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Enhancing University Physical Education Through Data-Driven Reform of Sports Club Systems

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Abstract: With China's educational reform, college physical education teaching mode has also made some innovations. Sports club is a new modern education model developed on the basis of traditional physical education courses. It provides students with more choices and is convenient for autonomous learning, thus forming a student-centered engineering education model. With the background of sports reform, this paper investigates and analyzes the reform of sports club system in universities, puts forward specific implementation means to stimulate the development process of sports reform in universities in China, puts forward data analysis schemes, and analyzes and guides the reform of sports club system. The specific research results show that our reform plan has been recognized by 92% of students and 94% of teachers.

Keywords: Physical education reform, Sports club system, Student-centered, Data mining and analysis

1. Introduction

The traditional physical education teaching mode based on teachers is more lasting. Although students can master relevant theoretical knowledge and skills, they cannot give full play to their subjective initiative because they are passive and have no motivation to actively participate [1,2]. Under the background of physical education reform in Universities, physical education majors should change the teaching mode, make reasonable and full use of sports club colleges, help students understand sports correctly, fully cultivate students' understanding and ability of "maintaining sports forever", and cultivate the habit of regular sports [3].

However, the traditional physical education mode mainly focuses on competitive sports, so there are certain limitations in cultivating students' interest in sports and strengthening their physical quality [4, 5]. In contrast, the sports club teaching model is designed to promote students' adaptation to physical education and sports skills education, and to meet their practical needs to the greatest extent possible. The reform of this teaching model will change students' bad habits and improve their physical exercise autonomy by determining the principles and contents, formulating relevant teaching plans, arranging necessary tutorials, training and activity hours, and guiding students to participate in club training activities with flexible and reasonable use of available time [6].

Although most students like some sports, they show resistance and negative psychology when facing the traditional physical education courses. This is mainly due to the backward teaching methods and boring contents, which affects the students' enthusiasm to participate and the related situa-
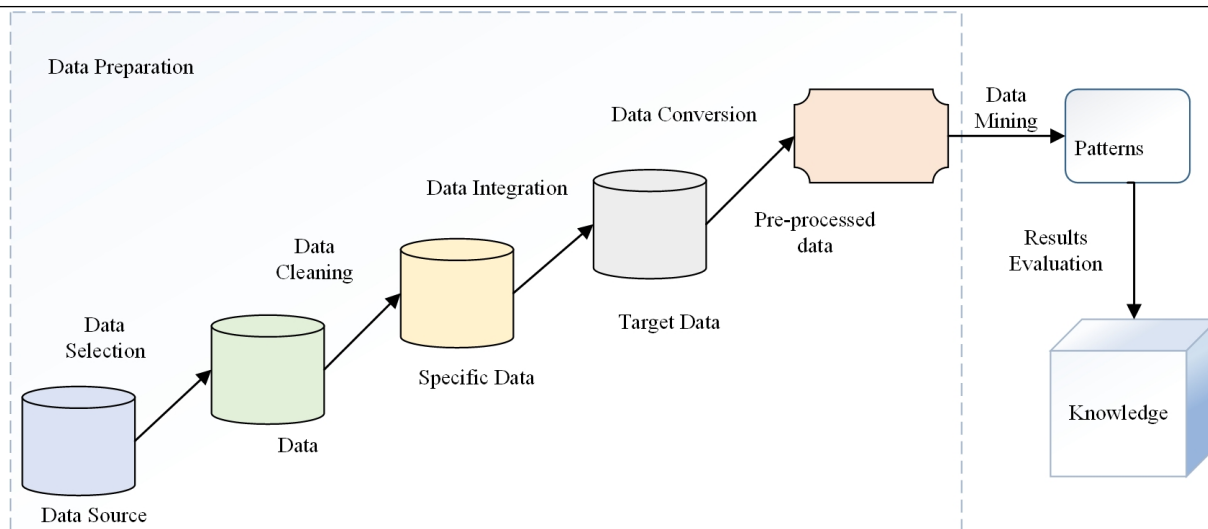
Figure 1. The Process of Data Mining and Analysis

tion [7, 8]. The sports club teaching mode can meet students' requirements and preferences for the course, which enhances the diversity and flexibility of the teaching structure of the course and gives students more independent choice, thus enhancing their love for the physical education course [9]. Using the flexibility and variety of the sports club system, students are attracted to join various sports clubs focusing on items of interest to them, and then select tutorials for skills of interest to them, allowing them to actively choose relevant courses. The basic skills are learned in the club tutorials, and the overall ability is expanded in combination with club activity classes, thus enhancing students' athletic ability and promoting their institutional health [10, 11].

