

Optimization of the Training Effect Mode of the Current Physical Education MOOC System in Universities by K-means Algorithm

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ABSTRACT: *With the popularity of online learning and MOOCs, sports MOOCs are gradually receiving attention. However, there are some problems with the existing sports MOOC system, such as insufficient training effectiveness and lack of personalization in the learning process. We propose an optimization scheme based on the K-means algorithm to address these issues. This plan first collects students' learning data, including learning duration, practice frequency, discussion participation, etc. Then, we use the Kmeans algorithm to divide these data into different groups and develop more personalized training plans based on the characteristics and needs of different groups. At the same time, we also considered the characteristics of the sports discipline. We incorporated various factors such as physical health, sports skills, and psychological quality into the training plan to comprehensively improve students' sports literacy. Through experimental verification, we found that the optimization scheme based on the K-means algorithm can significantly improve the training effectiveness of the sports MOOC system. Compared with traditional training modes, the optimized mode has higher learning efficiency and lower learning costs. In addition, students also showed higher satisfaction and stronger learning motivation towards the optimized training mode.*

Keywords: K-means Algorithm, "Internet +" Background, PE Teaching in Ordinary Universities, MOOC Model

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1. Introduction

The sports industry's development is crucial to the present age. Under the background of rapid economic development and people's material and cultural life being satisfied, the sports industry is no longer merely one or several forms of sports performance. It is manifested more in the promotion of people's physical health and the improvement of people's overall literacy [1]. Nowadays, the rapid development of the sports industry in the world has brought some positive effects to the nationals in various regions, including the healthier people, the more pleasant mood and the more substantial international influence of the country. [2] Physical education has also made significant progress; various countries and regions worldwide have begun to

develop physical education to guide certain sports so that athletes or people can be more accurate in training to obtain more efficient training results [3]. The development of computer technology also provides a positive impetus to the reform of college PE teaching mode, especially the emergence of more affiliated technologies, which makes today's PE teaching mode more suitable for PE learners through the more systematic training process and obtain more excellent athletic performance [4]. In this study, the author will analyze the shortcomings of MOOC teaching methods in our country's current college sports teaching, and provide a reference for developing and improving the whole PE teaching mode through the combination of theory and practice, providing a theoretical basis for development.

2. State of the Art

Physical is usually considered a more complex social and cultural phenomenon [5]. This kind of cultural expression is mainly based on the laws of human and intellectual development, based on a clear cognition of some external influences and follow-up changes on people's growth and life, and then analyzes their physical functions and qualities and other aspects of exercise, and ultimately to improve people's growth and development status, living standards and physical activity form [6]. Therefore, the development of sports has a long history. With the development of the times, it also plays different roles at various times. For example, sports were often the training activities for soldiers' literacy in the war era. In peacetime, the early period of sports was also a kind of entertainment for urban aristocracy [7]. Nowadays, with the globalization of the world economy and globalization in various fields, sports are no longer merely social activities such as athletics and training among individuals. Many countries have started to regard sports as a way to promote their international influence and cooperate with other developed countries as a form of exchange [8]. Especially nowadays, large-scale sports events are widely held, and many countries have begun to devote themselves to raising the economic level of their athletes, prompting them to obtain more excellent results in incentive-winning large-scale events and ultimately to enhance their international status and provide a positive impact [9]. Under this demand, physical education has also been extensively developed. The continuous improvement and innovation of the traditional PE teaching modes, especially the emergence of computer technology, has provided a positive impetus to reform the PE teaching mode [10]. The MOOC model is an emerging teaching method developed under computer technology. The development of this teaching method has arisen and been used among many developed sports countries worldwide. Through the advantages of its teaching methods, such as diversification, the overall strength of the upgrade provided technical support [11].

