulin Normal University.

Population

Discuss before

Group 1: 210 former undergraduate students’ year 2 of Badminton Course, semester 1 on academic year 2022 in Yulin Normal University.

Class 1: 55 students major in Literature

Class 2: 50 students major in Chemistry

Class 3: 55 students major in History

Class 4: 50 students major in Education

Research instrument

The questionnaire for students

Designing instrument 1

1. Study badminton courses and factors affecting badminton technical skills.

2. Design a questionnaire on the factors to improve badminton technical skills for the students of Yulin Normal University. There are 3 Parts: Part 1 is about Common data of the respondent in overall (N=210) Part 2 Internal factors 15 numbers, external factors 15 numbers and Part 3 suggestion.

3. Present the draft of the questionnaire to the advisors for checking correctness and completeness.

4. Assess the validity of questionnaire on factors to improve badminton technical skills for the students in Yulin Normal University by 3 experts (List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below. (Phongsri, 2008, p. 1951).

+1 = Sure that the content is relevant to the topic

0 = Not sure that the content is relevant to the topic

-1 = Determined that the content is not relevant to the topic

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures1.00.

5. Design a Likert 5-point scale questionnaire on the following score rating criteria.

Score rating criteria

5 means strongly agree

4 means agree

3 means neutral

2 means disagree

1 means strongly disagree

The factors affecting badminton technical skills obtained from the students are interpreted using MEAN interpretation criteria proposed by Phongsri (2011).

4.51-5.00 means strongly agree

3.51-4.50 means agree

2.51-3.50 means neutral

1.51-2.50 means disagree

1.00-1.50 means strongly disagree

Data Collection

1. Ask for permission for data collection.

2. Collect data from the assigned students using the developed questionnaire.

Data Analysis

Descriptive Statistics i.e., Frequency, MEAN (μ), Standard Deviation (σ)

Group 2: 4 lecturers who teach badminton course in Yulin Normal University.

Research instrument

The interview for the lecturers

Designing instrument 2

1. Study literature on teaching the theory of flipped classroom and cooperative learning, improvement of teaching methods, and factors affecting students' badminton technical skills.

2. Design a draft open-ended interview on factors affecting students' badminton technical skills

3. Present the draft of open-ended interview to the advisors for checking correctness and completion.

4. Assess the validity of open-end interview on factors affecting badminton technical skills for the students at Yulin Normal University by 3 experts (List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00.

Data Collection

1. Ask for permission for data collection.

2. Collect data from the assigned lecturers using the developed interview.

Data Analysis

Content analysis

Output Phase 1

Factors affecting are internal and external factors to improve students' badminton technical skills of students and lecturers in Yulin Normal University by table 3.1.

Table 3.1 Conduct research from Phase 1

Topics	Details
Research process	Analyzed both internal and external factors
Research objective 1	To examine the factors to enhance undergraduate students' badminton technical skills .
Conduct research	Design internal and external factors that influence the badminton technical skills of university undergraduates. Design questionnaires and lecturer interview outlines.
Target group/Key informants	1) 210 former undergraduate students of Principles and Methods of college badminton course in the 1st semester on academic year 2022 from 4 majors in Yulin Normal University. 2) 4 lecturers who are teaching college badminton course from 4 majors in Yulin Normal University.
Instrument	1) Questionnaires 30 items. 2) Interview by 10 questions
Data analysis	Descriptive Statistics i.e., Frequency, mean (μ) standard deviation (σ) for questionnaires. 2) Content analysis for interview
Research process	Analyzed both internal and external factors
Output	The result of the factors to enhance badminton technical skills of undergraduates. The internal factors such as external factors such as teaching methods, teaching materials and environment etc.

Phase 2 was conducted to answer research objective 2: To develop flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Research instrument

Conformity Assessment Form of Flipped Classroom and Cooperative learning Instructional Model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.

Designing instrument

1. Study related concepts, principles, process about developing instructional model, including results in terms of factors affecting badminton technical skills from research objective 1.

2. Design handout of flipped classroom and cooperative learning instructional model.

3. Design a questionnaire on confirming the appropriateness of the instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.

4. Present the draft of open-ended interview to the advisors for checking correctness and completion.

5. Assess the validity of the questionnaire on confirming the appropriateness of the instructional model by 5 experts (List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

6. Design the conformity assessment form of the flipped classroom and cooperative learning instructional model.

Data Collection

1. Ask for permission of data collection

2. Collect appropriateness of the instructional model in terms of accuracy

standard, propriety standard, feasibility standard, and utility standard from the 5 experts using the developed conformity assessment form of the flipped classroom and cooperative learning instructional model.

Data Analysis

Descriptive analysis i.e., frequency and percentage. The acceptable items must not be less than 100%.

Expected Output Phase 2

The appropriateness of the Task-based Instructional model is confirmed by experts for further implementation .The acceptable items 100% by Table 3.2.

Table 3.2 Conduct research from Phase 2

Topics	Details
Research process	Development of flipped classroom and cooperative learning instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.
Research objective 2	To develop flipped classroom and ccooperative learning Instructional model to enhance badminton technical skills of undergraduate students.
Research method	Study the component for development of flipped classroom and cooperative learning instructional model
Target group/Key informants	5 experts through Item-Objective Congruence (IOC) according to the criteria
Instrument	The questionnaire
Data analysis	Frequency and percentage
Output	Flipped classroom and ccooperative learning instructional model to enhance badminton technical skills of undergraduate students the appropriateness of which is confirmed by experts for further implementation. The acceptable items 100%.

Summary handout of Flipped Classroom and Cooperative Learning instructional model by figure 3.1.

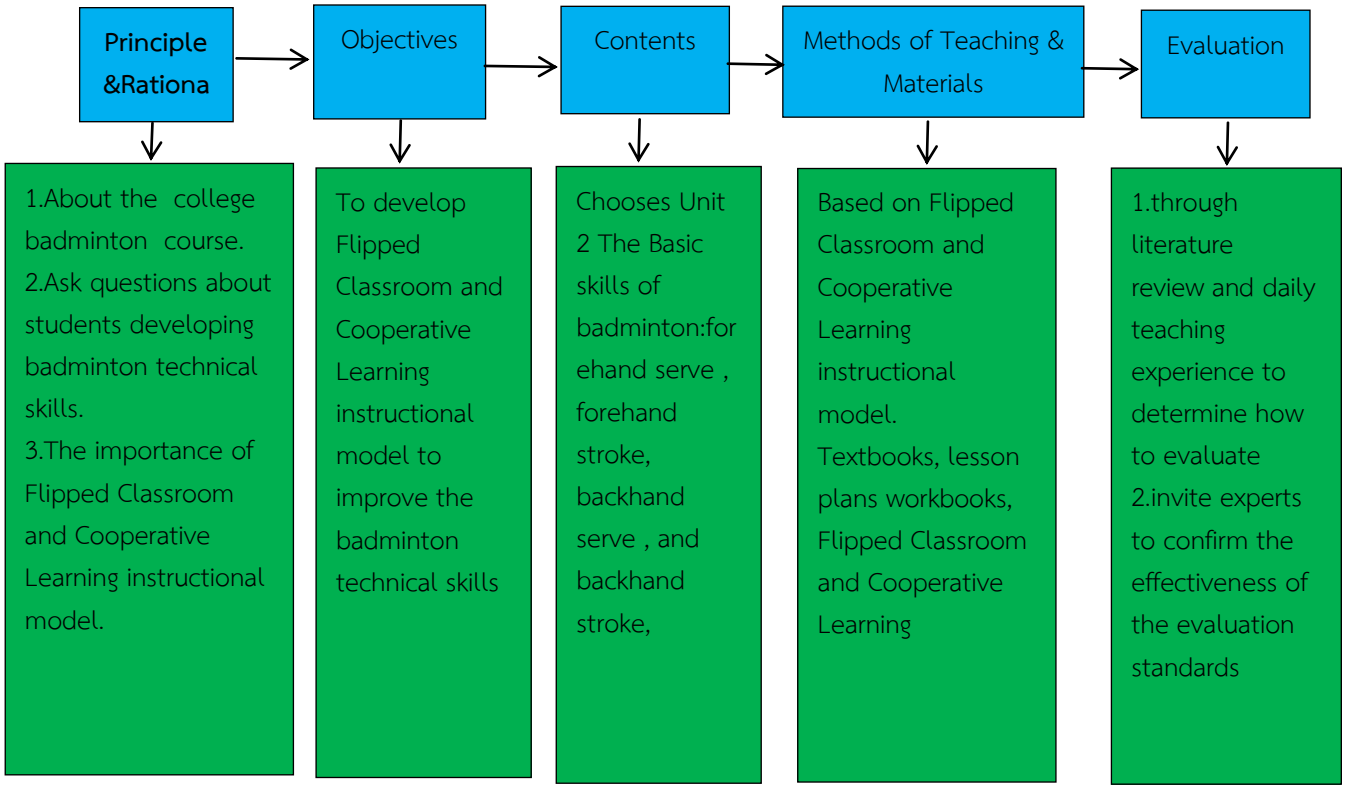

Figure 3.1 Summary handout of Flipped Classroom and Cooperative Learning instructional model

Phase 3 was conducted to answer Research Objective 3: To study the results of flipped classroom and cooperative learning instructional model to enhance model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Population

The total of 120 freshmen students from 3 sections of students who enrolled in the Badminton Course in semester 1 academic year 2023. Those sections involve the following.

41 students in classA, Literature major

40 students in class B, History major

39 students in classC, Chemistry major

The Sample Group

A simple random sample was obtained from 40 students who took the badminton course in class B.

Table 3.3 Posttest Only Experimental Design

Group	X	T1
Sample Group	Flipped classroom and cooperative learning Instructional model	Badminton technical skills

X = Flipped classroom and cooperative learning Instructional model.

T1 = Assessing Badminton technical skills using scoring rubric.

Research instruments

1. Lesson plans using the flipped classroom and cooperative learning instructional model

2. Rubric scoring form

Designing instrument 1

1. Study and design lesson plans with the following components: contents, objectives, methods of teaching, materials and evaluation**.**

2. Design lesson plans by format given.

3. Present the lesson plan to the advisors for checking correctness, completion and improvement.

4. Assess the validity of the designed lesson plans by 3 experts (List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below. (Phongsri,2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00.

5. Conduct a try-out of the developed lessons plans with another group of samples for further improvements and implementation with the sample group.

Designing instrument 2

Rubric scoring form

1. Study the rubric scoring criteria aligned with badminton technical skills and design 5-point range rubric scoring within 4 items consist of item 1 Forehand serve technical skill, item 2 Forehand stroke technical skill, item 3 Backhand serve technical skill, and item 4 Backhand stroke technical skill.