The traditional physical education model is prone to the phenomenon of unnecessary problems that plague students when promoting their overall mental health development. When students participate in sports training, they think more about getting credit for the course rather than pursuing the spirit of the sport. The sports club model is also associated with credits, but it is more appropriate to the students' psychology, and the club will attract students' attention through the specialized curriculum, so that students can participate more actively [12]. The club also organizes activities based on students' needs, cultivating their sense of rules, teamwork and competition in team activities.

2. Exploring the Teaching Reform of Sports Club System

Data mining and analysis is not a simple independent tool, but a well-designed process to obtain useful knowledge from a large amount of data. As a specific step in the process of database retrieval, data extraction uses special algorithms to extract data. From a macro point of view, the whole data extraction process consists of three parts: data preparation, data extraction and result interpretation and evaluation. Specifically, data preparation is a necessary step before data analysis [13], which directly affects the mining results. It includes, among other things, the stages of data selection, cleanup, integration, and transformation. The whole data extraction process is shown in Figure 1.

2.1. Formulation of Teaching Objectives

The purpose of teaching is to lay a foundation for the formulation of teaching content. Therefore, reasonable teaching objectives must be established. At the same time, the State Council requires that by 2020, the quality of physical education teaching in Universities should be greatly improved, students' physical and mental quality should be greatly improved, basic sports skills should be mastered, good sports habits should be formed, personality training should be paid attention to, and they should have a sense of common and cooperation [14, 15]. Therefore, while carrying out the reform of college

School Name	Basis for setting teaching objectives	Teaching Objectives Terminal Equipment
University 1	The Outline is the main focus, and it is integrated with the reality of our school	The teaching objectives are set and the national health first index standard, and the specific teaching objectives of each program are formulated
University 2	The Outline is the main focus, and is integrated with our school and physical education goals	To develop good sports habits, master basic sports skills, have a sense of independent sports, have the ability to survive in society, and have a good physical culture
University 3	The Outline is the main focus, and it is integrated with the reality of our school	Establish the idea of lifelong sports, master sports skills, and learn sports methods
University 4	The Outline is the main focus, and it is integrated with the reality of our school	Mastering theoretical knowledge, learning how to exercise, having the ability to guide sports, and having the ability to self-evaluate sports

Table 1. Analysis of Teaching Objectives of Physical Education Clubs in 4 Universities

sports clubs, we must also establish teaching objectives according to the physical education objectives of the State Council and the actual situation of our school. Table 1 lists the results of teaching objectives of four university sports clubs.

From the analysis of the Table 1-mentioned teaching objectives, we can see that the teaching objectives of these four schools are relatively systematic and vague, and they do not involve specific teaching contents and teaching methods, nor do they quantify the teaching objectives. Meanwhile, the survey also found that some teachers mechanically implement the syllabus requirements when teaching, and cannot set specific teaching objectives according to the syllabus. Therefore, universities should be able to set specific and operable teaching objectives based on the requirements of the syllabus, so as to ensure that the teaching objectives conform to the law of students' development and meet the national development needs [16, 17].

2.2. Model Construction

The theoretical framework for the design of the data analysis-based physical education model used in this study is shown in Figure 2.