3. Methodology

Since the reform and opening up in our country, the state has formulated more policies and vigorously developed economic sectors. At the same time, our nationals' material and cultural life has also been greatly satisfied. However, with the continuous improvement of China's economic strength, the state has also begun to realize that there can be no positive correlation between the overall national literacy and the economic development in our country. Especially in the modern era, our country's national health shows a declining trend. The influence of unhealthy living habits increases the incidence of some diseases. Therefore,



Figure 1. China's Sports Industry Development

the development of the people's constitutional health has become our country's current development process in a major decision. In addition, the impact on the physique of our country also plays an extremely important role in elevating the international influence of our country. Nowadays, many sports events are held continuously, and many countries have started to show their comprehensive national strength to the world through these sports events. Through these, the tournament exchanges with many countries in political, cultural and other fields to achieve a winwin situation among nations (Figure 1). Therefore, Chinese sports scholars are beginning to realize that in today's era, the development of the sports industry is of great importance to the country's overall development. It not only has a positive impact on the improvement of our national literacy but also the enhancement of our international influence. Force provides a positive effect. In this study, the author first investigated and interviewed relevant scholars in our country's sports field and reviewed the related dissertations in the field of sports. Based on this, the author conducted a comprehensive analysis of the importance and deficiencies of the development of the sports industry in China to provide the research foundation for this research.

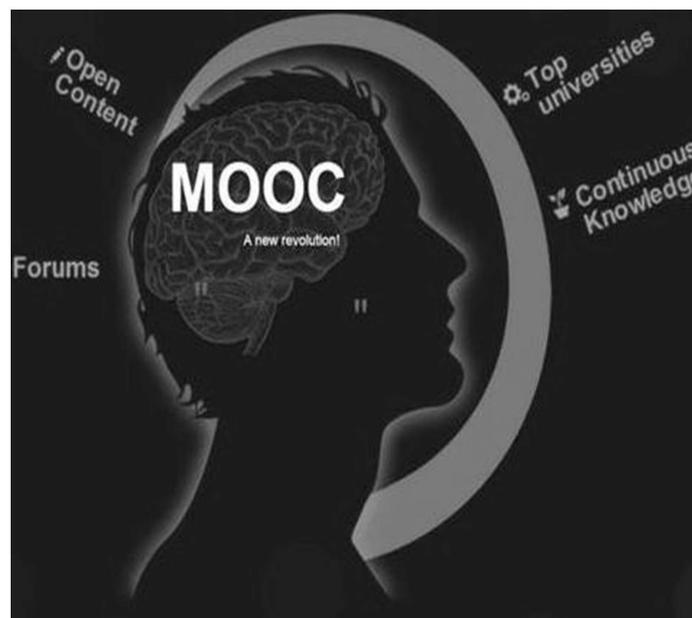


Figure 2. MOOC system applications

The necessity of the development of the sports industry has also begun to push our country to strengthen the development of physical education in colleges and universities. Physical education cannot only help spread sports in a broader range of forms but also help our sports learners be more advanced in sports training. Theory learning and cognition, and through more systematic training to obtain more efficient training results [12]. However, even though our country has begun to strengthen its investment in the field of sports, more and more colleges and universities have started to be established as the country's awareness increases. However, because of the teaching of physical education in our country, the teaching staff relies more on the teaching mode of precept and example to teach the students sports-related theory, which may make the learners cannot understand the details of the problem more clearly and may be at the process of training, we cannot obtain extremely effective training results through more precise training methods. Wrong training methods may also lead to an increase of the injury rate, which may eventually lead to short training opportunities for athletes the increasingly intense sports arena to get more excellent competition results. Therefore, under this situation, more systematic physical education reform has gradually become an essential part of the development of this field. The emergence of computer technology also provides technical support for the development and innovation of PE teaching mode. Especially in some teaching processes, due to the introduction of the subsidiary technology of computer technology, the teaching process is more diversified, which enhances the whole teaching effectiveness and provides a positive impact [13].

MOOC model is a new computer technology in our country in recent years; the introduction of the physical education teaching model (Figure 2), China has many colleges and universities have used the kind of teaching and obtained a particular application

effect; however, in some areas where education philosophy is relatively backward are still unable to demonstrate the advantages of the MOOC teaching model, because they are still unable to apply related technologies. In this study, the author will first analyze the superiority of the MOOC teaching model. Based on this, the author constructs the PE teaching system based on the MOOC teaching mode, and the constructed teaching system provides technical support for the follow-up research.

