


Research Article

Quality Evaluation of College Physical Training considering Apriori Algorithm

Rong Zhu,¹ Junrong Wang,² Fan Yu,² and Weilin Wang² 

¹Science and Technology College, Gannan Normal University, Ganzhou, Jiangxi 341000, China

²Institute of Physical Education, Gannan Normal University, Ganzhou, Jiangxi 341000, China

Correspondence should be addressed to Weilin Wang; 1000003@gnnu.edu.cn

Received 2 June 2022; Revised 18 July 2022; Accepted 27 July 2022; Published 22 August 2022

Academic Editor: Leipo Liu

Copyright © 2022 Rong Zhu et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the continuous progress of society and economy, more and more attention has been paid to the physical quality of students. As an essential support carrier, physical education (PE) class is responsible for the exercise and improvement of the physical quality and fitness of students. In this paper, with physical training as a breakthrough point, the data on training quality are evaluated based on the Apriori algorithm and the factor mining is carried out accordingly. Through the Apriori algorithm, an in-depth analysis is carried out in this paper on the practical teaching status of physical training programs at colleges and universities in the country. From various perspectives such as the development of the existing physical training programs and their functional features, the advantages of physical training programs in teaching at colleges and universities are analyzed. At the same time, suggestions are given with regard to the current teaching model and status quo at colleges and universities to achieve the goal of driving the development of physical training in the country. Finally, the results of the practical case analysis indicate that physical training programs are feasible in the education curriculum at colleges and universities. To some extent, the spirit of physical training programs is similar to the concept of physical education at colleges and universities. There are many types of physical training programs, which can be used as rich resources for physical education at colleges and universities. From the results of the research, it can be seen that the Apriori algorithm can be used to evaluate the training quality of physical education effectively; the mastery levels of physical education skills among male students are generally higher than those among female students, and the difference is relatively significant; the algorithm proposed in this paper can be used to evaluate the data effectively, which is of great significance for supporting the decisions on improving the quality of training.

1. Introduction

With the continuous advancement in the society and economy, more and more attention has been paid to physical training. It is necessary to ensure the growth of students as the primary subjects of education in their studies and physical fitness on all fronts [1–3]. However, due to the excessive academic load, the vast majority of students cannot obtain a proper degree of exercise. Hence, the importance of physical education as one of the essential courses in improving the physical fitness of students is gradually coming to the fore [4, 5]. Improving the quality of physical training and fully exerting its role in the relevant application is a crucial way and method to improve the physical quality of

students and enhance their physical fitness. Due to its specificity, physical training can be carried out in a systematic and targeted way to achieve the integration of training and exercise [6–8]. In accordance with various methods of classification, physical training can be divided into two categories: the classroom theory class and the outdoor practice class. The so-called classroom theory class refers to the class where classroom knowledge is taught in the classroom, while the outdoor practice class mostly refers to the class where the teachers and students are engaged in relevant physical activities in a venue or stadium [9–11]. With regard to the physical education practice classes, it is highly necessary to carry out the corresponding assessment and evaluation. First of all, the data acquired need to be

assessed, and further evaluation can be carried out based on the results of the assessment. Evaluation is a summary of the appearances, while evaluation is a summary of the outcome and results. The proper implementation of evaluation on physical training is conducive to helping the teachers accurately understand the training progress, training quality, and training priorities, sort out the training rules, identify the training deficiencies, summarize the gains and losses, and learn the relevant lessons from the training. In accordance with these summaries, experiences, and development directions, good training courses of physical education are rated and rolled out as pilot to improve the training quality of physical education classes. Assessing and evaluating the training in physical education is of important significance. However, it is necessary to have a comprehensive and objective understanding of the practical classroom training before the focus of physical education classroom training can be clarified and documented appropriately. With regard to the issues or confusions encountered by the students in physical education, it is necessary to have priority and take the key issues into consideration for in-depth analysis. For example, if the training quality is poor and the students are not sufficiently motivated, why this is the case and how to make improvement should be assessed comprehensively so as to obtain the relatively objective and scientific results. How is the quality of physical training evaluated effectively? In the existing studies, it is generally evaluated from both the qualitative and the quantitative aspects. The so-called qualitative evaluation refers to comprehensive evaluation based on data through surveys and consultations to identify the quality of physical training; on the other hand, quantitative evaluation refers to the implementation of evaluation by establishing a system of indexes, such as training capacity, mastery level of students, and their class performance, to carry out a comprehensive evaluation through the comparison of various indexes of the students [12–14]. However, it cannot be ignored that it is impossible to tap a large amount of hidden information intuitively. Thus, it is necessary to make use of the data mining techniques that have emerged in recent years to extract the hidden information from a large amount of data to provide support for decision-making with regard to the knowledge acquired [15]. Different from the existing models in foreign countries, the teaching models in China at present are mostly based on random grouping and free combination to carry out the relevant classification and training. Such grouping often leads to a relatively huge difference in the overall skill level, which, to some extent, can inhibit the learning effect of the students through teamwork and collaboration. It should be noted that as students are the future of the country, their physical health determines the long-term development of the nation and the economic revitalization of the country. It is exactly for this reason that more attention should be given to the physical fitness of students. The guidance of students to improve their physical fitness is mainly carried out in accordance with guidance-based, inspiration-based, and other strategies. Not only is it an attempt to practice education, but it is also a crucial direction for engagement and participation. Compared to the practices in foreign