2. Design rubric scoring criteria.

3. Present the developed rubric scoring criteria to the advisors for checking correctness, completion and improvement.

4. Assess the validity of the designed rubric scoring criteria by 3 experts through Item-Objective Congruence (IOC) according to the criteria as shown below:

+1 = Sure that the descriptors are related to the issue of assessment

0 = Not sure that the descriptors are related to the issue of assessment

-1= Sure that the descriptors are not related to the issue of assessment

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00. Criteria to evaluate unit2**:** badminton technical skills by table 3.4, table 3.5, table 3.6, table 3.7, and table 3.8**.**

Table 3.4 Criteria to evaluate 1. Forehand serve technical skill

Score	Grade
17-20	Excellent
13-16	Good
9-12	Medium
5-8	Pass
Less than 4	Poor

Table 3.5 Criteria to evaluate 2. Forehand stroke technical skill

Score	Grade
17-20	Excellent
13-16	Good
9-12	Medium

Table 3.5 (Continued)

Score	Grade
5-8	Pass
Less than 4	Poor

Table 3.6 Criteria to evaluate 3. Backhand serve technical skill

Score	Grade
17-20	Excellent
13-16	Good
9-12	Medium
5-8	Pass
Less than 4	Poor

Table 3.7 Criteria to evaluate 4. Backhand stroke technical skill

Score	Grade
17-20	Excellent
13-16	Good
9-12	Medium
5-8	Pass
Less than 4	Poor

Table 3.8 Criteria to evaluate badminton technical skills over all 16 Standards

Score	Grade
17-20	Excellent
13-16	Good
9-12	Medium
5-8	Pass
Less than 4	Poor

Data Collection

1. Ask for permission of data collection

2. Collect students' performance by using rubric scoring before assessment by external raters.

Data Analysis

Categorize students' performance according to rubric scoring criteria into their levels descriptor.

Expected Output Phase 3

Results of implementing flipped classroom and cooperative learning instructional model – students' performance according to rubric scoring criteria into their levels descriptor by Table 3.9.

Table 3.9 Conduct research from Phase 3

Topics	Details
Research process	1) Deign lesson plan 2) Design scoring rubric form
Research objective 3	To study the results of implementing flipped classroom and cooperative learning instructional model to enhance undergraduate students' badminton technical skills**.**
Conduct research	Designing instrument 1 (Lesson plan) Designing instrument 2 (Rubric evaluation form)
Target group/Key informants	The 40students who enroll in the college badminton course Yulin Normal University in the 1st semester, the academic year 2023 from Section B by cluster sampling.
Instrument	1.Lesson plan 2.Rubric evaluation form
Data analysis	Categorize students' performance according to rubric scoring criteria into their levels descriptor.
Output	Students' badminton technical skills are at a good level ≥ 80%.

Chapter 4
Results of Analysis

This chapter presents findings derived from the fieldwork procedures outlined previously, focusing on data collection crucial to this study. The objectives, outlined in Chapter I, serve three primary purposes:

objective 1. To study the factors to enhance badminton technical skills of undergraduate students in Yulin Normal University.

objective 2. To development of flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

objective 3. To examine the effects of flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Data Analysis Results

Phase 1 : Analysis results serving objective 1–To study the factors to enhance badminton technical skills of undergraduate students in Yulin Normal University.

This section presents analysis results serving objective 1 using table and description in terms of MEAN, standard deviation, interpretation (Level of Attitude), and ranking of all factors in overview. After that, items of all factors are presented likewise.

Table 4.1 Common data of the respondent in overall (N-210)

Data	Frequency	Percentage
Gender		
A. Male	36	17.10
B. Female	174	82.90
Total	**210**	**100.00**
Age		
A. below 18 yrs.	1	0.50
B. 18-19 yrs.	93	44.30
C. 20-21 yrs.	91	43.30
D. over 21yrs.	25	11.90
Total	**210**	**100.00**

As can be seen from Table 4.1, the overall common data of the respondents shows that about three quarters of the respondents were female, representing 82.90% of the total number of participants. Male respondents accounted for 17.10% of the total. The age distribution was concentrated in the 18-21 age group. The largest number of respondents were in the 18-19 age group (44.30%), followed by those in the 20-21 age group (43.30%), and there was only one respondent under the age of 18 (0.50%).

Table 4.2 The result of questionnaire from students in overview

Factors	μ	σ	Interpretation	Ranking within All Factors
Internal Factor				
1. Students are interested in the badminton program.	4.21	.849	Agree	12
2. Students understand the learning model of badminton technical knowledge and ability in the badminton course.	3.86	.990	Agree	15
3. Students believe that good teaching techniques can be used to improve badminton technical skills in courses.	4.18	.766	Agree	7
4. Students believe that watching videos before class can improve their technical skills in badminton courses.	3.99	.875	Agree	13
5. Students have physical fitness and sports ability conducive to developing badminton technical skills.	4.37	.709	Agree	5
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.	4.28	.808	Agree	9
7. Students believe that the badminton program is important for their personal growth and future development.	4.06	.822	Agree	11
8. Students think that the assignments and feedbacks given by the lecturer can help students to utilize what they have learned.	3.96	.880	Agree	14
9. Students can learn and practice badminton skills in this badminton course.	4.36	.692	Agree	2

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	4.41	.667	Agree	1
11. Students have new ideas about learning the technical skills of badminton in a badminton course.	4.14	.818	Agree	10
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.	4.28	.707	Agree	4
13. Students' increased ability to manage their study time is conducive to learning outcomes.	4.30	.706	Agree	3
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	4.17	.782	Agree	8
15. Students can develop a sense of competition and teamwork through badminton lessons.	4.35	.711	Agree	6
Total Average	**4.19**	**.785**	**Agree**	
External Factor				
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	4.14	.776	Agree	14

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.	4.19	.757	Agree	8
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	4.25	.723	Agree	5
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	4.29	.703	Agree	4
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.	4.31	.702	Agree	3
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.	4.32	.699	Agree	2
7. The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	4.21	.762	Agree	10
8. The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	4.20	.798	Agree	15

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.	4.26	.752	Agree	7
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	4.30	.763	Agree	11
11. The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.	4.24	.771	Agree	13
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	4.28	.727	Agree	6
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills training.	4.28	.764	Agree	12
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in badminton technical abilities.	4.36	.758	Agree	9
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	4.47	.642	Agree	1
Total Average	**4.27**	**.740**	**Agree**	

Table 4.2 shows that the internal factors affecting badminton technical skills are generally at a high level (μ=4.19). In terms of individual items, item 10 has the highest mean (μ=4.41), followed by item 9 (μ=4.36) and item 2 has the lowest mean (μ=3.86).

For the external factors affecting badminton technical skills, the overall level is high (μ=4.27). Item-by-item analysis revealed that item 15 had the highest mean (μ=4.47), followed by item 6 (μ=4.32), and item 8 had the lowest mean (μ=4.20).

Table 4.3 Common data of the respondent in Class 1: 55 students major in Literature at Yulin Normal University. (N-55)

Data	Frequency	Percentage
Gender		
A. Male	10	18.20
B. Female	45	81.80
Total	**55**	**100.00**
Age		
A. below 18 yrs.	1	1.80
B. 18-19 yrs.	24	43.60
C. 20-21yrs.	21	38.20
D. over 21 yrs.	9	16.40
Total	**55**	**100.00**

As can be seen in Table 4.3, the largest number of respondents majoring in Literature were female, accounting for 81.80% of the respondents. The largest number of respondents were in the age group of 18-19 years old (43.60%), while there was only one respondent under the age of 18 years old (1.80%).

Table 4.4 The result of questionnaire from students major in Literature at Yulin Normal University. (N-55)

Factors	μ	σ	Interpretation	Ranking within All Factors
Internal Factor				
1. Students are interested in the badminton program.	4.11	.832	Agree	12
2. Students understand the learning model of badminton technical knowledge and ability in the badminton course.	3.87	1.037	Agree	15
3.Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.	4.20	.755	Agree	9
4.Students believe that watching videos before class can improve their technical skills in badminton courses.	3.89	.875	Agree	14
5. Students have physical fitness and sports ability conducive to developing badminton technical skills.	4.31	.814	Agree	4
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.	4.24	.816	Agree	8
7. Students believe that the badminton program is important for their personal growth and future development.	4.13	.747	Agree	11
8. Students think that the assignments and feedbacks given by the lecturer can help	3.96	.981	Agree	13

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
students to better utilize what they have learned.				
9. Students can learn and practice badminton skills in this badminton course.	4.27	.706	Agree	6
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	4.45	.662	Agree	2
11. Students have new ideas about learning the technical skills of badminton in a badminton course.	4.20	.779	Agree	10
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.	4.29	.762	Agree	5
13. Students' increased ability to manage their study time is conducive to learning outcomes.	4.25	.799	Agree	7
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	4.31	.791	Agree	3
15. Students can develop a sense of competition and teamwork through badminton lessons.	4.45	.633	Agree	1

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
Total Average	**4.20**	**.799**	**Agree**	
External Factor				
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	4.24	.769	Agree	10
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.	4.22	.712	Agree	13
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	4.33	.721	Agree	5
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	4.20	.730	Agree	14
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.	4.31	.742	Agree	7
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate	4.36	.729	Agree	3

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
students' technical skills in badminton.				
7. The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	4.24	.793	Agree	11
8. The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	4.27	.757	Agree	8
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.	4.24	.860	Agree	12
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	4.35	.799	Agree	4
11. The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.	4.18	.796	Agree	15
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	4.42	.686	Agree	2
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills	4.31	.814	Agree	6

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
training.				
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in badminton technical abilities.	4.25	.886	Agree	9
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	4.42	.686	Agree	1
Total Average	**4.29**	**.765**	**Agree**	

Table 4.4 shows that the internal factors affecting badminton technical skills are generally at a high level (μ=4.20). In terms of individual items, the highest mean (μ=4.45) was found for items 15 and 10, followed by item 14 (μ=4.31), and the lowest mean (μ=3.87) was found for item 2.

For the external factors affecting badminton technical skills, the overall level was also high (μ=4.29). Item-by-item analysis revealed that items 15 and 12 had the highest mean (μ=4.42), followed by item 6 (μ=4.36), and the lowest was item 11 (μ=4.18).

Table 4.5 Common data of the respondent in Class 2: 50 students major in Chemistry at Yulin Normal University. (N- 50)

Data	Frequency	Percentage
Gender		
A. Male	6	12.00
B. Female	44	88.00
Total	**50**	**100.00**
Age		
A. below 18 yrs.	0	0.00
B. 18-19 yrs.	29	58.00
C. 20-21yrs.	17	34.00
D. over 21 yrs.	4	8.00
Total	**50**	**100.00**

From Table 4.5, it can be seen that the most common data of respondents in Chemistry are females (88.00%), and the most respondents are in the age group of 18-19 years (58.00%). There were no respondents under the age of 18 years.

