

A Brief Analysis on the Strategies of the Discovery Teaching Method to Improve the Classroom Atmosphere in General Table Tennis Courses in Physical Education Departments of Universities — A Case Study of Xichang University

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Abstract. The core task of curriculum reform is to fundamentally change both the teaching methods of educators and the learning approaches of students. This paper, based on the study of classroom atmosphere, takes the general table tennis course as a case and uses the discovery teaching method to analyze its influence on the classroom atmosphere in table tennis courses. The goal is to promote multi-directional interaction and dynamic development in the classroom, responding to the demands of curriculum reform, and to offer suggestions for creating a positive classroom atmosphere. The research reveals that the government is vigorously promoting reforms in physical education courses. In the general table tennis courses at colleges and universities, observations indicate that the atmosphere in practical sessions is more active than in theoretical ones, a phenomenon commonly found across institutions. The teaching atmosphere in the general table tennis course is manifested in the attitudes and behaviors of both teachers and students. The research concludes that the creation of a positive table tennis classroom atmosphere can be viewed from two aspects: 1) The attitude index is reflected in the teacher's self-confidence in physical education, proper mental outlook, and the positive engagement and emotional control of individual students in the learning environment. 2) The behavioral index is reflected in the harmonious teacher-student relationship, the teacher's attentiveness and guidance, the students' careful study and exploration of table tennis skills, as well as friendly communication with peers.

Keywords: classroom atmosphere, discovery teaching method, general courses, teaching, table tennis.

1. Introduction

In our country, Sports curriculum reform has undergone historical stages, including the reference to the Soviet model, the foundation of physical education ideology, the borrowing of Western experiences, and the construction of a curriculum with Chinese characteristics[1]. The "Science Popularization of China" project mentions in its scientific encyclopedia entries that "the discovery teaching method is a problem-based learning approach, which means that when students are learning concepts and principles, the teacher does not directly provide the content to the students, but instead offers them a problem situation. The teacher provides some facts (examples) and questions, encouraging students to actively think, independently explore, and discover and master the corresponding principles and conclusions themselves"[2].

In table tennis teaching, this is reflected in the teacher indirectly transmitting existing table tennis theories to individual students, guiding them through the table tennis learning process that the teacher has carefully designed and organized. Through exploring table tennis theory, exchanging table tennis tactics and skills, and mastering relevant knowledge and skills, students learn independently[3]. This paper aims to explore whether the discovery teaching method improves the classroom atmosphere in general table tennis courses. It will combine the discovery teaching method with table tennis teaching to analyze whether it has an effect on enhancing the classroom atmosphere in general table tennis courses.

Research related to the discovery teaching method includes searching for relevant literature, examining its significance and role, and studying its application and effectiveness abroad. By

observing the current classroom atmosphere in general education courses, it has been found that many classrooms lack a strong atmosphere of student learning and teacher teaching.

The main research content is to analyze whether the use of the discovery teaching method improves the classroom atmosphere in general table tennis courses at physical education institutions, and whether it is suitable for table tennis teaching. The paper will also explore how the atmosphere of a table tennis classroom should be created, how teachers can pay attention to the timing of their involvement, and how to manage the rhythm of the entire class. These aspects have not yet been fully explored.

The research methods to be used include literature review, observation, experimentation, comparison, and logical analysis. The implementation plan involves an experiment with 15 students from two general table tennis classes at Xichang University, using the discovery teaching method over four weeks (8 class sessions) to examine its effect on improving the classroom atmosphere.

This experiment focuses on second-year students from the physical education department and centers on the impact of the discovery teaching method on the classroom atmosphere in general table tennis courses. The experiment will be compared with a class that does not use the discovery teaching method. The behaviors of teachers and students will be observed, and the tendency of the results will be analyzed. The preliminary results suggest that the application of the discovery teaching method in general table tennis courses contributes to the improvement of the classroom atmosphere. This provides a reference for future improvements in classroom atmosphere in general table tennis courses and lays a foundation for subsequent physical education teaching practices.

2. Experimental Design

2.1. Experimental Subjects

The experimental subjects were 15 students with similar levels of table tennis skills, selected from the general table tennis course at the School of Physical Education, Xichang University. The research content involves a comparative analysis of the number of ball pickups, the number of ball strikes, student-to-student communication, and teacher-student communication before and after the experiment.

2.2. Implementation of the Discovery Teaching Method Experiment

2.2.1. Experiment Purpose

The purpose of the general table tennis course teaching is to enhance students' interest in table tennis and help them further master relevant knowledge and skills. In the process of table tennis classroom teaching, the classroom atmosphere, as an environmental factor, can serve as a starting point for improving teaching effectiveness.