countries, the interventions for students in our country are relatively fewer and less frequent.

The physical training at colleges and universities is sorted out effectively based on the Apriori algorithm. The intelligent monitoring of the types of physical training actions at colleges and universities is carried out, and the statistics of heterogeneous group teaching and learning are obtained. Process evaluation is performed on the physical training at colleges and universities by using the modified factor algorithm with the purpose of further improving the effectiveness of the physical training and teaching outcome at colleges and universities. The badminton training in physical education is taken as a breakthrough point to evaluate the quality of physical training by mining the relevant information. In addition, the factors influencing the training quality are identified so as to enhance the training quality and improve the training methods.

2. Basic Theory of the Apriori Algorithm and the Related Algorithm

The Apriori algorithm is an undirected link tree, in which each focused node stands for an attribute, the branch on the node stands for an output of the attribute, and each branch leaf node stands for the corresponding category distribution. The application of the Apriori algorithm consists of two main steps: Firstly, the relevant training data sets are collected, organized, evaluated, and tested to establish the corresponding data evaluation types. Secondly, the data evaluation types thus generated are used to classify the data samples that have yet to be classified and processed.

The Apriori algorithm is an iterative process from the top-down. The test is carried out on the attributes in the sample set from the root node of the Apriori algorithm. The training results are classified in accordance with the test results and then further divided into several training subsets. Subsequently, each training subset is transformed into a nonleaf node of the directory tree, and the iterative loop repeats the step to create the leaf nodes of the directory tree. During the whole transformation process, the branches of the Apriori algorithm are unable to reflect the salient parts of the training set due to the existence of various data noise. These parts tend to influence the results and lead to overfitting and other issues. Hence, it is necessary to carry out pruning on the Apriori algorithm accordingly at the right time.

The classification algorithm of Apriori is implemented on the basis of the following principle.

Let S be the training set and s stand for the number of samples. It is assumed that the class C_i ($i = 1, 2, \dots, m$) has m different values and that s_i stands for the number of samples in the class C_i . The expected information required to classify a given sample can be obtained according to the equation as follows:

$$I(s_1, s_2, \dots, s_m) = -(p_1 * \log_2(p_1) + p_2 * \log_2(p_2) + \dots + p_m * \log_2(p_m)). \quad (1)$$

In this equation, $p_i = s_i/s$ stands for the probability that any sample is classified as C_i .

It is assumed that attribute A has ν different values $\{a_1, a_2, \dots, a_\nu\}$, and S can be further divided into ν subsets $\{S_1, S_2, \dots, S_\nu\}$ by using the attribute A ; among them, the samples in S_j have the same value a_j for the attribute A . If A is selected as the test attribute, the aforesaid subsets correspond to the branches grown from the nodes containing the set S . Let s_{ij} be the number of samples in the class C_i of the subset S_j . The expected information entropy of the subset classified based on A can be calculated according to

$$E(A) = \sum_{i=1}^{\nu} \frac{s_{ij} + \dots + s_{mj}}{S} I(s_{ij}, \dots, s_{mj}). \quad (2)$$

In the previous equation, the term $s_{ij} + \dots + s_{mj}/S$ serves as the weight of the j -th subset. At this point, the encoded information that can be obtained through the bifurcation on the attribute A is calculated according to

$$\text{Gain}(A) = I(s_1, s_2, \dots, s_m) - E(A). \quad (3)$$

The algorithm is used to calculate the information attribute of each attribute, and the attribute with the highest information gain value calculated is taken as the test attribute of S . A node is created in accordance with the test attribute and marked with the aforesaid attribute; then, a branch is built for each value of the corresponding attribute, and the samples are classified accordingly.