Table 4.6 The result of questionnaire from students major in Chemistry at Yulin Normal University. (N- 50)

Factors	μ	σ	Interpretation	Ranking within All Factors
Internal Factor				
1. Students are interested in the badminton program.	4.18	.919	Agree	10
2. Students understand the learning model of badminton technical knowledge and ability in the badminton course.	3.70	1.093	Agree	15
3.Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.	4.06	.740	Agree	12
4.Students believe that watching videos before class can improve their technical skills in badminton courses.	4.06	.867	Agree	13
5. Students have physical fitness and sports ability conducive to developing badminton technical skills.	4.34	.745	Agree	5
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.	4.30	.814	Agree	6
7. Students believe that the badminton program is important for their personal growth and future development.	4.08	.853	Agree	11

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
8. Students think that the assignments and feedbacks given by the lecturer can help students to better utilize what they have learned.	3.98	.820	Agree	14
9. Students can learn and practice badminton skills in this badminton course.	4.48	.677	Agree	2
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	4.48	.614	Agree	1
11. Students have new ideas about learning the technical skills of badminton in a badminton course.	4.20	.808	Agree	8
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.	4.24	.716	Agree	7
13. Students' increased ability to manage their study time is conducive to learning outcomes.	4.34	.658	Agree	4
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	4.18	.748	Agree	9
15. Students can develop a sense of competition and teamwork through badminton lessons.	4.34	.717	Agree	3
Total Average	**4.20**	**.786**	**Agree**	

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
External Factor				
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	4.18	.800	Agree	15
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.	4.20	.833	Agree	14
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	4.30	.678	Agree	10
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	4.38	.602	Agree	4
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.	4.36	.631	Agree	5
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.	4.40	.571	Agree	3

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
7. The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	4.30	.735	Agree	11
8. The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	4.22	.737	Agree	13
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.	4.28	.701	Agree	12
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	4.34	.772	Agree	8
11. The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.	4.36	.693	Agree	6
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	4.32	.653	Agree	9
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills training.	4.34	.745	Agree	7

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in badminton technical abilities.	4.48	.646	Agree	2
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	4.52	.646	strongly agree	1
Total Average	**4.33**	**.696**	**Agree**	

Table 4.6 shows that the internal factors affecting badminton technical skills are generally at a high level (μ=4.20). In terms of individual items, items 10 and 9 have the highest mean value (μ=4.48) and item 2 has the lowest mean value (μ =3.70).

For external factors affecting academic performance in the Principles and Methods of Critical Thinking course, the overall level was high (μ=4.33). Item-by-item analysis revealed that item 15 had the highest mean (μ=4.52), followed by item 14 (μ=4.48), and the lowest mean was for item 1 (μ=4.18).

Table 4.7 Common data of the respondent Class 3: 55 students major in History at Yulin Normal University. (N- 55)

Data	Frequency	Percentage
Gender		
A. Male	14	25.50
B. Female	41	74.50
Total	**55**	**100.00**
Age		
A. below 18 yrs.	0	0.00
B. 18-19yrs.	19	34.50
C. 20-21 yrs.	28	50.90
D. over 21 yrs.	8	14.50
Total	**55**	**100.00**

Table 4.7 shows that 74.5% of the respondents majoring in history were female. The majority of the respondents were aged 20-21 years old (50.90%). There were no respondents under the age of 18.

Table 4.8 The result of questionnaire from students major in History at Yulin Normal University. (N- 55)

Factors	μ	σ	Interpretation	Ranking within All Factors
Internal Factor				
1. Students are interested in the badminton program.	4.35	.821	Agree	5
2. Students understand the learning model of badminton technical knowledge and ability in the badminton course.	3.80	.970	Agree	15
3.Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.	4.18	.841	Agree	9
4.Students believe that watching videos before class can improve their technical skills in badminton courses.	4.02	.913	Agree	12
5. Students have physical fitness and sports ability conducive to developing badminton technical skills.	4.49	.663	Agree	1
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.	4.29	.762	Agree	7
7. Students believe that the badminton program is important for their personal growth and future development.	3.96	.860	Agree	13
8. Students think that the assignments and feedbacks given by the lecturer can help	3.87	.904	Agree	14

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
students to better utilize what they have learned.				
9. Students can learn and practice badminton skills in this badminton course.	4.22	.738	Agree	8
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	4.38	.652	Agree	2
11. Students have new ideas about learning the technical skills of badminton in a badminton course.	4.05	.911	Agree	11
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.	4.33	.695	Agree	6
13. Students' increased ability to manage their study time is conducive to learning outcomes.	4.36	.677	Agree	3
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	4.15	.803	Agree	10
15. Students can develop a sense of competition and teamwork through badminton lessons.	4.35	.751	Agree	4
Total Average	**4.19**	**.797**	**Agree**	

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
External Factor				
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	4.09	.800	Agree	14
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.	4.11	.786	Agree	11
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	4.11	.737	Agree	12
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	4.25	.751	Agree	4
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton	4.31	.663	Agree	3
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.	4.22	.712	Agree	6

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
7. The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	4.11	.737	Agree	13
8. The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	4.05	.870	Agree	15
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.	4.25	.700	Agree	5
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	4.16	.788	Agree	8
11. The Lecturer and evaluates the learning process that contributes to the development of learning efficiency.	4.11	.832	Agree	10
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	4.13	.771	Agree	9
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. I ncluding technical skills training.	4.18	.772	Agree	7

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in badminton technical abilities.	4.35	.775	Agree	2
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	4.45	.662	Agree	1
Total Average	**4.19**	**.757**	**Agree**	

Table 4.8 shows that the internal factors affecting badminton technical skills are generally at a high level (μ=4.19). Looking at the individual items, item 5 has the highest mean (μ=4.49), followed by item 10 (μ=4.38) and item 2 has the lowest mean (μ=3.80).

For the external factors affecting badminton technical skills, the overall level was high (μ=4.19). Item-by-item analysis revealed that item 1 had the highest mean (μ=4.45), followed by item 14 (μ=4.35) and the lowest was item 8 (μ=4.05).

Table 4.9 Common data of the respondent Class 4: 50 students major in Education at Yulin Normal University. (N- 50)

Data	Frequency	Percentage
Gender		
A. Male	6	12.00
B. Female	44	88.00
Total	**50**	**100.00**
Age		
A. below 18 yrs.	0	0
B. 18-19yrs.	21	42.00
C. 20-21 yrs.	25	50.00
D. over 21 yrs.	4	8.00
Total	**50**	**100.00**

Table 4.9 shows that 88.00% of the respondents majoring in education were female. The majority of the respondents were aged 20-21 years old (50.00%). There were no respondents under the age of 18.

Table 4.10 The result of questionnaire from students major in Education at Yulin Normal University. (N-50)

Factors	μ	σ	Interpretation	Ranking within All Factors
Internal Factor				
1. Students are interested in the badminton program	4.32	.683	Agree	4
2. Students understand the model of badminton technical knowledge and ability in the badminton course.	3.98	.869	Agree	15
3.Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.	4.26	.723	Agree	7
4.Students believe that watching videos before class can improve their technical skills in badminton courses.	4.00	.857	Agree	14
5. Students have physical fitness and sports ability conducive to developing badminton technical skills.	4.34	.593	Agree	3
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.	4.30	.863	Agree	5
7. Students believe that the badminton program is important for their personal growth and future development.	4.06	.843	Agree	11

Table 4.10 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
8. Students think that the assignments and feedbacks given by the lecturer can help students to better utilize what they have learned.	4.04	.807	Agree	12
9. Students can learn and practice badminton skills in this badminton course.	4.48	.614	Agree	1
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	4.34	.745	Agree	2
11. Students have new ideas about learning the technical skills of badminton in a badminton course.	4.10	.789	Agree	10
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.	4.26	.664	Agree	6
13. Students' increased ability to manage their study time is conducive to learning outcomes.	4.24	.687	Agree	8
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	4.04	.781	Agree	13
15. Students can develop a sense of competition and teamwork through badminton lessons.	4.24	.744	Agree	9
Total Average	**4.20**	**.751**	**Agree**	

Table 4.10 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
External Factor				
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	4.06	.740	Agree	15
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.	4.22	.708	Agree	14
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	4.26	.751	Agree	11
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	4.34	.717	Agree	4
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.	4.26	.777	Agree	10
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.	4.32	.768	Agree	5

Table 4.10 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
7. The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	4.22	.790	Agree	13
8. The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	4.24	.822	Agree	12
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.	4.26	.751	Agree	8
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	4.34	.688	Agree	3
11. The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.	4.32	.741	Agree	6
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	4.26	.777	Agree	9
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills training.	4.28	.730	Agree	7
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in	4.36	.693	Agree	2

Table 4.10 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
badminton technical abilities.				
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	4.48	.580	Agree	1
Total Average	**4.28**	**.736**	**Agree**	

Table 4.10 shows that the internal factors affecting badminton technical skills are generally at a high level (μ=4.20). Looking at the individual items, item 9 has the highest mean (μ=4.48), followed by item 10 (μ=4.34) and item 2 has the lowest mean (μ=3.98).

For the external factors affecting badminton technical skills, the overall level was high (μ=4.28). Item-by-item analysis revealed that item 15 had the highest mean (μ=4.48), followed by item 14 (μ=4.36) and the lowest was item 1 (μ=4.06).

The Lecturers Interview analysis results

The amount of lecturers University

1 lecturer, from School of Literature in Yulin Normal University.

1 lecturer, from School of Chemistry in Yulin Normal University.

1 lecturer, from School of History in Yulin Normal University.

1 lecturer, from School of Education in Yulin Normal University.

Table 4.11 Common data of the respondent in Yulin Normal University.

Data	Frequency	Percentage
Gender		
A. Male	3	75.00
B. Female	1	25.00
Total	**4**	**100.00**
Experience teaching		
A. below 3 yrs.	0	0.00
B. 3-6 yrs.	1	25.00
C. 7- 9 yrs.	1	25.00
D. over 9 yrs.	2	50.00
Total	**4**	**100.00**
Age		
A. below 25 yrs.	0	0.00
B. 25-35 yrs.	1	25.00
C. 36-49 yrs.	2	50.00
D. over 49 yrs.	1	25.00
Total	**4**	**100.00**

As can be seen in Table 4.11, the common data for lecturers shows that the most common gender was male, which accounted for 75.00% of the respondents, while female lecturers accounted for 25.00% of the sample.

In terms of teaching experience, one person had 3-6 years of teaching experience; one person had 7-9 years of teaching experience; and two person had more than 9 years of teaching experience. respectively, representing 50.00% of the sample.

In terms of age, two person was 36-49 years old, accounted for 50.00% of the sample.; one person was 25-35 years old;and one person was over 49 years old. Each accounted for 25.00% of the sample.

After interviews with three lecturers, the factors that affect the badminton technical skills of undergraduate students are summarized as follows:

In this interview, four lecturers share their ideas and approaches to developing a flipped classroom and cooperative learning model to improve university students' technical skills in badminton. Despite the differences in their responses, it can be seen that they share some common concerns and strategies in terms of teaching objectives, teaching methods, assessment methods, and student participation.

Motivation and interest in teaching. All three lecturers emphasized that they chose to teach this course because of their strong interest in sports and badminton. They hoped to inspire their students' interest and love for badminton through teaching. This positive teaching motivation can help create a positive learning atmosphere and motivate students to be more engaged in learning.

Diversified teaching methods. The lecturers realized the importance of using multiple teaching methods in teaching. They mentioned that pre-study before class, demonstration and explanation in class, cooperative learning and teaching competitions not only help students better understand the techniques and rules of badminton, but also increase the interest and participation in class, making learning more vivid and practical.

Individualized coaching and support. Individualized coaching and support is a common strategy of the three instructors in teaching. They understand students' differences and are willing to provide specific guidance and assistance to students according to their different levels and needs. This individualized attention enhances student learning and allows each student to progress at a pace that suits them.

Multiple modes of assessment. Lecturers have emphasized the use of multiple assessment methods to get a comprehensive picture of student learning. Classroom performance, homework, group projects and practical exercises are some of the diverse assessment methods that can more accurately reflect students' knowledge mastery, skill utilization and cooperation ability, so as to better guide the teaching and learning process of students.