2.2.2. Significance of the Experiment

"Classroom atmosphere, as a soft context in the teaching process, usually refers to a dominant attitude and emotional expression in the classroom[4]." "The basic characteristics of a positive classroom atmosphere include: students are energetic, classroom discipline is good, students are focused, the teacher-student relationship is harmonious, the teacher is good at guiding and inspiring students, students think actively, speak enthusiastically, and the classroom presents a lively, active, yet calm and serious scene[5]." This study explores the meaning and important educational value of the classroom atmosphere in general table tennis courses and investigates strategies for creating a good sports teaching atmosphere. The aim is to provide students with an open and conducive learning environment that allows for more comprehensive and personalized development. In the context of sports education reform, teachers are required to actively seek and apply new teaching concepts and methods to not only improve the effectiveness of physical education but also to promote the reform of sports teaching. Therefore, a positive classroom atmosphere in general table tennis courses is an essential part of sports education reform.

2.2.3. Experimental Conditions

The course will be taught by the course instructor, with me participating as a teaching assistant in the planning, design, record-keeping, and summarization of the experiment. At present, the experimental subjects' abilities for independent, cooperative, and exploratory learning in table tennis have not yet been developed[6]. The experiment will stimulate students' interest in learning table tennis, and increased communication between teachers and students will further enhance students' initiative in learning.

2.2.4. Experimental Methods

The 15 students will undergo an initial performance diagnosis and their baseline results will be recorded. Then, the discovery teaching method will be applied to teach ball control techniques, attacking techniques, and forehand-backhand techniques. Students' behavior in class will be observed. Data on individual attitudes and behaviors, as well as the frequency of student-to-student communication and teacher-student communication, will be recorded. When observing the data on the number of strikes, the absolute strength differences between male and female students should be considered, so the target number of strikes for male students will be set slightly higher.

2.2.5. Experimental Steps

Step 1: Prepare table tennis teaching questions and assign targeted practice content. Students are required to engage in practice with a focus on the questions, which will help them acquire knowledge and skills more effectively. The teacher will circulate the class to monitor progress, provide timely guidance, or pose additional questions during practice to encourage critical thinking.

Step 2: Select excellent case studies to demonstrate table tennis techniques developed through critical thinking, then organize a class discussion to evaluate the strengths and weaknesses of the techniques. Summarize how the skills have improved the sport and repeat the practice to reinforce the learning.

2.2.6. Experiment Prediction and Analysis

A comprehensive analysis of the teachers' and students' behaviors and attitudes shows that, when the discovery teaching method is applied in general table tennis courses, students are more active in acquiring knowledge, skills, and behavioral habits. This is reflected in an increase in the frequency of ball strikes, ball pickups, teacher-student communication, and student-to-student communication. Students will become more engaged in the teacher's class and develop a more positive learning attitude, thereby improving the overall classroom atmosphere of the general table tennis course.

2.3. Experimental Indicators

2.3.1. Number of Ball Pickups

This refers to the number of times a student picks up balls during multi-ball practice in class. The capacity of a standard table tennis multi-ball basket is used as the unit of measurement. The more frequently a student picks up balls, the more it indicates that the student is energetic. This can be used as an indicator of whether the classroom atmosphere is active.

2.3.2. Number of Ball Strikes

After applying the discovery teaching method in table tennis class, students' enthusiasm increases, prompting them to engage more seriously in technical practice. With focused attention, the number of ball strikes increases, reflecting whether the classroom atmosphere has improved.

2.3.3. Number of Student-to-Student Interactions

The discovery teaching method requires students to engage in communication. The more interactions there are between students, the more they are involved in thinking about the issues, and the better the classroom discipline is. This can indicate whether the classroom atmosphere has improved.

2.3.4. Number of Teacher-Student Interactions

Interactions between students are not always sufficient to support the learning of techniques, but when students consult the teacher, it indicates their eagerness to learn table tennis skills. The more teacher-student interactions, the more harmonious the teacher-student relationship, which affects whether the classroom atmosphere improves.

3. Experimental Measurement and Recording

3.1. More Active Ball Picking

Table 1. Statistics of Ball Picking Times per Class

	Post-Experiment (times)	Pre-Experiment (times)
First Class	3	2
Second Class	4	2
Third Class	5	3
Fourth Class	6	3
Fifth Class	6	3
Sixth Class	7	3
Seventh Class	7	3
Eighth Class	8	3

The experimental records show that after applying the discovery teaching method, the experimental group's ball picking frequency gradually increased from 3 times to 8 times, showing a significant increase. In contrast, the control group's ball picking frequency remained steady, averaging between 2 and 3 times with no significant increase.