In the establishment of the Apriori algorithm, the phenomenon of repeatedly training anomalous bifurcation is observed after the calculation due to the presence of the prominent influence of the data in the training set and this part of the anomalous branches needs to be pruned. For the purpose of generating a simple Apriori algorithm that is easy to understand, it is necessary to prune the Apriori algorithm quantitatively to address the issue of branch anomalies. In general, the pruning methods of the directory tree include the prepruning method and the postpruning method. The former is to suspend the creation of children nodes for branches that fail to meet the tree building conditions before the directory tree is established, while the latter is to subtract the abnormal branches after the tree has been built and generate a new Apriori algorithm based on the leaf nodes after pruning. After comprehensive assessment, the post-pruning method is adopted in this paper.

3. Evaluation of Physical Training Quality

The data samples used in this paper are selected from the freshmen class of 2020 at a college, and the data are collected by distributing survey forms at the end of the semester. The main content of the survey form is to investigate the factors that may affect the training quality of physical education. The purpose of the evaluation is to reveal the true value of physical education training. To this end, the evaluation indexes need to be objective and scientific and to be able to reflect the true training status and the practical effect comprehensively. At the same time, experts in physical education are also invited to assess the training results of the physical education teachers and establish the relevant database for evaluation. The 0.7 samples are extracted from the

database and used for data evaluation. The information in the extracted data is mined to build a classification model based on the Apriori algorithm. The remaining 0.3 data are used as the validation data to assess the established data classification model, and the model is considered valid when the accuracy rate is above 95%.

$$h_t = o_t^* \tanh(c_t). \quad (4)$$

The dynamic features at the individual level and the motion level are obtained by using the Apriori algorithm, and the details are shown in

$$\widehat{Z} = LSTM(\widehat{\theta}_1, \widehat{\theta}_2, \dots, \widehat{\theta}_T), \quad (5)$$

$$Z^n = LSTM(\theta_1^n, \theta_2^n, \dots, \theta_T^n). \quad (6)$$

From the beginning to the end of the training, athletes often show a significant stability in their movement. In this paper, the average intensity of movements in the athletes is ranked in a descending order, and iterative training is implemented by assigning the initial weight values to all individuals in the movement. An estimation method with high precision is adopted, and the details are shown as follows:

$$F^k(u, v, 2i - 1) = d_t^x(u, v), \quad (7)$$

$$F^k(u, v, 2i) = d_t^y(u, v). \quad (8)$$

In the teaching process of the Apriori algorithm, collaboration and interaction are implemented and the cooperative instruction is carried out in the form of competition within the group to further clarify the concept of collective thinking in students so as to enhance the cohesion and teamwork of the students. In this way, they can experience the collaboration and unity when they are playing the ball game, which can improve their motivation and the effectiveness of badminton physical exercise. In the process of experimental instruction, effective evaluation should be carried out on each group and the specific evaluation index is determined in accordance with the features of each technique to achieve the goals of teaching and training.

3.1. Evaluation of the Students' Learning Process by Teachers.

In each stage of the process, the teachers rate the students based on whether the corresponding learning objectives are achieved, the extent of progress made in the subject matter, the spirit of teamwork, and other aspects. The valid scores are in the threshold range of [1, 4]:

- ① Firstly, the quality of training is evaluated. The evaluation of the training quality of the students is carried out during the fixed training process, as shown in Table 1, and the mean score of mutual ratings among the students is calculated accordingly.
- ② *Method of Modification Factor*. In accordance with the comprehensive evaluation of the learning process by the relevant teachers and students, mutual evaluation and self-evaluation are set as the specific

TABLE 1: Quality content of special training programs of physical education for students at general colleges and universities.