Student participation and cooperation. All three lecturers focus on active student participation and cooperation. Through group activities, collaborative projects, discussions and hands-on activities, they encourage students to communicate with each other, share their experiences, and develop a sense of

cooperation and teamwork. This interactive teaching environment fosters communication and cooperative learning of badminton skills.

School support and resources. Lecturers agree that school support and resources provided are very important for teaching and learning. They would like the school to provide more badminton court space, equipment and professional coaching resources to support the smooth running of teaching and learning. This kind of school support can provide better teaching conditions for lecturers and more learning opportunities for students.

Teaching objectives and overall development. The teaching objectives are not only to improve students' technical skills in badminton, but the three lecturers also emphasized the development of students' spirit of cooperation, sense of competition, and physical and mental qualities. They recognize that physical education is not only the teaching of skills, but also the cultivation of students' comprehensive qualities. Through badminton courses, students can not only improve their sports skills, but also cultivate teamwork, competitive awareness and physical quality to achieve comprehensive development.

To summarize, the three lecturers have some consistency in teaching objectives, teaching methods, assessment methods, student participation and school support. Through diversified teaching strategies and individualized instruction, they aimed to stimulate students' interest, improve their skills, and foster a spirit of cooperation and a sense of competition among them. This jointly focused effort will help to improve the technical skills of university students in badminton and promote their overall development.

Phase 2 Analysis results serving objective 2: To develop flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

To serve objective 2, the collected data of confirming the appropriateness of 5 components of instructional model are analyzed in 4 areas, i.e. utility, feasibility, propriety, and accuracy and presented by frequency and percentage of the specialists as shown in table and description below.

Table 4.12 Frequency and percentage of confirmability of utility, feasibility, propriety, and accuracy of the instructional model components in 5 components of instructional model by specialists.

No	Components of Instructional Model of flipped classroom and cooperative learning	Opinion of the Specialists															
		Utility				Feasibility				Propriety				Accuracy			
		Agree		Disagree		Agree		Disagree		Agree		Disagree		Agree		Disagree	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Principle and Rationale	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
2	Objectives	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
3	Contents	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
4	Methods of Teaching & Materials	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
5	Evaluation	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0

From Table 4.12 the confirmability of each component of the instructional model by 5 specialists 100 % all utility, feasibility, propriety, and accuracy.

Principle and Rationale

The utility of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100 %; feasibility 5 specialists 100 %; propriety 5 specialists 100 %; and accuracy 5 specialists 100 %

Objectives

The objectives of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100 %; feasibility 5 specialists 100 %; propriety 5 specialists 100 %; and accuracy 5 specialists 100 %

Contents

The contents of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100 %; feasibility 5 specialists 100 %; propriety 5 specialists 100 %; and accuracy 5 specialists 100 %

Methods of Teaching & Materials

The methods of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100 %; feasibility 5 specialists 100 %; propriety 5 specialists 100 %; and accuracy 5 specialists 100 %

Evaluation

The evaluation of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100 %; feasibility 5 specialists 100 %; propriety 5 specialists 100 %; and accuracy 5 specialists 100 %

Phase 3: Analysis results serving objective 3: To study the results of flipped classroom and cooperative learning instructional model to enhance model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Objective 3 analysis results are presented by reporting students' performance according to rubric score-based assessment criteria and satisfaction of badminton technical skills through flipped classroom and cooperative learning Instructional model as specified in chapter 3 with tables and descriptive analysis.

Badminton technical skills over all 16 Standards

Table 4.13 Students' Performance Results on Basis of Analytic and Holistic Rubric-Score Assessment

No	Aspects of assessment	$\overline{X}$	SD	Interpretation of quality level	Rank
1	Forehand serve technical skill	17.05	1.880	Excellent	1
2	Forehand stroke technical skill	15.63	2.047	Good	3
3	Backhand serve technical skill	16.58	2.363	Excellent	2
4	Backhand stroke technical skill	15.47	2.298	Good	4
5	Average (Analytic RSA)	16.18	2.147	Good	
6	Average Total Scores (Holistic RSA)	64.72	7.418	Excellent	

Table 4.13 indicates that after implementing flipped classroom and cooperative learning Instructional model, students' performance assessed by analytic at Good level ($\overline{X}$=16.18) and holistic rubric-scoring at Excellent level ($\overline{X}$=64.72). For analytic results, Forehand serve technical skill is the aspect the students can develop most obviously followed by backhand serve technical skill, forehand stroke technical skill.

Relative gained score of students' badminton technical skills enhancement through flipped classroom and cooperative learning instructional model.

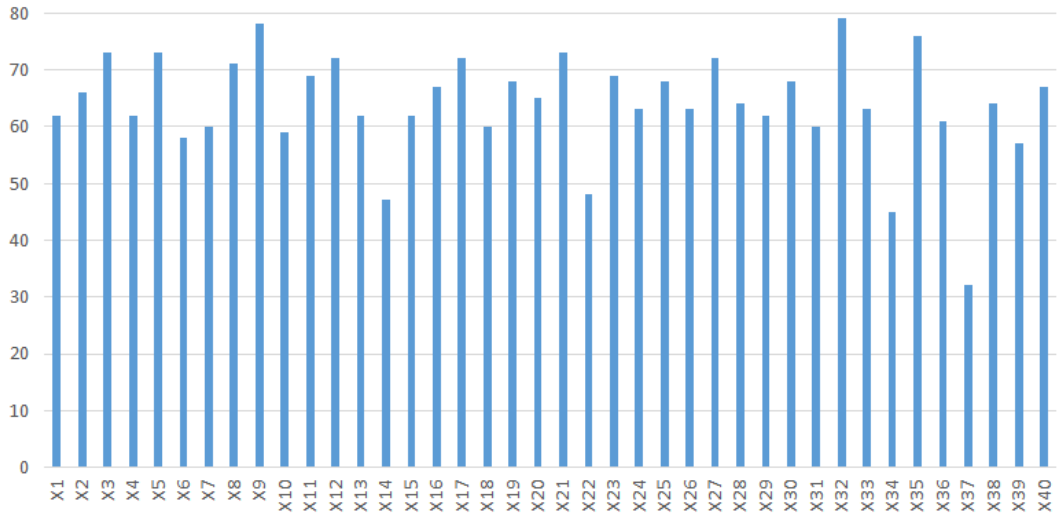

Figure 4.1 Total badminton technical skill level assessment score for all 16 criteria

Increasing the frequency and percentage of relatively acquired scores for students' badminton technical skills over all 16 Standards through the flipped classroom and cooperative learning instructional model.

Table 4.14 Summary the level:badminton technical skills over all 16 Standards

Development level	Score	Frequency	Percentage
Excellent	65-80	12	30.00
Good	49-64	24	60.00
Medium	33-48	3	7.50
Pass	17-32	1	2.50
Poor	Less than 16	0	0.00

From Table 4.14, it can be seen that most of the students (90%) showed good badminton technical skills. Among them, 12 were excellent (30.00%), 24 were good (60.00%), 3 were average (7.50%). 1 student had a pass level of badminton technical skills.

Overall, as can be seen from Table 4.14, after implementing the flipped classroom and cooperative learning Instructional model, the badminton technical

skills of most students (90.00%) has been improved. This result is consistent with the research hypothesis that after implementing the flipped classroom and cooperative learning Instructional model, students' badminton technical skills will increase by 80% overall (Good Level or higher). Therefore, we can conclude that the flipped classroom and cooperative learning Instructional model is effective for improving students' badminton technical skills.

Forehand Serve Technical Skill

Relative gained score of students' Forehand Serve Technical Skill enhancement through flipped classroom and cooperative learning instructional model.

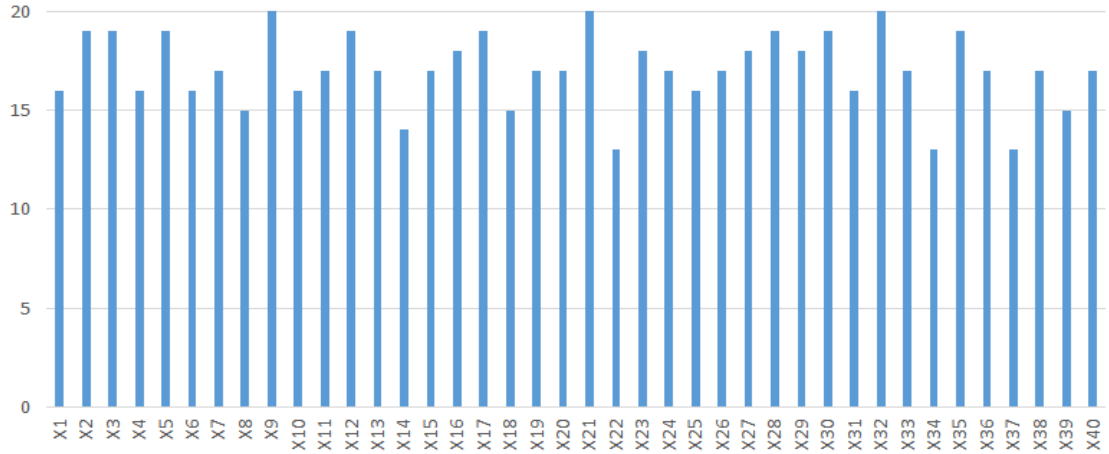

Figure 4.2 The Assessment scores for Forehand Serve Technical Skill (Item1)

Increasing the frequency and percentage of relatively acquired scores for students' Forehand Serve Technical Skills through a flipped classroom and cooperative learning instructional model.

Table 4.15 Summary the level item 1 Forehand Serve Technical Skill

Development level	Score	Frequency	Percentage
Excellent	17-20	27	67.50
Good	13-16	13	32.50
Medium	9-12	0	0.00
Pass	5-8	0	0.00
Poor	Less than 4	0	0.00

From Table 4.15, most students (100%) have achieved a good or excellent level of forehand Serve Technical Skill, exceeding the expected 80% in the research hypothesis. This indicates that the flipped classroom and cooperative learning instructional model has a significant positive impact on students' forehand serve technical skills.

Forehand Stroke Technical Skill

Relative gained score of students' Forehand Stroke Technical Skill enhancement through flipped classroom and cooperative learning instructional model.

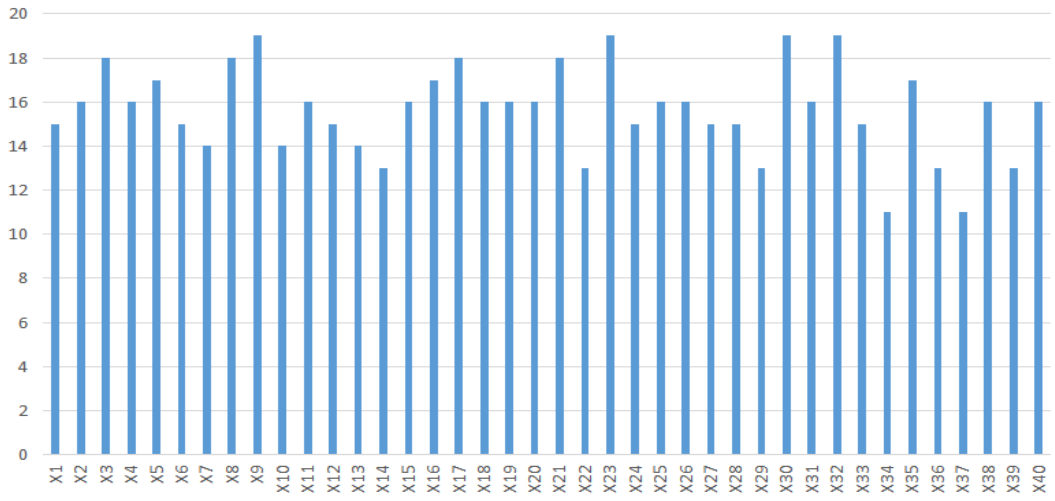

Figure 4.3 The Assessment scores for Forehand Stroke Technical Skill (Item2)

Increasing the frequency and percentage of relatively acquired scores for students' Forehand Stroke Technical Skills through a flipped classroom and cooperative learning instructional model.