To determine the actual application efficiency of MOOC teaching mode, in this study, the author selected 80 volleyball students in a physical education university as the research object; before the experiment, all the students for theoretical courses, training skills, physical fitness tests, then all students were randomly divided into two experimental groups of MOOC physical education model experimental group and traditional physical education model control group, according to the physical education results and the gender of the students. The experimental group of students were 40, boys and girls each 20. Then volleyball physical education teaching, the teaching period is from April 20, 2017, to August 18, 2017, a total of 112 days. The number of teaching hours is 32, including teaching hours of 4 volleyball theoretical courses and teaching hours of 28 actual training courses. Except for the different teaching modes, the two experimental groups arranged their learning content, teaching teachers and teaching practice to be similar to reduce the credibility of the research results caused by objective factors. At the end of the entire study period, all students were tested for theoretical courses, training skills and physical fitness. All the obtained test data were analyzed by SPSS 22.0 software.

The k-means algorithm is a model developed based on increasing industry data in recent years. This algorithm can analyze data information with high dimensionality [14]. Because of this algorithm, the data analysis process is more convenient, and the results are more efficient; therefore, it began to be gradually applied to various sectors of the data analysis process. The application process of this algorithm model is that it is vital to select a certain initial point with high credibility in the data matrix to be analyzed and then calculate the distance between other data in the data matrix and the initial point; all data values that can be clustered with the initial locations, then retrieved for final evaluation analysis by calculation of the average of all data values. The model formula of this algorithm is shown in (1), and its visibility is shown in Figure 3.

$$J_n = \frac{1}{n} \sum_{i=1}^k \sum_{x \in C_i} |x - m_i|^2 \tag{1}$$

Where n represents the number of data in the data matrix to be analyzed, x represents each data information, C_i represents the initial aggregation point, m_i represents the data information of the initial aggregation point, k represents the number of initial aggregation points, J_n represents the data information and the distance between initial points.

$$J = \frac{J_1 + J_2 \dots + J_n}{n} \tag{2}$$

Where J represents the average distance between all the analyzed data information and the initial point, J_n represents the distance between the data information and the initial point, and n represents the number of all the data information.

4. Result Analysis and Discussion

4.1. China's Sports Industry Development Status Survey Results

The development of the sports industry has an extremely important impact on improving China's overall strength and enhancing its international status. Especially in today's era, the sports industry has gradually become the subsidiary pathway for the political and cultural exchanges between different countries in the development of the times. By holding large-scale sports events at home and abroad, the sports industry can also prompt the country to show its strength in development. The results show that with the development of the times, our country has begun to pay more attention to the sports industry. Significantly during the 2008 Beijing Olympic Games, the injection of sports funds in our country was increasing and more sports colleges and universities are established, and a large number of athletes began to be cultured (Figure 4). This also shows that our country started to pay attention to the sports industry to a certain extent. The reason was that the importance of developing the sports industry is beyond doubt. It provides a positive impetus to improving the comprehensive literacy of our country's citizens. With the development of the sports industry, the outstanding achievements of Chinese athletes in major sporting events have also