Evaluation indexes and scores	4 points	3 points	2 points	1 point
Level of skills	Very proficient	Relatively proficient	Have a certain level of skill	Have relatively poor skills
Level of physical fitness	Able to adapt to the training easily	Adapt to the training generally	Barely adapt to the training	Unable to adapt to the training
Extent of progress	Very obvious	Relatively obvious	With some progress	With relatively small progress
Status of engagement	Very motivated and active	Relatively motivated and active	Average attitude	Passive and lack of confidence

modification factor of the group evaluation to ensure that the final grade of individual students can reflect the specific situation of the students in the group learning process truthfully and effectively.

The weight of the process evaluation of badminton skills is 40%.

3.2. Summative Evaluation of the Study Performance in the Students. In practical physical education, there should be improvement in the standardized technical movements, the timely feedback on the effect, and the enhancement of the skill level in the process of physical education of the students. In this paper, 3 specific items are selected for the effectiveness evaluations in the learning effect, which accounts for 60% in the overall evaluation of badminton skills.

3.3. Evaluation Scores of Special Techniques and the Weight of Each Part in the Experimental Class and the Control Class. It is assumed that the total evaluation score in the experimental class is 100, the process evaluation score accounts for 40% of the total score, and the end-of-study evaluation score accounts for 60% of the total score.

It is assumed that the total evaluation score of the control class is 100 points, the evaluation score at the end of the learning session accounts for 60% of the total score, and the evaluation score during the teaching training accounts for 40% of the total score.

Based on the computation of the relevant scores, the mean value of each item is calculated and valid statistical analysis is carried out by using the statistical software, that is, the quality evaluation of the effective training of badminton skills and internal motivation.

With the introduction of multimedia, Internet, and other technologies, a number of training models have been established for physical training, and the relatively popular ones include the “happy physical training” and the “active physical training.” However, due to the different organization and focus of the aforesaid training models, the following aspects need to be taken into consideration in their evaluation.

3.3.1. Objectives of Physical Training. For each physical education class, the teachers should be clear about their training objectives. The student status, practical physical

education conditions, available equipment and venues, weather conditions, and other situations should be taken into comprehensive consideration in the development of the training objectives. For different textbooks, different hours of physical training classes, and different classes of students, different training objectives should be developed. Hence, the objectives formulated need to reflect authenticity, relevance, and scientific nature. With regard to the badminton training, it takes a certain process and some time to increase the mastery level of the relevant movements and improve the physical quality and fitness. How to achieve a certain goal or mastery level within 45 minutes of a class should be clarified. For example, “the understanding and mastery of the basic situation” and “the consolidation and improvement of the relevant skills” should be stated in the unit and training sessions accordingly.

3.3.2. Engagement Degree of Students. For all the students, it is necessary to improve their motivation to engage in learning by themselves, which is also the key to physical education classes and can directly influence the effectiveness of physical training. Thus, whether the motivation of students can be fully mobilized by the teachers and whether the students themselves are willing to learn independently are the key to evaluating the quality of physical training. On the one hand, it is necessary to teach the students according to their aptitude; that is, different students with various features should be trained based on different methods. For example, some individual students are good at singles; in this case, they should train hard on the singles skills. In comparison, some students are suitable for doubles; in this case, it is necessary to train their tacit cooperation with their teammates in addition to the general skill training. As far as improving physical fitness and capability is concerned, it should be clarified which quality to focus on and which capability to improve. The accuracy of the training objectives can directly influence the process and effectiveness of the classroom training as a whole.

3.3.3. Efficiency of Classroom Training. In accordance with the different training models and various features of the classes, teachers can guide the students with the corresponding explanation, guidance, and practice. However, it cannot reflect the guidance efficiency of the teachers and the learning efficiency of the students quantitatively. Hence, the

factors that affect the efficiency of classroom training may include the reasonableness in the design of the venue and equipment, the good conditions of the weather, the reasonableness of the training methods, and so on.

3.3.4. *Achievement of Training Objectives.* Whether the students can achieve the expected training goals, how to evaluate this part quantitatively, whether the students can master the corresponding skills and movement essentials properly, and whether the corresponding psychological quality, will power, and quality training is in line with the physical training objectives can truly reflect the effectiveness of classroom training, which is also the main basis of quality evaluation.

4. Experiments and Result Analysis

With the badminton training as the breakthrough point, the training methods, organizational methods, and management models at this college are collected, consolidated, and evaluated to improve the badminton mastery levels of the students.