In table tennis classes, students' levels of interest often vary: some are very interested, others have moderate interest, and some are not interested at all. As a result, there is often an imbalance in the enthusiasm for picking up balls during class. This is a common issue for most physical education teachers. By applying the discovery teaching method, attention was paid to stimulating the interest of less engaged students, motivating them to participate more actively. Through group discussions, each student shared their opinions, and by fostering friendly competition among students, the frequency of ball picking increased as students became more actively involved.

In a table tennis class, if students pick up balls more frequently, this can be observed through signs such as students frequently interrupting training to pick up balls, the rhythm of training being disrupted by ball picking, students showing fatigue or complaining about frequently bending down to pick up balls, the coach needing to remind students more often to improve their strike accuracy, balls being more scattered across the playing area, reduced training efficiency due to ball picking, increased interaction between students during ball picking, and potential disruptions to classroom discipline. These signs suggest that the increase in ball picking could be affecting the smoothness of the class and the effectiveness of training. Coaches and students need to work together to reduce unnecessary ball picking by improving strike accuracy and control, thereby improving class efficiency and the students' learning experience.

3.2. Significant Increase in Ball Strikes

Each class's table tennis content was recorded, and the experimental results are summarized in the table below.

Table 2. Experimental Group's Multi-ball Practice and Combination Practice Statistics

	Multi-ball Attack (100 balls)	Multi-ball Block (100 balls)	Left Block-Right Attack (50 groups)
First Class	50	40	0
Second Class	50	42	0
Third Class	50	44	0
Fourth Class	55	50	10
Fifth Class	50	47	10
Sixth Class	69	66	20
Seventh Class	78	74	26
Eighth Class	80	85	40

From the table, it is clear that after applying the discovery teaching method, the number of successful strikes in multi-ball attack practice increased from 50 to 80, the number of successful block strikes increased from 40 to 85, and the left-block-right-attack practice grew from 0 to 40. These data indicate that students' strike frequency significantly increased. As students developed a better understanding of table tennis techniques, their concentration improved, which in turn significantly boosted their accuracy and the number of successful strikes in multi-ball practice. The following factors contribute to the improvement in students' strike frequency:

(1) Technical Proficiency: As the number of practice sessions increases, students become more proficient in basic techniques such as forehand and backhand strokes, serving, and receiving serves.

(2) Reaction Speed: Students' reaction times shorten, allowing them to respond faster to incoming balls, which results in more strikes.

(3) Footwork: With improved agility and foot speed, students are able to reach the ball more effectively, increasing their opportunities for strikes.

(4) Ball Feel: Students' ability to judge the spin, speed, and placement of the ball improves, helping them make more accurate strikes.

(5) Stamina and Physical Fitness: As students' physical fitness improves, they can maintain a higher strike frequency for longer periods.

(6) Tactical Understanding: As students develop a deeper understanding of match tactics, they are better able to control the pace of the game and create more opportunities for strikes.[7]

(7) Mental Toughness: With improved ability to stay calm under pressure, students are able to perform consistently, even in high-pressure situations, which leads to more successful strikes.[8]

(8) Opponent Adaptability: Students can adapt more quickly to different opponents' playing styles, allowing them to adjust their strategy and create more striking opportunities.

(9) Multi-ball Training: In multi-ball training, students are continuously striking, which is a high-intensity form of practice that helps improve their strike frequency.

(10) Error Correction: With the guidance of the coach and self-reflection, students are able to identify and correct their mistakes more quickly, leading to fewer errors and an increase in successful strikes.

3.3. Increase in Student-to-Student Communication

Table 3. Average Number of Student-to-Student Communication and Discussion per Class

	Post-Experiment (times)	Pre-Experiment (times)
First Class	4	0
Second Class	5	0
Third Class	5	0
Fourth Class	5	1
Fifth Class	4	0
Sixth Class	6	1
Seventh Class	7	0
Eighth Class	7	1

From the table, it is evident that student-to-student communication increased from 4 times to 7 times, while prior to the experiment, communication remained low, consistently between 0 and 1 time per class. This increase in interaction highlights a higher level of engagement and cooperation among students. During the experiment, students were encouraged to engage in discussions with both more experienced classmates and those who were less skilled. This fostered peer support, allowing for short but frequent exchanges of ideas. These interactions became more dynamic as students worked together, helping one another and improving the collective learning environment. The data indicates that, through the discovery teaching method, students' ability to think critically and engage in collaborative discussions was enhanced, which contributed to a better classroom atmosphere.