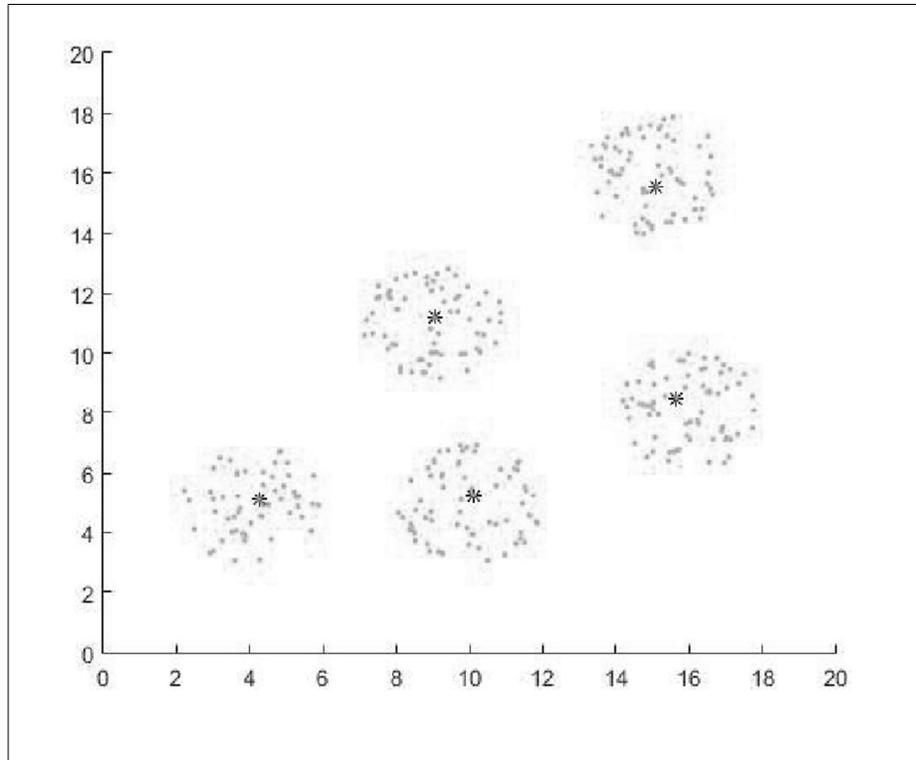


Figure 3. K-means algorithm

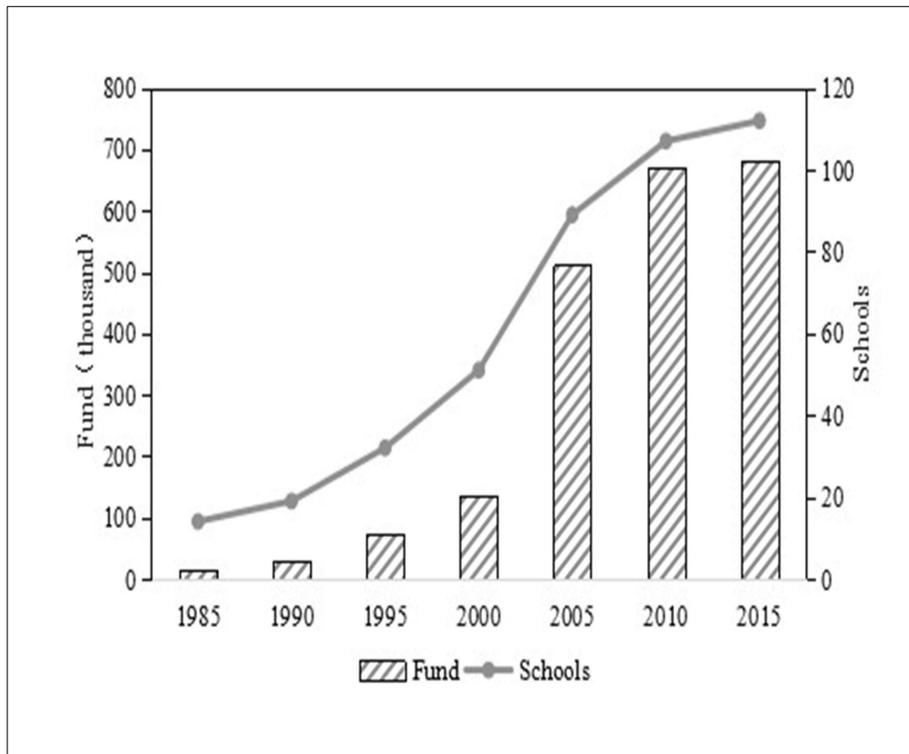


Figure 4. China's sports industry development status quo

helped to enhance our country’s international status and ultimately increase the communication channels between our country and other countries. However, the development of the sports industry in our country still has many drawbacks, which manifested in our country’s sports industry is not related to the theory and training techniques; athletes cannot be trained in the process of more accurate and efficient training, and athletes may be injured as a result of mistakes in the athlete’s training process. They may severely affect their careers, and the current fiercer international competitions require athletes to master more skilful and precise skills. Therefore, under the current situation of development, the development of physical education is extremely necessary.