It can be observed from the calculation results that with regard to the mastery level of forehand serve of the kill shot, the male students have an excellent rate of 10.1%, which is about three times the excellent rate of the female students; with regard to the mastery level of the forehand serve of the backcourt lofty goal, the male students still have an excellent rate of 10.8%, which is more than 3 times the excellent rate of the female students. This suggests that it is relatively tricky to master the two badminton serve techniques described above. Hence, the physical education teachers should focus on these skills during training; in terms of the training methods, continuous improvement should be carried out accordingly (Figure 1).

The calculation results of Figure 2 suggest that except for the mastery of the skills on the backhand serve of the net shot, there is no apparent difference between male students and female students, while there are obvious gender differences in the rest of the badminton techniques. For example, the mean score of the male students is 9 points higher than that of the female students in the forehand serve of the backcourt lofty goal; the mean score of the male students is also nearly 9 points higher than that of the female students in the backhand serve of the backcourt lofty goal; and the mean score of the male students is even up to 13 points higher than that of the female students in the forehand serve of the kill shot. With regard to such techniques that require strength and skills, the male students have a much higher level of mastery than the female students. The routine survey of the students indicates that strength and speed are still crucial factors affecting their mastery of skills. In addition, it is relatively obvious that male students may be more interested in badminton than female students.

From the calculated results in Figures 3 and 4, it can be known that with regard to the technique of the forehand serves of the kill shot, the scores of the students in the tenth grade are 15 points higher than those of the students in the

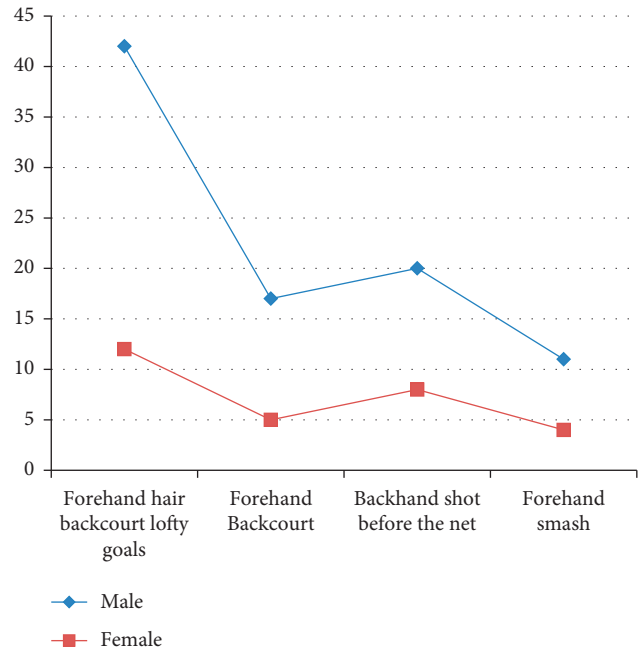


FIGURE 1: List of excellence rates in the badminton test scores of the students of different genders ($N_1 = 157, N_2 = 109$).

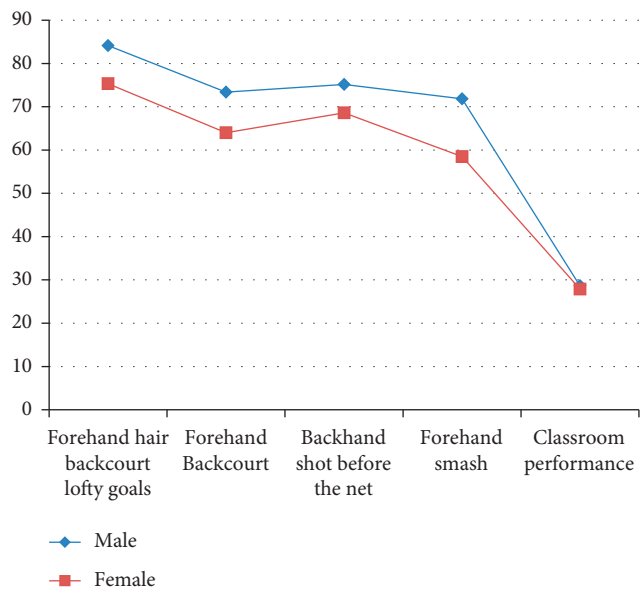


FIGURE 2: Comparison of the mean scores in the badminton tests among the students of different genders.

eleventh grade, which are significantly different, while no significant difference is observed in the scores of the other test items.