Table 4.16 Summary the level item 2 . Forehand Stroke Technical Skill

Development level	Score	Frequency	Percentage
Excellent	17-20	11	27.50
Good	13-16	27	67.50
Medium	9-12	2	5.00
Pass	5-8	0	0.00
Poor	Less than 4	0	0.00

From Table 4.16, most students (95.00%) have achieved a good or excellent level of badminton forehand stroke technical skill, exceeding the expected 80% in the research hypothesis. This indicates that the flipped classroom and cooperative learning instructional model has a significant positive impact on students' badminton forehand stroke technical skills.

Backhand Serve Technical Skill

Relative gained score of students' Backhand Serve Technical Skill enhancement through flipped classroom and cooperative learning instructional model.

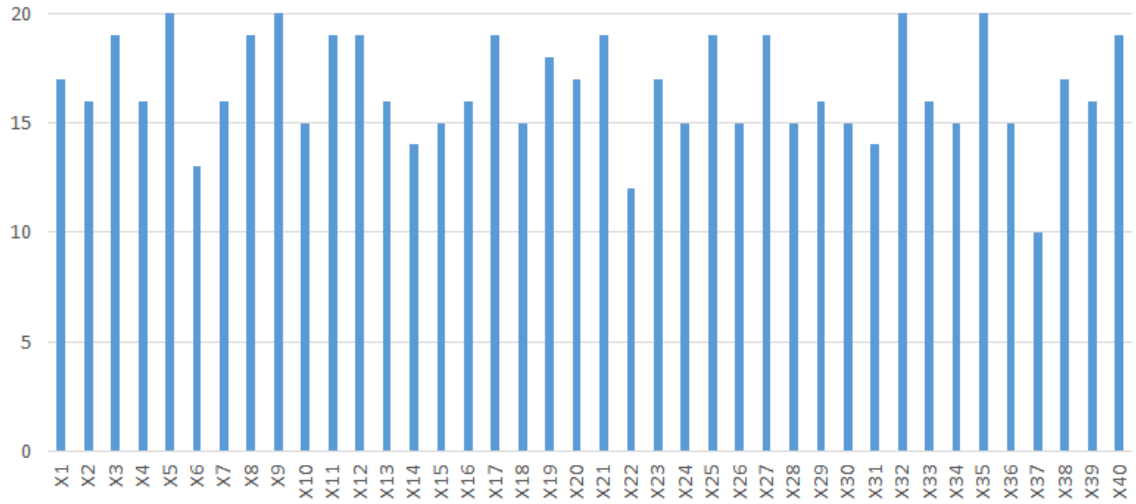

Figure 4.4 The Assessment scores for Backhand Serve Technical Skill (Item3)

Increasing the frequency and percentage of relatively acquired scores for students' Backhand Serve Technical Skills through a flipped classroom and cooperative learning instructional model.

Table 4.17 Summary the level item 3. Backhand serve technical skill

Development level	Score	Frequency	Percentage
Excellent	17-20	18	45.00
Good	13-16	20	50.00
Medium	9-12	2	5.00
Pass	5-8	0	0.00
Poor	Less than 4	0	0.00

From Table 4.17, most students (95.00%) have achieved a good or excellent level of badminton backhand serve technical skill, exceeding the expected 80% in the research hypothesis. This indicates that the flipped classroom and cooperative learning instructional model has a significant positive impact on students' badminton backhand serve technical skill.

Backhand Stroke Technical Skill

Relative gained score of students' Backhand Stroke Technical Skill enhancement through flipped classroom and cooperative learning instructional model.

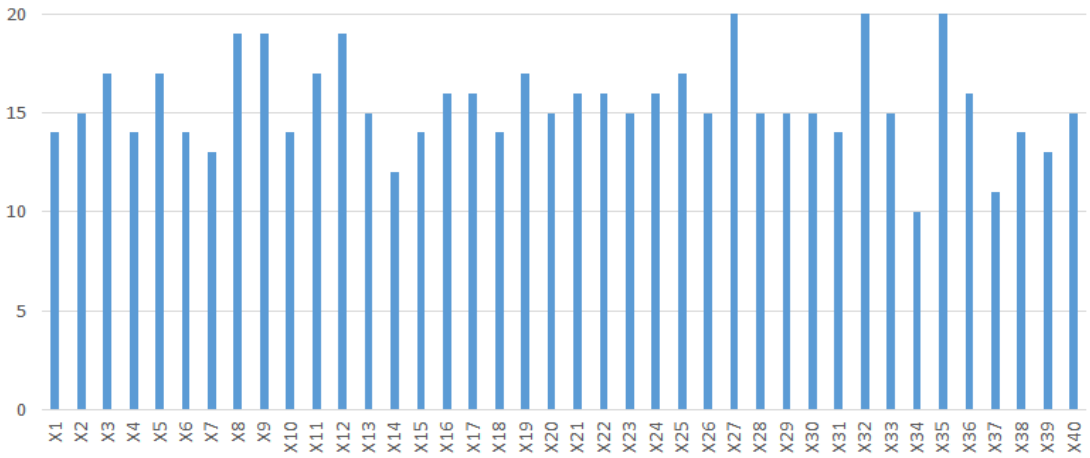

Figure 4.5 The Assessment scores for Backhand Stroke Technical Skill (Item4)

Increasing the frequency and percentage of relatively acquired scores for students' Backhand Stroke Technical Skills through the flipped classroom and cooperative learning instructional model.

Table 4.18 Summary the level item 4. Backhand stroke technical skill

Development level	Score	Frequency	Percentage
Excellent	17-20	11	27.50
Good	13-16	26	65.00
Medium	9-12	3	7.50
Pass	5-8	0	0.00
Poor	Less than 4	0	0.00

From Table 4.18, most students (92.50%) have achieved a good or excellent level of badminton backhand stroke technical skill, exceeding the expected 80% in the research

hypothesis. This indicates that the flipped classroom and cooperative learning instructional model has a significant positive impact on students' badminton backhand stroke technical skills.

Chapter 5
Conclusion Discussions and Recommendations

After analyzing and presenting data analysis results in chapter 4 as serving all research 4 research objectives of the present study “Development of Flipped Classroom and Cooperative Learning Instructional Model to enhance Badminton Technical Skills of Undergraduate Students”, it can be concluded and discussed as follows. Further, some approaches are recommended on basis of the findings.

Research Objectives

1. To examine the factors affecting badminton technical skills of undergraduate students in Yulin Normal University.

2. To develop flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students kills.

3. To study the results of flipped classroom and cooperative learning instructional model to enhance model to enhance badminton technical skills of undergraduate students in Yulin Normal University.

Conclusion

1. The factors promoting undergraduate students' technical skills in badminton include two aspects: one aspect is internal factors, which mainly include undergraduate students' learning attitude, motivation, interest, and self-confidence in learning. The other aspect is external factors, which mainly include teaching objectives, teaching methods, evaluation methods, student participation and school support, etc. Through diversified teaching strategies and personalized instruction, students' interests are stimulated and their technical skills are improved.

2. The 5 components of the instructional model – principle and rationale, objectives, contents, methods of teaching & materials, and evaluation are unanimously confirmed by 5 specialists or 100% of all specialists based on appropriateness in 4 areas: utility, feasibility, propriety, and accuracy.

3. After implementing the flipped classroom and cooperative learning Instructional model, the badminton technical skills of most students (90.00%) has been improved. This result is consistent with the research hypothesis that after

implementing the flipped classroom and cooperative learning Instructional model, students' badminton technical skills will increase by 80% overall (Good Level or higher). Therefore, we can conclude that the flipped classroom and cooperative learning Instructional model is effective for improving students' badminton technical skills.

Discussions

1. There were 2 Factors: Internal Factors and External Factors from the students and the lecturers were affecting badminton technical skills of undergraduate students according to:

Respondents' internal factors. The overall data suggests that internal factors have a significant impact on the implementation of badminton learning among university students. They mainly include learning motivation, learning attitude, learning ability and learning habits. lecturers can stimulate students' interest in learning, improve students' motivation to learn, cultivate students' learning attitude, and develop students' learning habits, so as to improve students' learning performance. Therefore, internal factors have an important influence on the implementation of badminton learning for college students.

Respondents' external factors. From the overall data analysis, it is mainly focused on the following three aspects. One is the aspect of venue facilities, badminton teaching needs to have suitable venue facilities, such as the size of the venue, the ground material, lighting and so on, and the good or bad of these facilities will directly affect the learning effect of students. Second, the teaching level of lecturers, the level and experience of lecturers is also an important factor affecting the badminton teaching, the lecturer's teaching methods, technical level, teaching attitude and so on will affect the learning effect of students. The third , social factors will also affect badminton teaching, such as the importance of the society to physical education, the impact of badminton tournaments and so on, these factors will affect the students' interest and participation in badminton.

In conclusion, college students' badminton learning is greatly influenced by internal factors such as motivation, attitude and habit, and lecturers can improve students' performance by stimulating interest, improving motivation, and cultivating attitude and habit. External factors mainly include venue facilities, lecturer level and

social factors, which also have an important influence on learning effects. Therefore, both internal and external factors have an important influence on college students' badminton learning.

2. After 5 experts confirm the 5 components of the teaching model to determine the implementation of the teaching model. Through the confirmation results of 5 experts, flipped classroom and cooperative learning instructional model have been unanimously agreed and supported.

The Principle and Rationale. The utility, feasibility, propriety, and accuracy ofthe Principle and Rationale of this model have been unanimously recognized by experts, which shows that the Principle and Rationale of flipped classroom and cooperative learning instructional model is robust and has a relatively solid theoretical foundation. The teaching mode is conducive to the enhance of students' badminton technical skills, which provides effective support in theory.

The objective. The teaching objectives of this model have been unanimously approved by five experts. Clear teaching objectives are the prerequisite for achieving teaching effects. The clarity and clarity of the teaching objectives of this model can enhance students' badminton technical skills.

The contents. Component also received a 100% confirm ability score from all the specialists, underlining that the learning material and topics are suitable and well-designed for the model's aim.

The Methods of Teaching & Materials. The content and materials of the flipped classroom and cooperative learning instructional model have been unanimously approved by experts. The well-designed flipped classroom and cooperative learning instructional activities and interesting learning experience have good adaptability to the teaching model, which can effectively Promote the improvement of students' badminton technical skills.

The evaluation. The evaluation part has been unanimously approved by experts, emphasizing the effectiveness and appropriateness of the evaluation and feedback mechanism in improving students' badminton technical skills, and can give effective feedback to students' badminton technical skills.