4.2. “Internet +” Under the Background of Ordinary University PE Teaching MOOC System Construction Results

The development of computer technology is a relatively new science and technology nowadays. Since this technology can collect vast amounts of data and information and then excavate all the data information using a more systematic computing model, some industries and fields’ development processes is more critical information resources [15]. Thus, computer technology began to be widely used in various industries. “Internet +” is a more critical development trend of the rapid development of computer technology. This kind of technology organically connects different industries and people through the use of the network and the Internet for specific data, etc. The transmission, thus breaking the transmission of the original information, may be subject to time and space constraints. Today, many industries and fields have begun to use the “Internet +” technology; the MOOC system is using such technology to form a new field of education through the Internet technology to link all aspects of the traditional teaching process organically. Throughout the teaching process, teaching effectiveness has been greatly improved. In this study, based on the discussion of the predominance factors of MOOC system, the author constructed the MOOC system of PE teaching in colleges and universities. The result of system construction is shown in Figure 5.

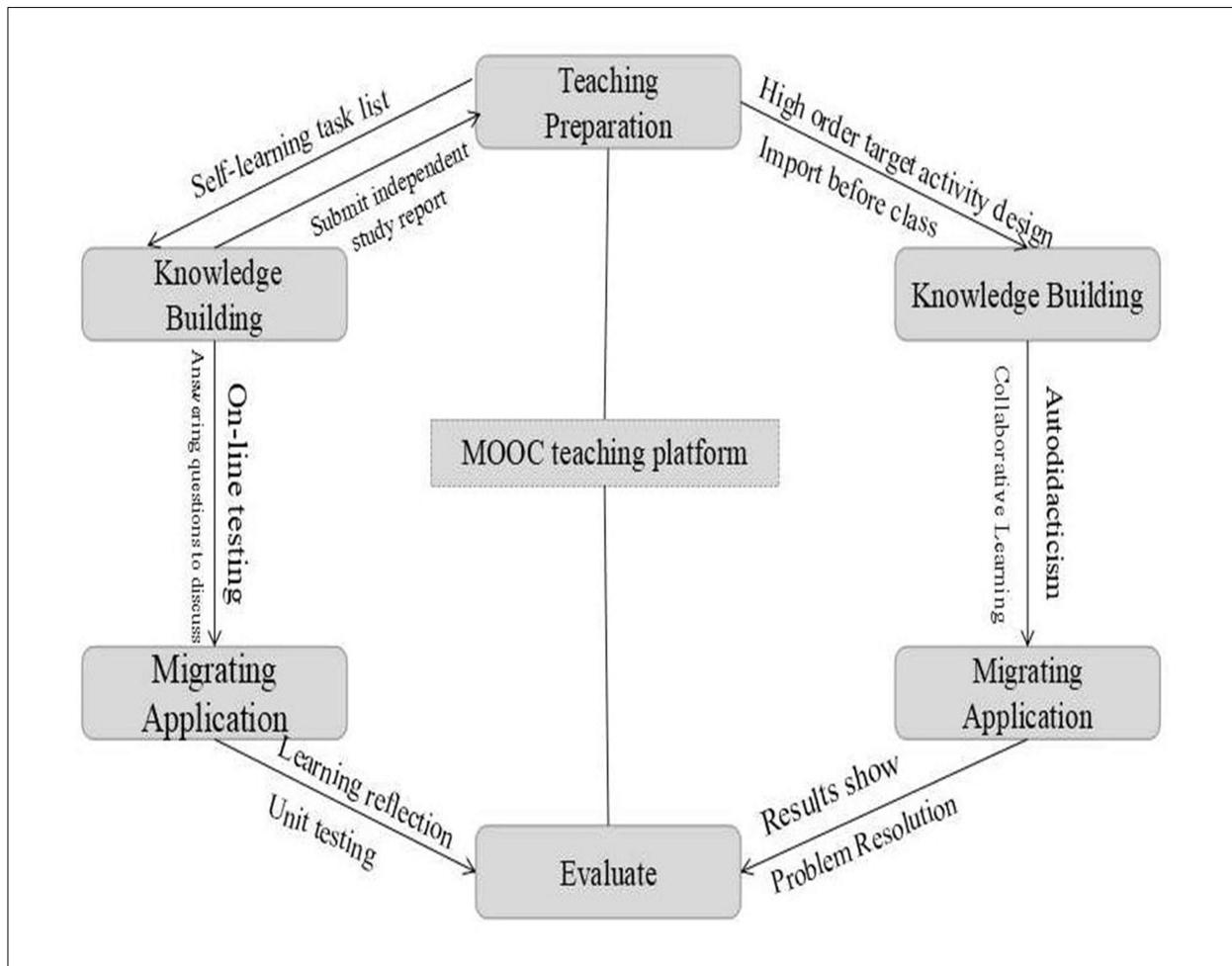


Figure 5. Results of building MOOC system of PE teaching in colleges and universities under the background of “Internet +”