From the test results in Figure 5, it can be concluded that there is no difference in the scores between the students in the experimental class and the students in the general class after the tests of various serve techniques, except for the scores of the forehand serve of the lofty goal. No abnormalities are found in the results of the other tests, which have verified that there is no huge gap between the students in the

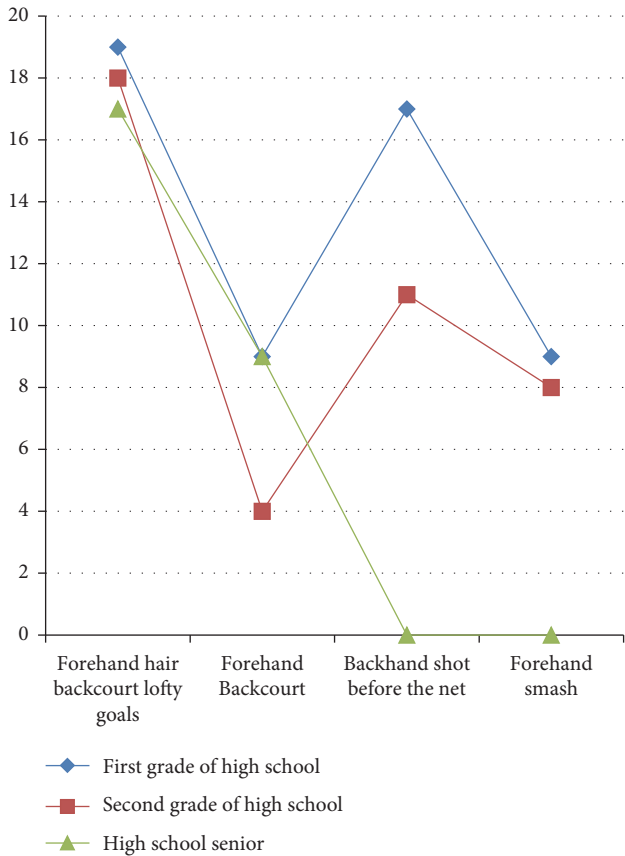


FIGURE 3: Comparison of the excellence rates in the badminton test scores of the students in different grades.

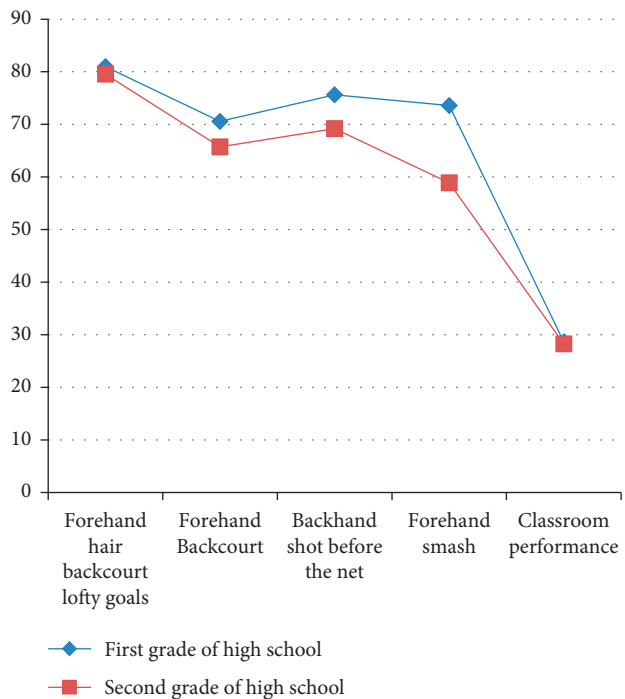


FIGURE 4: Comparison of the mean scores in the badminton tests of the students in the tenth grade and eleventh grade.