In the evaluation for the reform effect, we perform the model construction as shown in Figure 3. The base classifier in the original rotating forest algorithm uses a decision tree algorithm, but the decision tree itself has a simple structure and the classification accuracy is relatively limited. In this paper, we propose a combined classifier combining rotating forest and LGB, referred to as Physical-LGB model. In this model, the decision tree algorithm of the base classifier is replaced by the LGB algorithm. The LGB algorithm has a significant advantage over other GBDT algorithms in terms of speed, and has a disadvantage over the simple decision tree algorithm in terms of speed [18], but has a significant improvement in classification accuracy. In the original rotation forest algorithm, the underlying classifier of LGB itself is also a decision tree algorithm, which is also consistent with the original rotation forest model. The overall model takes advantage of the excellent performance of the rotation forest and the classification accuracy of LGB, providing an alternative to pursue higher accuracy. The maximum confidence level is used to determine the final category to which x belongs [19].
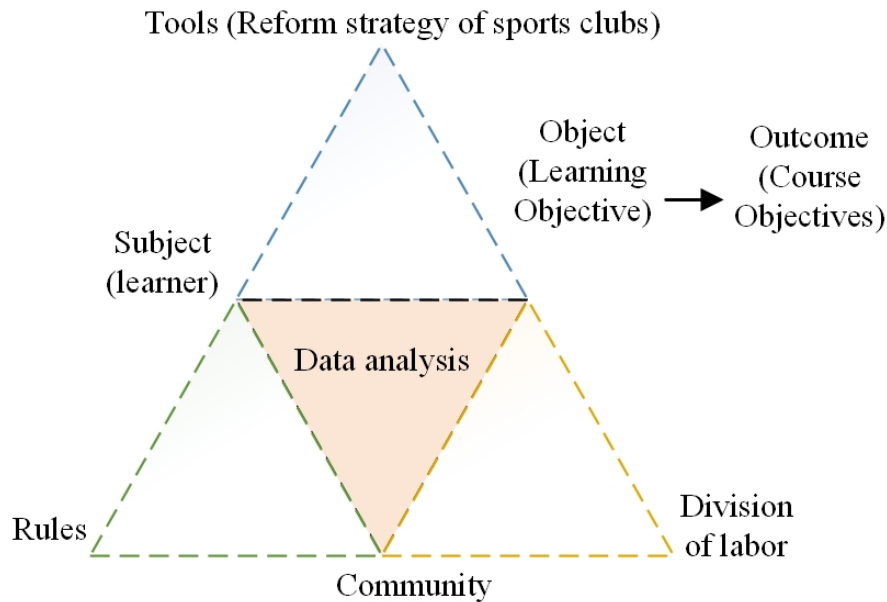
Figure 2. Physical Education Teaching Design Using Data Analysis

$$\mu_j(x) = \frac{1}{L} \sum_{i=1}^{L} d_{ij}(xR_i^a), j = 1, ..., c \tag{1}$$

The flow chart of the algorithm is shown in Figure 3.

For the integrated classification model, the number of base classifiers directly affects the final classification results. In the original rotating forest algorithm [20], L is taken as 10, and the performance of bagging and boosting algorithms with the same number of base classifiers is compared, and the rotating forest is superior. In addition, the number of feature subsets is chosen with the value of K such that $n/K = 3$, which means that the feature set is divided into K feature subsets of size 3.

3. Experiments

3.1. Selection of Teaching Contents

The state requires universities to carry out sports activities according to students' interests and strive to cultivate students' healthy quenching consciousness and good habits. When formulating the physical education syllabus, universities should be able to carry out sports activities on the basis of teaching items [21]. At the same time, the State Council pointed out in the national sports development plan that universities should increase the training frequency of traditional sports subjects such as volleyball and basketball, increase the number of special sports events such as ice, snow and rock climbing, and enrich physical education courses. Therefore, universities should combine the actual situation of educational institutions in our country, enrich the teaching content, and take classes in sports clubs. Economic factors have the greatest impact on the implementation of club teaching, because financial investment directly affects the teaching institutions of universities, and then affects the selection of club teaching content [22]. This also shows that sports clubs have a high demand for equipment. According to the research conducted in the four universities, the location of the teaching institutions of the four universities is shown in Table 2.

From the Table 2 results, the teaching facilities of the institutions are mainly basic sports fields such as ball games and athletics. By conducting a questionnaire survey on the satisfaction of facilities, the specific findings are shown in Figure 4.

From Figure 4, it can be seen that 57.62% of the teachers are generally satisfied with the teaching
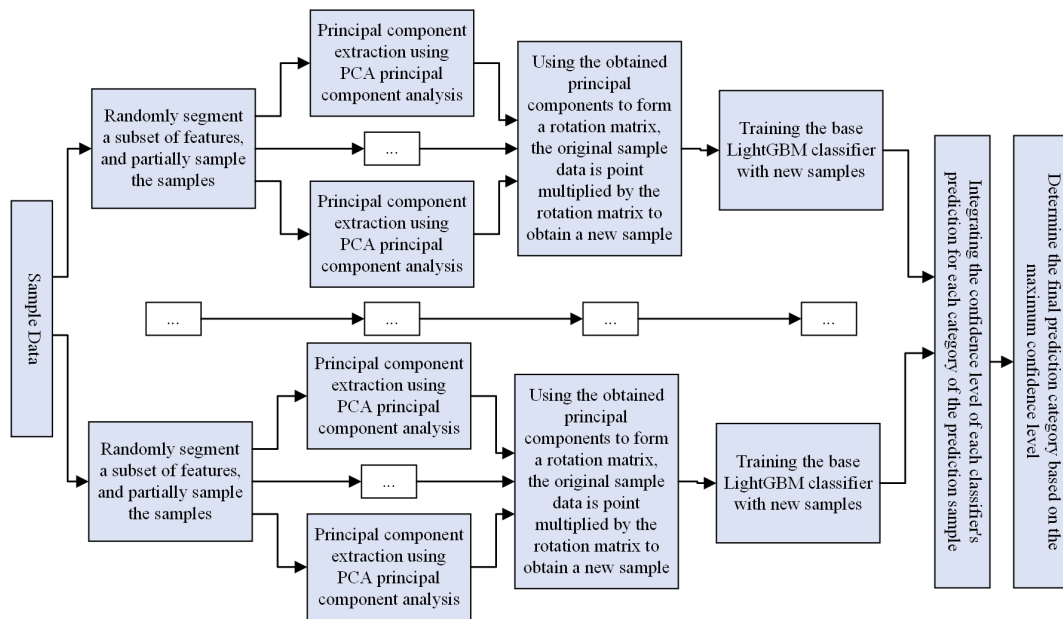
Figure 3. Physical-LGB Algorithm

