



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

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.

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[2] Physical education has also made great progress in this situation; various countries and regions have begun to develop physical education to guide certain sports so that athletes or people can be more accurate in training ways 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. Finally, through a more systematic training process, one can obtain more excellent athletic performance [4]. In this study, the author will analyze the shortcomings of MOOC teaching methods in the current college sports teaching in our country and provide a reference for the development and improvement of 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 as 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. For example, in the war era, sports are often training activities for soldiers' literacy. In peacetime, the early period of sports is 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, the field of physical education has also been greatly 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 is being used in 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 lives have 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, 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 a vital role in elevating its international influence. 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 win-win 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 on 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 so as to provide the research foundation for this research.

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. The development of physical education can not only help sports spread in a wider range of forms but also help our sports learners to 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 sports, more and more colleges and universities have become 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 increase the injury rate, which may eventually lead to short training opportunities for athletes in 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 certain 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.



Figure 1. China's Sports Industry Development

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, for 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

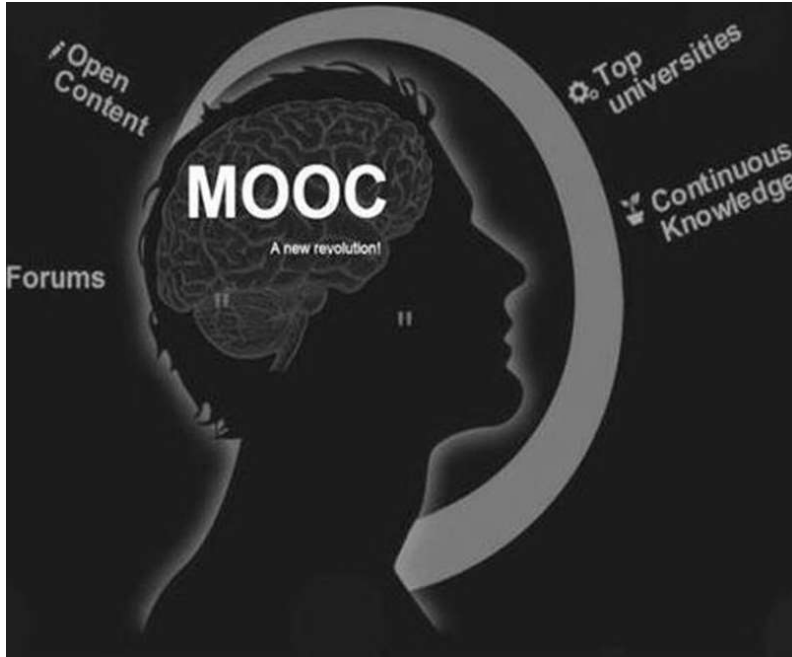


Figure 2. MOOC system applications

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 test data obtained were analyzed using SPSS 22.0 software.

The *k*-means algorithm is an algorithmic model developed to increase the amount of data in various industries in recent years. This algorithm can analyze data information with high dimensionality [14]. Because of this algorithm the process of data analysis is more convenient, and the results of the analysis of data more efficient, therefore, began to be gradually applied to various sectors of the data analysis process. The application process of this algorithm model is that it is important 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 can be clustered with the initial locations and then retrieved for final evaluation analysis by calculating the average of all data values. The model formula of this algorithm is shown in (1), and its visibility is shown in Figure 3.

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.

$$j_n = \sum_{i=1}^k \sum_{x \in C_i} |x - m_i|^2 \quad (1)$$

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.