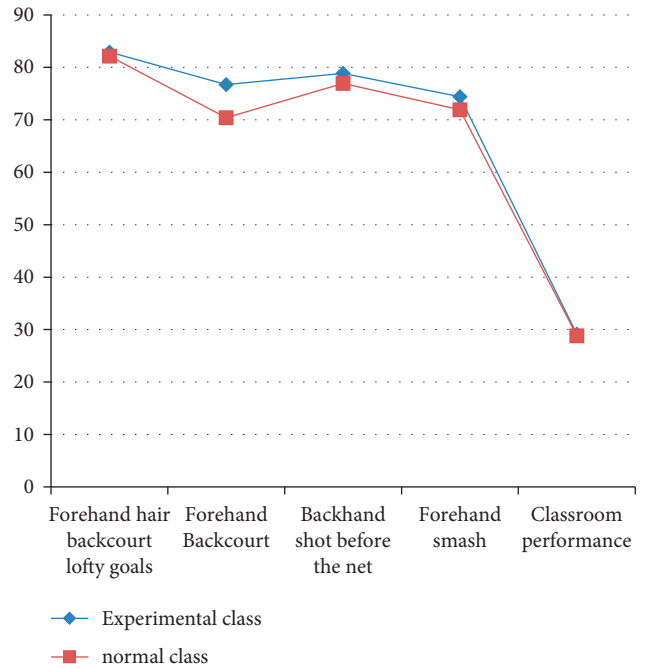


FIGURE 5: Comparison of the mean scores in the badminton tests among the students with different academic levels.

experimental class and those in the general class in their badminton learning and training.

From Figure 6, it can be seen that there is a relatively huge difference between the students in the experimental class and the students in the Yuhua class in the test results of various techniques. There is a gap of 7 points in the test results of the forehand serve of the lofty goal and a gap of even 15 points in the test results of the forehand serve of the kill shot; there is a gap of 16 points in the test results of the backhand serve of the lofty goal and a gap of up to 20 points in the test results of the backhand serve of the kill shot, which is the highest. The above results indicate that the students with excellent study performance are also more excellent in badminton skills than the students with relatively poor study performance; at the same time, it can be observed from the data on their performance in class that the students with excellent study performance also perform better than the students with relatively poor study performance. Combined with their training performance on the court at ordinary times, it can be seen that the students with relatively poor study performance are more prominent in terms of being late for class, lack of concentration in their learning and training, and absenteeism from class.

Students with the excellent study performance are assigned to the experimental class, those with relatively good study performance are assigned to the general class, and those with relatively poor study performance are assigned to the Yuhua class. Through the competition of badminton serve court skills, the relevant scores are obtained. In the samples, 106 students have a score of more than 80 points, accounting for 67.5% of the total samples. Among them, there is one student who failed the test, accounting for 0.6% of the total samples. The number of students who score more

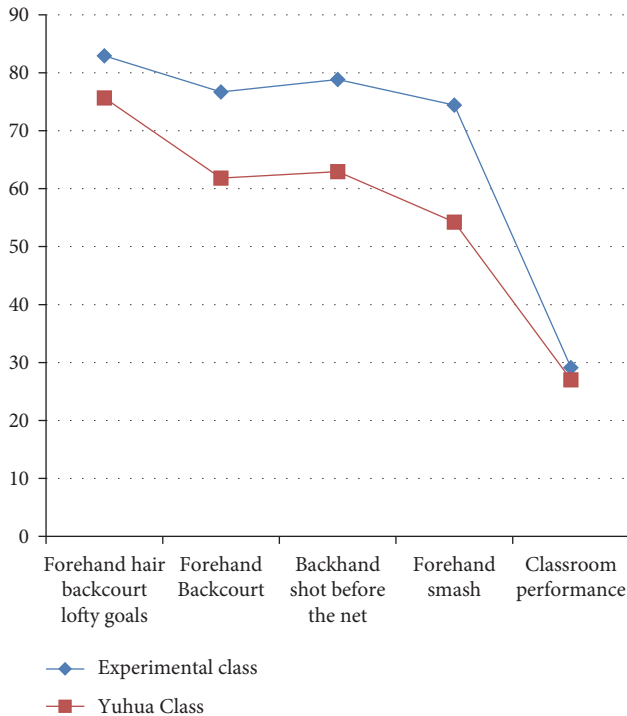


FIGURE 6: Comparison of the mean scores in the badminton tests among the students with different academic levels.

than 80 points in the batting skill test is 48, which accounts for 30.6% of the total samples. Among them, 25 students are not up to the standard in the score, which accounts for 43.1% of the total samples; 6 students failed the test, which accounts for 5.5% of the total samples. However, in the competition of forehand ball skills, the students in the eleventh grade (a total of 109 students) did not attend the test; 36 students have a score of more than 80 points, accounting for 33% of the total samples; 10 students failed the test, accounting for 9.2% of the total samples. From the test results of the basic skills of badminton, it can be observed that the skills of the students in forehand serve are higher than those in the long ball and that their skills of backhand serve are relatively higher, with 67.5% and 43.1% reaching the excellent scores, respectively. Among them, the probability of failing the test is also relatively low, with the forehand serve of the lofty goal accounting for 30.6% and the forehand serves of the kill shot accounting for 33%. At the same time, the failure rate of the two basic techniques described above is relatively high. Thus, it can be concluded that the skills for the forehand serve of the lofty goal and the forehand serve of the kill shot are relatively tricky, which should be the focus of practice among the students in class.