In conclusion, the experts unanimously recognized the utility, feasibility, propriety, and accuracy of the flipped classroom and cooperative learning instructional model, indicating that the robustness and adaptability of the model, if

implemented smoothly, can effectively enhance the badminton technical skills of college students ability.

3. After the implementation of the develop flipped classroom and cooperative learning Instructional model, the results of students`badminton technical skills were more than 80% had a good level by these reasons :

(1) Designing pre-study tasks: The preview task is designed to let students have an understanding of badminton before class and develop their interest and initiative in learning. By watching the badminton game video and understanding the rules and technical points, students can better understand the lecturer's explanation in class and improve their learning effect (Zhang, 2019). The preview task can also stimulate students' curiosity and inquisitiveness, laying a foundation for classroom learning.

(2) Group cooperative learning: Group cooperative learning is an effective way to promote student interaction and cooperation. Dividing students into groups for badminton practice and confrontation can enhance the sense of teamwork among students and cultivate their communication and collaboration skills (Zhou, 2018). At the same time, students can observe and exchange experiences with each other in group learning, learn from each other and make progress together. This cooperative learning mode can stimulate students' enthusiasm for learning and enhance their learning motivation.

(3) Evaluation and feedback:Evaluation and feedback is a crucial part of the teaching process. lecturers observe students' performance in the classroom, give timely evaluation and feedback, and help students correct their technical movements and improve their playing level. At the same time, allowing students to evaluate and give feedback to each other can promote learning exchange and progress among students (Wang, 2016). This timely feedback can help students better understand their deficiencies and promote their self-improvement and improvement.

In short, classroom learning is enhanced by watching game videos and understanding the technical points of the rules. Cooperative group learning promotes student interaction and cooperation, develops communication and collaboration skills, and enhances learning. Evaluation and feedback help students correct technical movements and promote learning exchange and progress among students.

These factors work together to improve the technical ability of college students in badminton.

Recommendations

The findings from the present study bring twofold suggestions: applicability of the results and future research.

Applicability of the results

First, to the students. The flipped classroom and cooperative learning teaching mode can better meet the needs of students' individualized learning. Students can watch relevant badminton teaching videos at their own time and pace, and master basic knowledge and skills through independent learning. This approach enables students to participate more in practical learning activities in the classroom, such as practical training, match simulation, etc., so as to better improve their skills. In addition, cooperative learning can also cultivate students' teamwork and communication skills, and solve problems and complete tasks through group cooperation, thus improving students' learning effect.

Secondly, to the lecturers. The teaching mode of flipped classroom and cooperative learning can enable lecturers to better utilize their teaching ability. lecturers can play more of a mentor and guide role in the classroom, guiding students in practical learning activities, answering students' questions, and providing personalized guidance and counseling. At the same time, lecturers can also use classroom time to better observe and assess students' learning, and timely adjust the content and mode of teaching, so as to better meet students' learning needs.

Third, to the schools. The flipped classroom and cooperative learning teaching mode can also promote the innovation and development of the school's teaching mode. Schools can provide students with rich learning resources and support by building online learning platforms and resource libraries. At the same time, schools can also provide corresponding training and support for lecturers to help them better utilize the flipped classroom and cooperative learning teaching mode. In this way, schools can better adapt to and meet the needs of students' individualized learning and improve the quality and effectiveness of teaching.

Future Research

The future research on the instructional mode of flipped classroom and cooperative learning in college badminton course teaching can be carried out in the following four aspects.

1. Comparative study of teaching modes: Compare the effects of flipped classroom and traditional teaching modes in the enhancement of college students' badminton skills, and explore the advantages, disadvantages and applicable scenarios of the two teaching modes.

2. Research on skill learning evaluation methods: design and validate the methods and tools applicable to the evaluation of badminton skills of college students, and explore the impact of flipped classroom and cooperative learning on skill learning evaluation.

3. Research on teaching design and implementation: design and implement the teaching program of badminton skills for college students based on flipped classroom and cooperative learning, explore the problems and challenges in the process of teaching design and implementation, and summarize the effective teaching strategies and methods.

4. Motivation and Attitude Research: Investigate the motivation and attitude of college students in learning badminton skills, analyze the impact of flipped classroom and cooperative learning on motivation and attitude, and explore how to stimulate students' interest and motivation in learning.

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List of experts to validate research instruments

1. Assistant Professor Dr.Nuttamon Punchatree	Educational Management and Learning Management Innovation Program Bansomdejchaopraya Rajabhat University
2. Professor Dr. Liu Chunyu	Sports Rehabilitation Program Yulin Normal University
3. Professor Dr. Zhou Jiajin	Physical Education Program Yulin Normal University

List of experts to evaluate the format Instructional Model

1. Assistant Professor Dr. Tanaput Chancharoen	Learning Innovation and Teachbnology Bansomdejchaopraya Rajabhat University
2. Assistant Professor Dr.Wanida Ploysangwal	English Program University of the Thai Chamber of Commerce
3.Dr. Panas Jansritong	Admistration Program Krirk University
4. Professor Li Yuanhua	Teaching methodology Program YuLin Nomal University
5.Professor Sun Qingbin	Physical Education Program YuLin Nomal University

Appendix B

Official Letter

Ref. No. MHESI 0643.14/ 1079

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

9 August 2023

Subject Request for research tool validation

Dear Assistant Professor Dr.Nuttamon Punchatree

Attachment validation sheets

Regarding the thesis entitled "Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students" of Mr.Wang Shijing,a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103115 , Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring form as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, Interview, rubric scoring form, questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

Ref. No. MHESI 0643.14/1082

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for research tool validation

Dear Professor Dr. Liu Chunyu

Attachment validation sheets

Regarding the thesis entitled "Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students" of Mr.Wang Shijing,a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103115 , Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring form as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, Interview, rubric scoring form, questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

Ref. No. MHESI 0643.14/ 1083

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for research tool validation

Dear Professor Dr.Zhou Jiajin

Attachment validation sheets

Regarding the thesis entitled "Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students" of Mr.Wang Shijing,a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103115 , Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring form as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, Interview, rubric scoring form, questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

Ref. No. MHESI 0643.14/ 1084

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr. Tanaput Chancharoen

Attachment model sheets

Regarding the thesis entitled"Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students"of Mr.Wang Shijing,a Ph.D.student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6473103115,Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/1085

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Wanida Ploysangwal

Attachment model sheets

Regarding the thesis entitled"Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students"of Mr.Wang Shijing,a Ph.D.student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6473103115,Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1081

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for evaluation of instructional model

Dear Dr. Panas Jansritong

Attachment model sheets

Regarding the thesis entitled"Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students"of Mr.Wang Shijing,a Ph.D.student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6473103115,Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1089

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for evaluation of instructional model

Dear Professor.Li Yuanhua

Attachment model sheets

Regarding the thesis entitled"Development of virtual reality plus augmented reality sport Instructional model to enhance tennis technical skills of undergraduate students"of Mr.He Xianghai,a Ph.D.student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6473103115, Thailand under the supervision of Assistant Professor Dr.Nuttamon Punchatree as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol, the written pretest-posttest as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1088

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for evaluation of instructional model

Dear Professor Sun Qingbin

Attachment model sheets

Regarding the thesis entitled"Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students"of Mr.Wang Shijing,a Ph.D.student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6473103115,Thailand under the supervision of Associate. Professor Dr.Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/1089

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

27 August 2023

Subject Request for permission to implement experiment

Dear President of Yulin Normal University

Regarding the thesis entitled "Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students" of Mr.Wang Shijing , a Ph.D.student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103115 Thailand under the supervision of

Major Advisor : Associate. Professor Dr.Jittawisut Wimutipanya

Co-advisor : Associate Professor Dr.Areewan Iamsa-ard

Co-advisor : Associate Professor Dr.Suriya Phankosol

the researcher needs to implement an experiment in compliance with approved methodology and collect data in terms of development of flipped classroom and cooperative learning instructional model from 40 first year students of section B majoring in department of history of college of historical culture and tourism,Yulin Normal University during the 1st semester of academic year 2023. Hence, I'm formally requesting permission to implement the experiment and access the aforementioned data.

The researcher plans to use this data for his thesis completion and further necessary publication as required by the Ph.D. course.

I am grateful for your consideration of my request. I pledge to adhere to any stipulations you deem fit. You may reach me at the phone number or email address provided below in case of any related questions. I look forward to your response.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

For hardcopy questionnaire
(กรณีส่งเป็นเอกสารชุดแบบตอบถาม)

Ref. No. MHESI 0643.14/ 1090

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

29 August 2023

Subject Request for data collection

Dear President of Yulin Normal University

Attachment questionnaire and interview

Regarding the thesis entitled "Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students" of Mr.Wang Shijing, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103115 Thailand under the supervision of

Major Advisor : Associate. Professor Dr.Jittawisut Wimutipanya

Co-advisor : Associate Professor Dr.Areewan Iamsa-ard

Co-advisor : Associate Professor Dr.Suriya Phankosol

The researcher needs to collect data using questionnaire in terms of factors to enhance badminton technical skills of undergraduate students' year 2 of badminton Course, semester 1 on academic year 2023 in Yulin Normal University.Class 1: 55 students major in E-commerce;Class 2: 50 students major in Advertising Radio;Class 3: 55 students major in Television Journalism;Class 4: 50 students major in Systems Science.Hence,I'm formally requesting your assistance in distributing the attached questionnaire to the informants as referred above and please send the completed ones back to the researcher via email address Wang Shijing1254004180@qq.com. Or mailing address,Yulin Normal University, Yulin, Guangxi, China,53700.

The researcher plans to use this data for her thesis completion and further necessary publication as required by the Ph.D. course.

I am grateful for your consideration of my request. I pledge to adhere to any stipulations you deem fit. You may reach me at the phone number or email address provided below in case of any related questions. I look forward to your response.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. 66 0204737000

Appendix C

Research Instruments

- Questionnaire for students (Objective 1)
- Interview for lecturers (Objective 1)
- Questionnaire for experts (Objective 2)
- Lesson Plan (Objective 3)
- Scoring rubric form (Objective 3)

Questionnaire For students(Objective 1)
Directions:

These questionnaires are the instruments for collecting data in 1st phase of the research entitled “Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students” conducted by Wang Shijing, a Ph.D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University under the supervision of Associate Professor Dr.Jittawisut Wimutipanya, majoring advisor, Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol co-advisor.

This questionnaire is divided into 3 sections i.e.
Section 1 Common data of the respondent
Section 2 Section 2 Information on the factors influencing the technical skills of badminton of undergraduate students at Yulin Normal University.
The questionnaire type is the Closed-ended questions that can only be answered by selecting from provided number to summated rating scale, 5 scales.
The important issues of the items consist of two groups of the factors: Internal factors (respondents) and External factors (lecturers, circumstances, etc.)
Section 3 Further suggestions

Data obtained from this questionnaire are only used for the purpose of conducting aforementioned research and remain confidential. Individual or personal data presentation will be avoided.

Answer the questionnaire:

Section 1 Common data of the respondent

Directions: Please put ✓into the ❑ according to your own personal data.

Gender is ❑ Male ❑ Female

Students from ❑ Yulin Normal University, Major in Literature

❑ Yulin Normal University, Major in Chemistry

❑ Yulin Normal University, Major in History

❑ Yulin Normal University, Major in Education

3. Age ❑ A. below 18 yrs. ❑ B. 18-19 yrs.

❑ C. 20-21yrs. ❑ D. over 21 yrs.