$$j = \frac{j_1 + j_2 + \dots + j_n}{n} \quad (2)$$

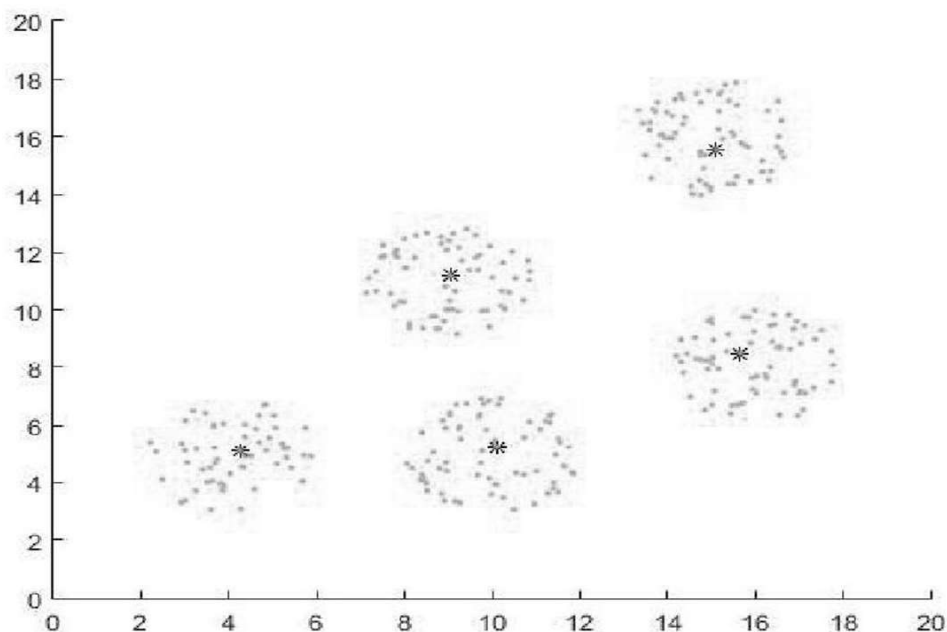


Figure 3. K-Means Algorithm

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. Especially during the 2008 Beijing Olympic Games, the injection of sports funds in our country was increasing, and more sports colleges and universities were established, and a large number of athletes began to be cultured (Figure 4). To a certain extent, this also shows that our country started to pay attention to the sports industry. 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 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, in the current situation, the development of physical education is essential.

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 huge amounts of data and information and then excavate all the data information by using a more systematic computing model, some industries' and fields' development processes are more important information resources [15]. Thus, computer technology began to be widely used in various industries. "Internet +" is a more important 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, the Internet for certain data, etc.

The transmission, thus breaking the transmission of the original information, may be subject to the constraints of time and space. Today, many industries and fields have begun to use the "Internet +" technology. MOOC system uses such technology to form a new field of education through 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.