The increase in student-to-student communication in the classroom can be identified by observing the frequency of their conversations, the level of engagement in interactions, the increase in non-verbal communication, active participation in group cooperation, the liveliness of the classroom atmosphere, the improvement in student engagement, student-led discussions under teacher guidance, the enhancement of student motivation, the cooperative nature of classroom activity design, mutual assistance among students, references to communication opportunities in post-class feedback, and the communication between students outside the classroom through social media and messaging tools[9]. These signs indicate that student interactions have become more frequent, the classroom atmosphere has become more dynamic, which helps improve learning outcomes and enhances students' cooperative abilities.

3.4. Increase in Teacher-Student Interaction

Table 4. Frequency of Student-Teacher Interaction per Lesson

	Responding to Teacher's Questions							
After Experiment (4 Lessons)	7	8	7	8	7	8	7	8
Before Experiment (4 Lessons)	2	2	2	2	2	2	2	2
	Actively Asking the Teacher for Help							
After Experiment (4 Lessons)	3	4	4	5	5	7	6	8
Before Experiment (4 Lessons)	1	0	0	0	1	1	0	0
	Teacher's Roving Guidance							
After Experiment (4 Lessons)	5	3	5	6	4	4	5	6
Before Experiment (4 Lessons)	2	2	2	2	2	2	2	2

As shown in the table, the number of times students answered the teacher's questions during the experiment (7-8 times) was significantly higher than the pre-experiment number of 2 times. The number of times students actively sought help from the teacher increased from 3 times to a maximum of 8 times, showing a marked improvement. The average number of teacher-student interactions during the teacher's rounds of guidance was 5, clearly higher than the pre-experiment average of 2.

The analysis suggests that when comparing the individual activities of both the teacher and the students in the table tennis class, several key aspects should be considered. These include the value of the teacher's questions, encouraging students to ask questions, establishing an interactive feedback mechanism, and improving the atmosphere of physical education teaching. Strategies to optimize the atmosphere of the table tennis class include focusing on students' individual levels of comprehension and enhancing teacher-student interaction to create a positive, relaxed atmosphere conducive to academic discussion in the class [10].

In table tennis training, the increase in communication between the teacher and students can be identified by observing the frequency of communication, the increase in non-verbal communication, the provision of personalized guidance, the teacher's active participation in training, the timely adjustment of training content, the provision of emotional support, the setting of common goals, the timeliness of feedback, an increase in student enthusiasm, improvements in team atmosphere, positive feedback from parents, frequent interactions via social media and communication tools, and the maintenance of detailed records and notes [11]. These signs indicate that the interaction between teachers and students has become more frequent and deeper, which helps improve training effectiveness and foster students' personal growth.

4. Classroom Atmosphere Analysis Results

(1) Before the experiment, the classroom atmosphere in current university table tennis general courses generally lacked aspects such as questioning interactions, game interactions, and activity interactions. Issues such as pseudo-interaction, poor classroom atmosphere, students' reluctance to cooperate with teachers' individual interactions, ineffective teacher questioning, and passive student participation occurred frequently.[12] The classroom atmosphere affects students' subjective impressions of what they are learning, influences their enthusiasm and initiative, and impacts the teacher's teaching efficiency and quality.

(2) Applying the discovery-based teaching method in the general table tennis course can avoid most of these issues. Both the teacher and students can promote each other, creating a mutually beneficial learning process. The use of discovery-based teaching improves communication between students and between the teacher and students, increasing student participation and enthusiasm in class activities.

(3) In this experiment, the use of discovery-based teaching improved students' cognitive abilities and motor skills. Before the experiment, students in traditional general courses showed passive and mechanical behavior. Therefore, discovery-based teaching can be considered an innovative approach in table tennis education compared to previous teaching methods, effectively stimulating students' enthusiasm and initiative in learning, and it is relatively flexible in implementation.

(4) The application of discovery-based teaching helps improve the classroom atmosphere in table tennis courses. This conclusion can effectively address the shortcomings of the current classroom atmosphere in table tennis courses. By analyzing similar and related research in physical education teaching and the results from before the experiment, it is concluded that discovery-based teaching improves the classroom atmosphere in table tennis by influencing students' classroom behaviors, teacher-student communication, and student-to-student interactions. In summary, the government has vigorously promoted reforms in physical education courses. In general table tennis courses in universities, the practical class atmosphere is more active than the theoretical class atmosphere, a phenomenon that is widely observed in schools. The status of the classroom atmosphere in table tennis courses is reflected in both the teaching attitudes and behaviors of the teacher and students in the classroom. [13-15]