Section 2 Questionnaire on factors affecting the technical skills of badminton of undergraduate students

Directions: Please rate the following factors affecting the Integration of Flipped Classroom and Cooperative Learning Instructional Model by putting ✓ into the attitude level column based on the criteria given below. Each question can select only one answer.

5 means you STRONGLY agree with the item.

4 means you QUITE agree with the item.

3 means you remain NEUTRAL.

2 means you DO NOT QUITE agree with the item

1 means you DO NOT STRONGLY agree with the item

Table 1 Questionnaire on factors affecting the technical skills of badminton of undergraduate students.

Questions	Answers		
	1	2	3
Internal factors (respondents)			
1. Students are interested in the badminton program.			
2. Students understand the learning model of badminton technical knowledge and ability in the badminton course.			
3. Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.			
4. Students believe that watching videos before class can improve their technical skills in badminton courses.			
5. Students have physical fitness and sports ability conducive to developing badminton technical ability.			
6. Students think that cooperative learning in a group can bring their abilities into full play in badminton lessons.			
7. Students believe that the badminton program is important for their personal growth and future development.			
8. Students think that the assignments and feedbacks given by the lecturer can help students to better utilize what they have learned.			
9. Students can learn and practice badminton skills in this badminton course.			
10. Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.			

Table1 (Continued)

Questions	Answers		
	1	2	3
11. Students have new ideas about learning the technical skills of badminton in a badminton course.			
12. Students perceive that the level of understanding and mastery of badminton techniques is conducive to the improvement of technical skills.			
13. Students' increased ability to manage their study time is conducive to learning outcomes.			
14. Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.			
15. Students can develop a sense of competition and teamwork through badminton lessons.			
External factors (lecturers, instructional model, environment)			
1. The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.			
2. The lecturer combines the classroom learning process assessment method and the post-classroom skill consolidation learning assessment method.			
3. The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.			

Table1 (Continued)

Questions	Answers		
	1	2	3
4. Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.			
5. Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.			
6. Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.			
7. The lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.			
8. The lecturer selects appropriate teaching materials and emerging online video teaching resources.			
9. Lecturer 's choice of teaching methods and teaching strategies affects the improvement of technical skills in badminton.			
10. Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.			
11. The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.			
12. The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.			

Table1 (Continued)

Questions	Answers		
	1	2	3
13. The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills training.			
14. The lecturer provides adequate teaching facilities and high-quality equipment that can enhance students' motivation to train in badminton technical abilities.			
15. Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.			

Section 3 Suggestions for improving the better instruction

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Thank you for your kind cooperation for completing the questionnaire!

Researcher

Mr. WangShijing

Interview for Lecturers (Objective 1)

Directions:

This interview is a part of research entitled “Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students”

Research Objectives: 1. To examine the factors to enhance badminton technical skills of undergraduate students.

It is conducted by Wang Shijing, a Ph.D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University under the supervision of

1.Assistant Professor Dr. Jittawisut Wimutipanya

2.Associate Professor Dr.Areewan Iamsa-ard

3.Assistant Professor Dr. Suriya Phankosol

The following open questions are the instrument for collecting data in 1st phase of the research, concerning about factors to enhance badminton technical skills of undergraduate students.

Please write down your own opinion for each question. Data obtained from this questionnaire are only used for the purpose of conducting aforementioned research and remain confidential. Individual or personal data presentation will be avoided.

These questions are the instrument for collecting data in 1st phase of the research.

1. Gender is ☐☐A. Male ☐☐B. Female

2. What university did you come to? What secondary college?

☐☐ A. From college of Literature , Yulin Normal University.

☐☐ B. From college of Chemistry , Yulin Normal University.

From college of History , Yulin Normal University.

From college of Education , Yulin Normal University.

Experience teaching

☐☐ A. Below 3 yrs. ☐☐ B. 3-6 yrs.

☐☐ C. 7- 9 yrs. ☐☐ D. Over 9 yrs.

Age

☐☐ A. Below 25 yrs. ☐☐ B. 25-35yrs.

☐☐ C. 36-49yrs. ☐☐ D. Over 49 yrs.

Section 2 Interview on factors influencing badminton technical skills of Undergraduate students.

Directions: The type of question is open-ended questions; you can answer according to your actual situation. Your answers will only be used in this research and will not be disclosed individually.

1.What is the reason you chose to teach this course? (Such as liking the lecturer, being good at content, being asked, or other reasons).

2.How do you plan on preparing to teach this subject? (Preparation of content, materials, teaching place, etc.)

3.How did you prepare to teach the subject for the first time, introducing students to the model, content, and assessment?

4.How do you have an idea to improve your teaching?

5.How do you give students opportunities to participate in instruction? (Please describe the methods).

6.Do you think your measurement and assessment programs reflect student learning outcomes and skill levels?

7.What learning tasks do you carry out to increase student motivation?

8.Do you provide after-school time for students? If so, how do you help students with their difficulties.

9.What aspects of your teaching need to be improved or where would you like the school to support you?

10.What problems have you encountered in teaching before?

Comment and recommendation for improving the better instruction

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Thank you for your kind cooperation for completing the questions.

Researcher

Mr. WangShijing

Questionnaire for experts (Objective 2)

Assessment form IOC for Validity of Instructional Model Questionnaire
Research Title : Development of Flipped Classroom and Cooperative Learning Instructional Model to Enhance Badminton Technical Skills of Undergraduate Students
Research Objectives 2: To development of flipped classroom and cooperative learning instructional model to enhance badminton technical skills of undergraduate students.

Assessor: Assistant Professor Dr.Nuttamon Punchatree
Position: English Program
Workplace: Bansomdejchaopraya Rajabhat University

Directions: Please assess the congruence between flipped classroom and cooperative learning instructional Model by putting ✓ in the box according to the following criteria.
+1 if you think the issues CAN measure the appropriateness of the instructional model.
0 if you are NOT SURE the issues can measure the appropriateness of the instructional Model.
-1 if you think the issues CANNOT measure the appropriateness of the instructional model.

Table1 Assessment form IOC for validity of instructional model questionnaire

No	Questions	Rating results			
		+1	0	-1	Remarks
1	Principle and Rationale:				
	Utility Standard				
	1. The result of questionnaire from students have the benefit for Principle and Rationale				
	2. The result of interview from lecturers have the benefit for Principle and Rationale				
	Feasibility Standard				
	3. The result of questionnaire from students have the possibility for Principle and Rationale				
	4. The result of interview from lecturers have the possibility for Principle and Rationale				
	Propriety Standard				
	5. The result of questionnaire from students have the suitability for Principle and Rationale				
	6. The result of interview from lecturers have the suitability for Principle and Rationale				
	Accuracy Standard				
	7. The result of questionnaire from students have the accuracy for Principle and Rationale				
	8. The result of interview from lecturers have the accuracy for Principle and Rationale				

Table1 (Continued)

No	Questions	Rating results			
		+1	0	-1	Remarks
2	Objectives:				
	Utility Standard				
	9. The objectives have benefit for students.				
	Feasibility Standard				
	10. The objectives have possibility for students.				
	Propriety Standard				
	11. The objectives have suitability for students.				
	Accuracy Standard				
	12. The objectives have accuracy for students.				
3	Contents:				
	Utility Standard				
	13.The contents have benefit for students.				
	Feasibility Standard				
	14. The contents have possibility for students.				
	Propriety Standard				
	15. The contents have suitability for students.				
	Accuracy Standard				
	16. The contents have accuracy for students.				

Table1 (Continued)

No	Questions	Rating results			
		+1	0	-1	Remarks
4	Methods of teaching & materials: Flipped Classroom and Cooperative Learning Instructional Model				
	Utility Standard				
	17. The methods of teaching & materials have benefit for students.				
	Feasibility Standard				
	18. The methods of teaching & materials have possibility for students.				
	Propriety Standard				
	19. The methods of teaching & materials have suitability for students.				
	Accuracy Standard				
	20. The methods of teaching & materials have accuracy for students.				
5	Evaluation:				
	Utility Standard				
	21.The evaluation has benefit for students.				
	Feasibility Standard				
	22. The evaluation has possibility for students.				
	Propriety Standard				

Table1 (Continued)

No	Questions	Rating results			
		+1	0	-1	Remarks
5	23. The evaluation has suitability for students.				
	Accuracy Standard				
	24. The evaluation has accuracy for students.				

Sign.....Assessor

Date...../...../.....

Appendix D

The Results of the Quality Analysis of Research Instruments

Table Appendix 1 Evaluation Results of IOC for Factor Analysis (For Students)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
Part 1							
1	No. 1 Gender A.Male B. Female	+1	+1	+1	3	1.00	Valid
2	No. 2 Major A. Literature of YulinNormal University B . Chemistry of YulinNormal University C.History of YulinNormal University D .Educationof Yulin Normal University	+1	+1	+1	3	1.00	Valid
3	No. 3 Age A. below 18 yrs. B. 18-19 yrs. C. 20-21 yrs. D. over 21yrs.	+1	+1	+1	3	1.00	Valid
Internal factors							
1	Students are interested in the badminton program.	+1	+1	+1	3	1.00	Valid
2	Students understand the learning model of badminton technical knowledge and ability in the badminton course.	+1	+1	+1	3	1.00	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
3	Students believe that good teaching techniques can be used to improve badminton technical skills in badminton courses.	0	+1	+1	2	0.67	Valid
4	Students believe that watching videos before class can improve their technical skills in badminton courses.	+1	0	+1	2	0.67	Valid
5	Students have physical fitness and sports ability conducive to developing badminton technical skills.	+1	+1	+1	3	1.00	Valid
6	Students think that cooperative learning in a group can bring their abilities into full play in lessons.	+1	0	+1	2	0.67	Valid
7	Students believe that the badminton program is important for their personal growth and future development.	+1	+1	+1	3	1.00	Valid
8	Students think that the assignments and feedbacks given by the lecturer can help students to better utilize what they have learned.	+1	+1	+1	3	1.00	Valid
9	Students can learn and practice badminton skills in this badminton course.	+1	0	+1	2	0.67	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
10	Students are satisfied with the friendly cooperation and interaction between lecturers and students or peers in the badminton program.	+1	+1	+1	3	1.00	Valid
11	Students have new ideas about learning the technical skills of badminton in a badminton course.	+1	+1	+1	3	1.00	Valid
12	Students perceive that the level of understanding and mastery of badminton abilities is conducive to the improvement of technical skills.	+1	+1	+1	3	1.00	Valid
13	Students' increased ability to manage their study time is conducive to learning outcomes.	+1	+1	+1	3	1.00	Valid
14	Students believe that the assessment program assignments set by lecturers and students help students to better apply what they have learned.	+1	+1	+1	3	1.00	Valid
15	Students can develop a sense of competition and teamwork through badminton lessons.	+1	+1	+1	3	1.00	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
External factors							
1	The lecturer utilizes new teaching methods (e.g., cell phones, videos, demonstrations, etc.) to stimulate students' interest and improve their technical skills in badminton.	+1	+1	+1	3	1.00	Valid
2	The lecturer combines the classroom learning process assessment method and the post-classroom skill learning assessment method.	0	+1	+1	2	0.67	Valid
3	The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	+1	+1	+1	3	1.00	Valid
3	The lecturer is able to guide students to realize that the learning of badminton and the development of badminton technical skills have a positive impact on their future healthy development.	+1	+1	+1	3	1.00	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
4	Lecturers pay more attention to students' practical application of badminton skills and their impact in the badminton program.	+1	+1	+1	3	1.00	Valid
5	Lecturers' timely feedback and evaluation of students' learning outcomes are conducive to the improvement of students' technical skills in badminton.	+1	+1	+1	3	1.00	Valid
6	Lecturers in the badminton program combine teaching methods and objectives with technical skills to improve undergraduate students' technical skills in badminton.	+1	0	+1	2	0.67	Valid
7	The Lecturer is able to stimulate students' interest in learning and satisfy students' exercise needs, such as badminton competitions.	+1	+1	+1	3	1.00	Valid
8	The Lecturer selects appropriate teaching materials and emerging online video teaching resources.	+1	+1	+1	3	1.00	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
9	Lecturer 's choice of teaching methods and teaching strategies affects the improvement of badminton technical skills.	+1	0	+1	2	0.67	Valid
10	Lecturers' guidance and development of students' cooperative learning are conducive to the improvement of teaching effectiveness.	+1	+1	+1	3	1.00	Valid
11	The Lecturer, monitors, and evaluates the learning process that contributes to the development of student learning efficiency.	+1	+1	+1	3	1.00	Valid
12	The lecturer provides practical, interactive and inspiring examples and materials which are useful to students.	+1	+1	0	2	0.67	Valid
13	The lecturer uses the teaching materials of the badminton course, taking into account the content and objectives of the badminton course appropriately. including technical skills training.	+1	+1	+1	3	1.00	Valid
14	The lecturer provides adequate teaching facilities and high-quality equipment	+1	0	+1	2	0.67	Valid