Hardware Facilities	University 1	University 2	University 3	University 4
Athletic field	1	1	2	1
Gymnasium	1	1	1	1
Basketball court	7	11	5	8
Swimming pool	0	0	1	0
Soccer field	1	2	1	1
Table tennis table	35	41	31	42
Tennis court	7	8	7	6
Badminton court	3	11	12	8
Gymnastics room	1	1	1	1
Roller skating court	1	1	1	1
Volleyball court	1	1	1	2

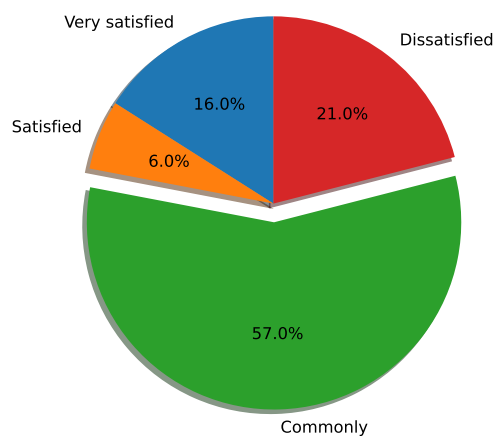**Table 2.** Survey on Hardware Facilities of Physical Education in 4 Universities

Figure 4. Status of Teachers' Satisfaction Survey on Hardware Facilities ($N_2 = 118$)

Specialized	Number of people	Percentage of%
Athletics	6	25.02
Basketball	3	16.68
Aerobics	3	12.55
Soccer	2	8.34
Martial Arts	2	8.34
Table Tennis	1	4.16
Tennis	1	4.16
Badminton	1	1.16
Swimming	1	4.16
Volleyball	2	8.32
Gymnastics	1	4.16
Others	1	4.16

Table 3. Special Survey of Physical Education Teachers in Undergraduate Universities ($N_3 = 24$)

facilities in our university, and 20% of the teachers are not satisfied with the teaching facilities in our university. This indicates that the current teaching facilities in the four universities are relatively homogeneous and teachers' satisfaction is low, which leads to the limitation of teaching contents. Due to the lack of teaching equipment students can only give up their favorite sports and choose the teaching contents they like more than the hardware facilities support. Through a special survey of teaching managers in four universities, their specific findings are shown in Table 3.

From the hardware side, we can see that the hardware facilities of the institutions are some basic hardware such as athletic fields and ball games, and not all schools have some hardware facilities such as swimming pools, which will limit the development of teaching contents to a certain extent. From the faculty side, it is found that there are few special teachers that students like, which will also limit the development of teaching contents [23].

3.2. Use of Teaching Methods

Teaching method is a measure used to accomplish teaching objectives and tasks, and the main changes of teaching methods under the teaching mode of sports department are.

(1) Flexible teaching style. Sports club teaching is not limited to teaching methods, but can be explored and independent learning in a flexible way, creating a free learning space for students [21, 22].

(2) Changes in the teaching subject. The main body of teaching is the teacher under the traditional teaching method, while the main body of teaching is the students under the sports club teaching mode [4, 6, 7].

If the teaching methods adopted by teachers in physical education activities are not reasonable, it will affect the students' interest in the course. Therefore, the State Council has pointed out in the teaching program that higher education institutions should try to diversify teaching methods and develop a sense of healthy exercise and good exercise habits. The results of the survey on these four schools are shown in Table 4.

From the survey of teaching methods of the institutions, we can find that although the club teaching mode is carried out, there is no innovation in teaching methods, and the traditional teaching method is still adopted. Such a teaching method with teachers as the main body and students' passive participation is contrary to the teaching intention of the club teaching mode itself. Through the survey on students' satisfaction with teachers' teaching methods, the specific findings are in Figure 5.