5. Conclusion

The discovery-based teaching method enhances the classroom atmosphere in table tennis courses by stimulating students' initiative and participation, promoting interaction and cooperation among students. This method encourages students to discover skills and knowledge through self-exploration and practice, boosting their innovative thinking and problem-solving abilities. At the same time, it allows students to learn at their own pace and according to their individual interests, providing a personalized learning experience. In this process, teachers transform into guides and facilitators, establishing a more equal and open relationship with students. Furthermore, the flexibility of discovery-based teaching allows teachers to adjust teaching strategies in real-time based on student feedback, keeping the class dynamic. This teaching approach, through diverse activities such as group discussions and experimental explorations, increases the fun and interactivity of the class, creating a vibrant and enthusiastic learning environment for table tennis.

The creation of the classroom atmosphere in table tennis courses can be viewed from two perspectives: (1) The attitude indicators mainly reflect the teacher's confidence in physical education teaching, the appropriate mental state, as well as the students' enthusiasm in the learning environment and their emotional control. (2) The behavior indicators reflect the harmony between teacher and student relationships, the teacher's care and guidance for students, the students' serious study and understanding of table tennis, and the friendly communication between peers.

(1) The application of the discovery-based teaching method in table tennis general courses results in increased ball picking frequency, improved shot accuracy, more student interactions, and more teacher-student interactions, thereby enhancing the classroom atmosphere.

(2) After applying the discovery-based teaching method in table tennis courses, the classroom atmosphere shows increased student involvement in thinking about table tennis techniques, greater focus, and improved utilization of class time. Consequently, students pick up balls faster and achieve higher shot accuracy during practice.

(3) The application of the discovery-based teaching method in table tennis general courses shows a positive experimental effect, with increased student interactions, more teacher-student exchanges, more student responses to teacher questions, and increased student-initiated inquiries.

References

- [1] Chen Xi, Shen Yifan. Research on the Practice of Discovery-based Teaching in Dance Education [J]. Art Education, 2021 (01):125-128.
- [2] Song Zhanqin. Study on the Application of Discovery-based Teaching in University Badminton Courses [D]. Shaanxi Normal University, 2014.
- [3] Gao Jun. Empirical Study of Discovery-based Teaching in University Table Tennis Elective Courses [D]. Chengdu Sports Institute, 2016.
- [4] Su Siwei. Application of Discovery-based Teaching in University Badminton General Courses [D]. Suzhou University, 2012.
- [5] Wang Yuhong. Initial Exploration of "Discovery-based Reading" in High School Chinese [D]. Northeast Normal University, 2007.
- [6] Le Jian. Comparative Study of "Discovery Learning" and "Inquiry-based Learning" [J]. Journal of Language and Literature, 2007 (S2):108-110.
- [7] Yang Dan. Re-recognition of Bruner's Structuralist Teaching Theory [J]. Modern Educational Science, 2008 (12):88-90.
- [8] Yu Linhao. Research on the Application and Effect of Flipped Classroom in University Table Tennis Elective Courses [D]. Shanxi University, 2022. DOI: 10.27284/d.cnki.gsxiu.2022.000003.
- [9] Ding Yunyun. Research on the Application of Layered Teaching in Vocational College Basketball Courses [J]. Hubei Radio and Television University Journal, 2014, 34 (03):44-45.

- [10] Gao Jun. Empirical Study of Discovery-based Teaching in University Table Tennis Elective Courses [D]. Chengdu Sports Institute, 2016.
- [11] Chen Zhihai, Yang Qing, Li Muzi, Tang Hao. Research on the Integration of "Ping Pong Spirit" into University Table Tennis Curriculum Reform from the Perspective of Ideological and Political Education [J]. Sports Vision, 2022 (23):39-42.
- [12] Li Min. The Importance and Strategies of Creating a Good Classroom Atmosphere in Primary School Chinese Teaching [J]. Primary School Students (First Issue), 2023 (03):37-39.
- [13] Gu Shanshan. Exploring Reading Teaching to Optimize Classroom Atmosphere [J]. Primary School Reading Guide (Lower Grade Edition), 2022 (08):24-26.
- [14] Qiao Weifeng, Li Manli, Li Ruimiao. Beyond Technology: The Impact of Classroom Atmosphere in Blended Teaching on College Students' Learning Outcomes [J]. Peking University Education Review, 2022, 20 (03):25-41+187-188.
- [15] Zhang Kezhu. Creating a Positive Classroom Atmosphere with Borrowed Classes to Build an Efficient Physical Education Classroom [J]. Education Circle, 2022 (32):77-79.