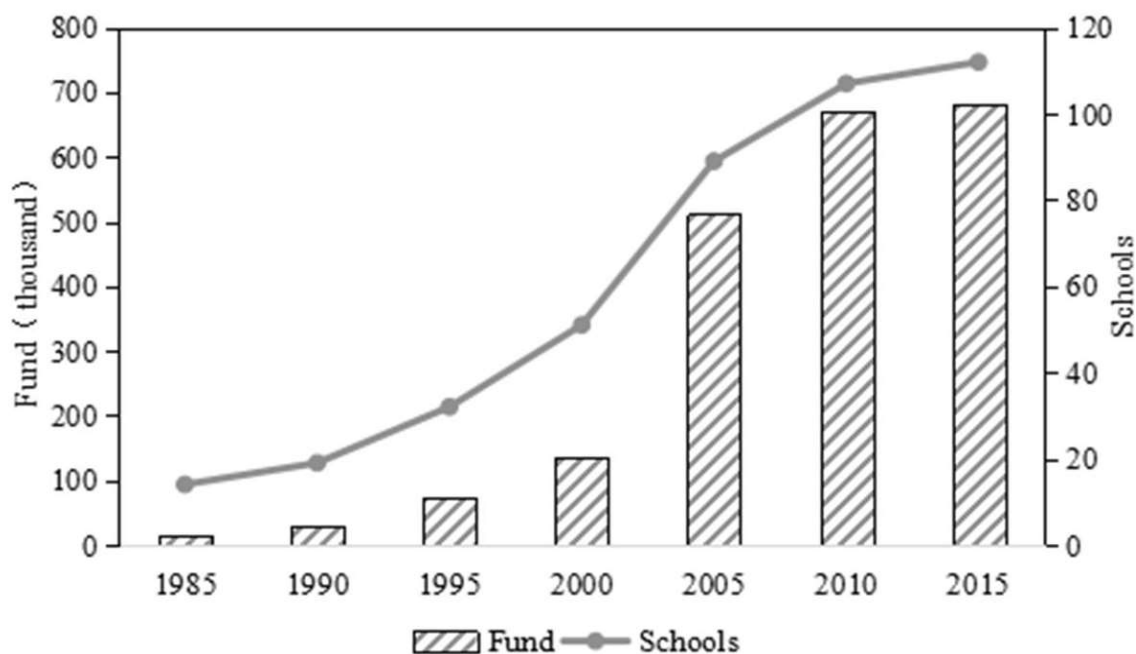


Figure 4. China's sports industry development status quo

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

Based on the completion of a MOOC teaching system in colleges and universities, the author applies it to the actual training process of volleyball majors in PE colleges. After 112 days of teaching, theoretical course test scores, skill level, and physical level were used for 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 in terms of test scores, technical skills and physical fitness of 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 it may be that the MOOC system uses computer technology to provide more systematic and 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 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 in the traditional teaching mode.

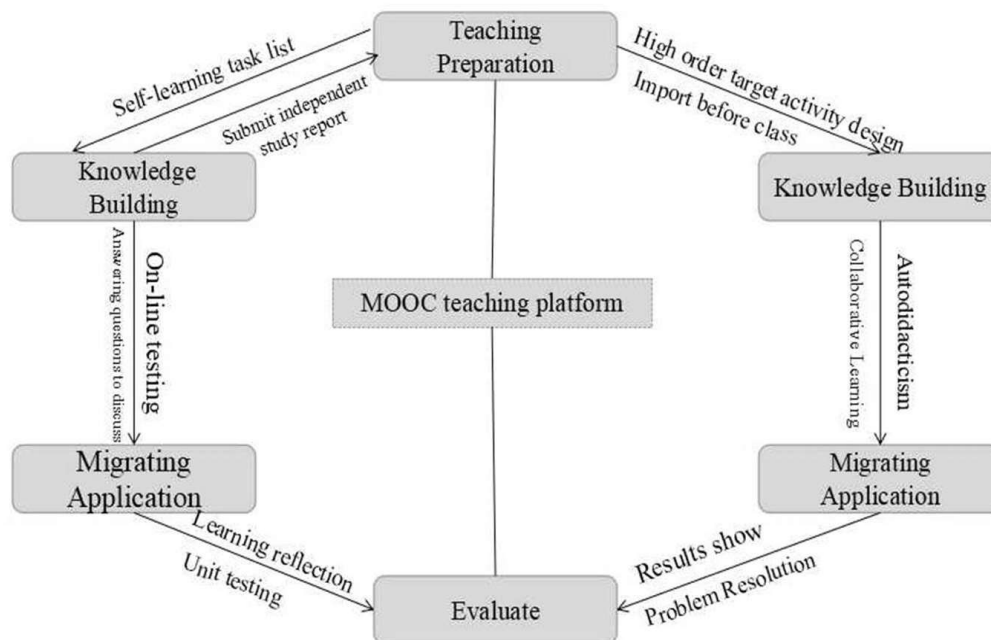


Figure 5. Results of building MOOC system of PE teaching in colleges and universities under the background of “Internet +”

Determining Quota	Group	Number of People	Average Value	Standard Deviation	t	P
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

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 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 has also become increasingly important. It not only shows that the national accomplishment of our country has been obtained through 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 entire sports industry. The proposal and application of the MOOC system also provide a positive impetus for the popularization of 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. However, there are still some deficiencies in the research because the few subjects set by the author have a certain degree of credibility.

Source	X Mean Value	Ci	mi	Jn	Sig.
Control Group	115.296	3	38.682	1.194	0.274
Experimental Group	131.252	1	121.727	3.611	0.048
Error	1603.731	1	1.627	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

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