Table Appendix 1 (Continued)

NO	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
	that can enhance students' motivation to train in badminton technical abilities.						
15	Lecturers provide an open and comfortable learning environment, impacting student interest and motivation.	+1	+1	+1	3	1.00	Valid
	Total (In Overview)				**78.03**	**0.91**	**Valid**

Note: Valid when $\geq \mathbf{0.50}$.

Table Appendix 2 Evaluation Results of IOC for Factor Analysis (For Lecturers)

No	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
	Part 1						
1	No. 1 Gender Male B. Female	+1	+1	+1	3	1.00	Valid
2	No. 2 Lecturer from A. School of Physical Education and Health B. School of Historical Culture and Tourism C. School of Physics and Engineering	+1	+1	+1	3	1.00	Valid
3	No. 3 Teaching experience A.Below 3 yrs. B.3-6 yrs. C.7- 9 yrs. D.Over 9 yrs.	+1	+1	+1	3	1.00	Valid
4	No. 4 Age A.below 25 yrs. B. 25-30 yrs. C. 36-49 yrs. D. over 49 yrs.	+1	+1	+1	3	1.00	Valid
5	No. 5 Professional title A. Professor B. Associate Professor C. Assistant Professor D. Lecturer	+1	+1	+1	3	1.00	Valid

Table Appendix 2 (Continued)

No	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
	Questions						
1	What is the reason you chose to teach this course? (Such as liking the lecturer, being good at content, being asked, or other reasons).	+1	+1	+1	3	1.00	Valid
2	How do you plan on preparing to teach this subject? (Preparation of content, materials, teaching place, etc.)	0	+1	+1	2	0.67	Valid
3	How did you prepare to teach the subject for the first time, introducing students to the model, content, and assessment?	+1	+1	+1	3	1.00	Valid
4	How do you have an idea to improve your teaching?	+1	+1	+1	3	1.00	Valid
5	How do you give students opportunities to participate in instruction? (Please describe the methods).	+1	+1	+1	2	0.67	Valid
6	Do you think your measurement and assessment programs reflect student learning outcomes and skill levels?	+1	+1	+1	3	1.00	Valid
7	What learning tasks do you carry out to increase student motivation?	+1	0	+1	2	0.67	Valid

Table Appendix 2 (Continued)

No	Item	Experts' rating			Total	MEAN	Results
		Expert 1	Expert 2	Expert 3			
8	Do you provide after-school time for students? If so, how do you help students with their difficulties.	+1	+1	+1	3	1.00	Valid
9	What aspects of your teaching need to be improved or where would you like the school to support you?	+1	+1	+1	3	1.00	Valid
10	What problems have you encountered in teaching before?	0	+1	+1	2	0.67	Valid
Total (In Overview)					**41**	**0.91**	**Valid**

Note: Valid when ≥ 0.50.

Table Appendix 3 Evaluation Results of IOC for instructional model

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Utility Standard								
1	The result of questionnaire from students have the benefit for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
2	The objectives have benefit for students.	0	+1	+1	+1	+1	4	0.80	Valid
3	The contents have benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
4	The methods of teaching & materials have benefit for students.	+1	+1	+1	0	+1	4	0.80	Valid
5	The evaluation has benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
	Feasibility Standard								
1	The result of questionnaire from students have the possibility for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix 3 (Continued)

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
2	The objectives have possibility for students.	+1	+1	0	+1	+1	4	0.80	Valid
3	The contents have possibility for students.	+1	+1	+1	+1	0	4	0.80	Valid
4	The methods of teaching & materials have possibility for students.	+1	+1	+1	+1	+1	5	1.00	Valid
5	The evaluation has possibility for students.	+1	+1	+1	+1	+1	5	1.00	Valid
	Propriety Standard								
1	The result of questionnaire from students have the suitability for Principle and Rationale	+1	0	+1	+1	+1	4	0.80	Valid
2	The objectives have suitability for students.	+1	+1	+1	0	+1	4	0.80	Valid
3	The contents have suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix 3 (Continued)

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
4	The methods of teaching have suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid
5	The evaluation has suitability for students.	0	+1	+1	+1	+1	4	0.80	Valid
	Accuracy Standard								
1	The result of questionnaire from students have the accuracy for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
2	The objectives have accuracy for students.	+1	+1	+1	0	+1	4	0.80	Valid
3	The contents have accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
4	The methods of teaching & materials have accuracy for students.	+1	0	+1	+1	+1	5	0.80	Valid
5	The evaluation has accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
	Total (In Overview)						**92**	**0.92**	**Valid**

Note: Valid when ≥ 0.50.

Table Appendix 4 Evaluation Results of IOC for rubric Observation

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Forehand Serve Technical Skill									
1	Standard 1: Completeness of serve	+1	+1	+1	+1	+1	5	1.00	Valid
2	Standard 2: Proficiency of the serving motion	+1	+1	+1	0	+1	4	0.80	valid
3	Standard 3: Height of serve	+1	0	+1	+1	+1	4	0.80	Valid
4	Standard 4: Depth of serve	+1	+1	+1	+1	+1	5	1.00	Valid
Forehand Stroke Technical Skill									
5	Standard 1: Completeness of stroke	+1	+1	+1	+1	+1	5	1.00	Valid
6	Standard 2: Proficiency in batting maneuvers	+1	+1	+1	+1	+1	5	1.00	Valid
7	tandard 3: Height of Stroke	0	+1	+1	+1	+1	4	0.80	Valid
8	Standard 4: Depth of stroke	+1	+1	+1	+1	+1	5	1.00	Valid
Backhand Serve Technical Skill									
9	Standard 1: Integrity of the serving action	+1	+1	+1	+1	+1	5	1.00	Valid
10	Standard 2: Proficiency of serving movement	+1	+1	0	+1	+1	4	0.80	Valid

Table Appendix 4 Evaluation Results of IOC for rubric Observation

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
11	Standard 3: Height of serve	+1	+1	+1	+1	+1	5	1.00	Valid
12	Standard 4: Depth of serve	+1	+1	+1	+1	+1	5	1.00	Valid
Backhand Stroke Technical Skill									
13	Standard 1: Completeness of stroke	+1	+1	+1	+1	+1	5	1.00	Valid
14	Standard 2: Proficiency of Stroke	+1	0	+1	+1	+1	4	0.80	Valid
15	Standard 3: Height of Stroke	+1	+1	+1	+1	+1	5	1.00	Valid
16	Standard 4: Depth of stroke	+1	+1	+1	+1	+1	5	1.00	Valid
Total (In Overview)							**75**	**0.94**	**Valid**

Note: Valid when ≥ 0.50.

Table Appendix 5 Evaluation Results of IOC for Lesson Plan

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Learning Objective									
1	Complying with content of the course	+1	+1	+1	+1	+1	5	1.00	Valid
2	Covering knowledge, process, and attitude	+1	+1	+1	0	+1	4	0.80	Valid
3	Being measurable in knowledge, process, and attitude	+1	+1	+1	+1	+1	5	1.00	Valid
Contents									
4	Complying with learning objective	+1	+1	+1	+1	+1	5	1.00	Valid
5	Being appropriate in terms of time management	+1	+1	+1	+1	+1	5	1.00	Valid
Flipped classroom and cooperative learning instructional models									
6	Complying with the designed instructional model	+1	+1	+1	+1	+1	5	1.00	Valid
7	Supporting students' learning	+1	+1	0	+1	+1	4	0.80	Valid
8	Including various activities	+1	+1	+1	+1	+1	5	1.00	Valid
Learning materials									
9	Complying with the learning objectives	+1	+1	+1	+1	+1	5	1.00	Valid
10	Complying with the contents	+1	+1	0	+1	+1	4	0.80	Valid

Table Appendix 5 (Continued)

No	Item	Experts' rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Evaluation and Assessment								
11	Complying with the learning objectives	+1	+1	+1	+1	+1	5	1.00	Valid
12	Including various methods and instruments	+1	+1	+1	+1	+1	5	1.00	Valid
	Total (In Overview)						**57**	**0.93**	**Valid**

Note: Valid when ≥ 0.50.

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mr. Wang Shijing

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 22nd August 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

MHESI 8038.1/12

Mcu Ubonratchathani journal
of Buddhist Studies (TCI.2)
Mahachulalongkornrajavidyalaya
University, Ubon Ratchathani Campus

RESPONSE FOR PUBLICATION OF THE ARTICLE

24th August 2023

The Editorial Department of Mcu Ubonratchathani journal of Buddhist Studies (TCI.2) MCU, Ubon Ratchathani Campus has considered the article

Title	DEVELOPMENT OF FLIPPED CLASSROOM AND COOPERATIVE LEARNING INSTRUCTIONAL MODEL TO ENHANCE BADMINTON TECHNICAL SKILLS OF UNDERGRADUATE STUDENTS
Writer	Wang Shijing, Jittawisut Wimutipanya, Areewan Iamsa-ard and Suriya Phankosol
Publication Approval	Mcu Ubonratchathani journal of Buddhist studies (ISSN : 2774-0463 (Online)) Mahachulalongkornrajavidyalaya University, Ubon Ratchathani Campus
Period of Publication	5th Year, Volume III (September-December, 2023)

Your article has been sent to 3 experts for peer review and found that its quality is at a "**Good**" level and academically useful.

Please be informed accordingly.

(Assoc.Prof. Dr.Phrakhruwutthidhampandit)
Editor of Mcu Ubonratchathani journal of Buddhist studies (TCI)
Mahachulalongkornrajavidyalaya University,
Ubon Ratchathani Campus

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