4.3. Ordinary University Teaching MOOC System Before and After the Application of Student Training Effectiveness Analysis Results

Based on the completion of the construction of a MOOC teaching system in colleges and universities, the author applies it to the actual training process of volleyball majors in a PE college. After a period of 112 days of teaching process, theoretical course test scores, skill level and physical level conducted a comparative analysis to determine the practical application of MOOC teaching effectiveness. Among them, the scores of the theoretical courses are mainly based on the results of the test of the curly scroll, with a score of 100; the skill level is mainly based on the determination of the pros and cons of the students and their self-knowledge and self-maturity; the level of the physique is based on the national Physique-related indicators for the evaluation criteria. The results are shown in Table 1. The results show that the students in the MOOC teaching experimental group are better than the traditional teaching control group regarding test scores, technical skills and physical fitness in theoretical courses. In contrast, their theoretical courses have significantly better test scores and skills than those of the traditional teaching control students ($P < 0.05$). The analysis suggests that the MOOC system uses computer technology to provide more systematic, accurate information for the students' training and then provides technical support for the training effect of learning.

4.4. Comparison of the Results of Comprehensive Training Effectiveness of Experimental Group and Control Group Based on K-means Algorithm

The author finally introduces the K-means algorithm to compare and analyze the comprehensive training effectiveness of

Determining quota	Group	Number of people	Average value	Standard deviation	<i>t</i>	<i>P</i>
Examination results of theoretical courses	experimental group	40	84.531	4.326	0.039	0.002
	control group	40	75.227	7.541		
level of skill	experimental group	40	80.145	3.677	1.071	0.032
	control group	40	77.278	6.502		
Physique level	experimental group	40	72.297	5.856	0.037	0.992
	control group	40	72.268	6.807		

Table 1. Results of Training Effectiveness Analysis Before and After the Application of MOOC Systems in Colleges and Universities

Source	X mean value	<i>Ci</i>	<i>mi</i>	<i>Jn</i>	<i>Sig.</i>
Control group	115.296	3	38.682	1.194	0.274
Experimental group	131.252	1	121.727	3.611	0.048
Error	1603.73	1	11.627	0.049	0.813
Amount to	1735.220	80			
Total after carrion	1722.705	80			

Table 2. K-means Algorithm Based Experimental Group and Control Group Comprehensive Training Effectiveness of Comparative Analysis Results

students in different teaching modes. The analysis results are shown in Table 2. The results show that students' comprehensive training effectiveness is significantly better under the MOOC teaching system than the traditional teaching mode.

5. Conclusion

In the course of the development of the times, while vigorously developing economic sectors and promoting more efficient development policies, our country has also made the overall strength of various industries and fields in our country and developed at a relatively high speed. However, with the economic development in our country, the state began to realize that our country's national accomplishment and economic development present an unbalanced development trend. Therefore, in this context, our country began to strengthen the development of the sports industry. Especially in recent years, the influence brought by the rapid development of the sports industry is also increasingly important. It not only shows that the national accomplishment of our country has been obtained the comprehensive promotion but also encourages the athletes in our country to get more impressive competition results in large-scale sports events and, to a certain extent, promotes the further improvement of China's overall national strength. The more systematic physical education methods can also provide perfect training techniques and theories for developing the sports industry. The proposal and application of MOOC system also provide a positive impetus for popularising sports training techniques and theories in our country. In this study, the author aims at the insufficiency of the PE teaching process in our country and then analyzes the practical application of the MOOC system. Although there are still some areas for improvement in the research because of the few subjects set by the author, they have a certain degree of credibility.

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