Options	Number of people	Percentage of%
Teacher lecture and student practice	339	85.82
Students participate in teaching	56	14.18
Others	0	0.00

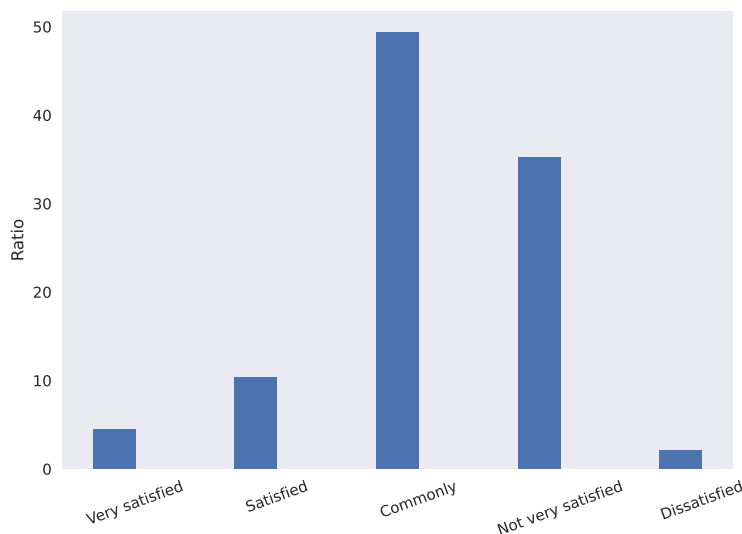**Table 4.** Teaching Methods Survey ($N_1 = 395$)

Figure 5. Teaching Method Survey($N_1 = 395$)

According to the Figure 5, almost half of the students are generally satisfied with teaching methods, 13.92% of the students are more or less satisfied with teaching methods, and 34.18% of the students are not satisfied. It can be seen that the satisfaction rate of teachers is low. This is mainly due to the improper use of teaching methods. Therefore, in order to use the club teaching mode more effectively, college teachers must adopt a variety of teaching methods.

3.3. Student Satisfaction

The State Council, in setting the objectives of physical education and sport, requires universities to be able to increase satisfaction in program teaching activities. Therefore, the following is a survey of students' perceptions, recognition and participation in the club teaching model.

Through the survey of college students' perception of club concept and college sports club teaching mode, the specific survey statistical results are in Table 5.

The table 5 shows that most of the students have a certain understanding of the concept of club, and the general direction of their understanding is correct, which lays a good foundation for students to participate and receive the club teaching model. Only 3.04% of the students think that clubs are groups formed by people with economic conditions, although this understanding is not correct, some socially organized clubs do have fees. At the same time, most of the students can find that the club is student-oriented, respects students' main opinions, and respects students' interests and hobbies.

4. Conclusion

In the context of physical education reform, sports clubs can better stimulate students' motivation for physical exercise and promote students' physical and mental development. Although we can get rid of the limitations of students' traditional sports teaching forms to a certain extent, we can give full play to students' basic role in sports. However, there are still deficiencies in the practical application of sports club model, which are manifested in students' body consciousness, habits and skills. Therefore, the further reform and innovation of this new teaching mode requires the formation of

Content	Selection	Number of people	Percentage of%
The concept of club	A group or a place where people with the same interests socialize and have fun	335	83.13
	A group or a place for recreational activities under a certain theme	44	10.96
	A group or place where people communicate to achieve a certain purpose	13	3.119
	A group or a place where people with good economic conditions are organized together	13	3.09
Understanding of the teaching model of sports clubs in universities	A combination of learning and recreational activities for the benefit of people with the same interests	74	18.57
	A kind of physical education activity in which people with the same hobby voluntarily participate	167	68.22
	A teaching model that is based on the will of students and follows the law of student development	15	4.09
	A social teaching model financed by the members and carried out mainly by the will of the members	39	9.45

Table 5. College Students' Understanding of Issues Related to the Concept of Club ($N_1 = 395$)

modern educational concept and the innovation of teachers. At the same time, we need to increase the corresponding financial resources to fundamentally optimize and improve the comprehensive quality and quality of students' physical education, so as to effectively expand and enrich the teaching area of physical education courses.

Funding
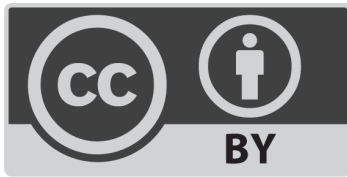
Conflict of interest

The author declares no conflict of interests.

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