5. Conclusion

More and more attention has been paid to the training quality at the physical education class. In this paper, with badminton as the breakthrough point, the relevant data samples are first consolidated based on the Apriori algorithm. Through classification and investigation, data mining,

and modeling evaluation, the factors that affect the training quality of physical education are explored with the purpose to improve the training quality of physical education classes. The teaching of physical programs in colleges and universities can not only drive the further development of physical training but also effectively fill the gaps due to the single competitive sports in the physical education programs at colleges and universities in foreign countries, which can facilitate the vigorous development of physical education and sports in domestic colleges and universities. The two aspects can promote each other to achieve a win-win situation. The physical training programs are of important significance in the teaching at colleges and universities. Hence, it is necessary to put the physical training programs on the right position in college education. Through reasonable and practical development of education resources in physical training, a scientific and rational physical education system is established. The sports culture is inherited and carried forward by changing the traditional teaching model. The results of the research indicate that the Apriori algorithm proposed in this paper can be used to evaluate the quality of physical training effectively; the relevant data can be evaluated effectively based on this algorithm, which is of great significance for supporting the decisions on improving the quality of training.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This research study was sponsored by 2019 National Social Science Funds. The name of the project is Evaluation System for Campus Football Characteristics Based on CIPP. The project number is 19XTY006. The authors thank the project for supporting this article.

References

- [1] D. Amado, T. Garcíacalvo, J. Marreiros, J. L. Chamorro, and F. Del Villar, "Analysis of students' emotions in agreement with the dance teaching technique used," *Physical Review*, vol. 63, no. 2, pp. 138–158, 2015.
- [2] M. Matsushita, A. Obara, M. Kihara, and S. Sotokawa, "Study on teaching of university regular physical education class (I): whtreferece to the present status of the consciousness toward the cbjects ofphysical education in the students," *Journal of Medicinal Chemistry*, vol. 33, no. 12, pp. 3127–3130, 2015.
- [3] M. Catucci, G. Venturi, L. Romano, P. E. Valensin, and M. Zazzi, "Analysis of the HIV-1nef gene in five intravenous drug users with long-term nonprogressive HIV-1 infection in Italy," *Journal of Medical Virology*, vol. 60, no. 3, pp. 294–299, 2000.

- [4] M. Towns, "Analysis of instructor facilitation strategies and their influences on student argumentation: a case study of a process oriented guided inquiry learning physical chemistry classroom," *Journal of Chemical Education*, vol. 93, no. 9, pp. 1501–1513, 2016.
- [5] E. V. Solovyeva and E. Borisov, "Demonstration of physical and analytical features of surface-enhanced Raman scattering by analysis of folic acid in commercial tablets," *Journal of Chemical Education*, vol. 97, no. 8, pp. 2249–2253, 2020.
- [6] R. B. Burns, J. E. Potter, H. A. Ricciotti, and E. E. Reynolds, "Screening pelvic examinations in adult women: grand rounds discussion from the beth Israel deaconess medical center," *Annals of Internal Medicine*, vol. 163, no. 7, pp. 537–547, 2015.
- [7] Y. Wang, Y. Wang, B. Greene, and L. Sun, "An analysis and evaluation of quality and behavioral change techniques among physical activity apps in China," *International Journal of Medical Informatics*, vol. 133, no. 1, Article ID 104029, 2020.
- [8] N. Acestor, S. Masina, J. Walker, N. G. Saravia, N. Fasel, and M. Quadroni, "Establishing two-dimensional gels for the analysis of Leishmania proteomes," *Proteomics*, vol. 2, no. 7, p. 877, 2002.
- [9] P. J. O'Malley, J. R. Agger, and M. W. Anderson, "Teaching a chemistry MOOC with a virtual laboratory: lessons learned from an introductory physical chemistry course," *Journal of Chemical Education*, vol. 3, no. 2, pp. 1508–1520, 2015.
- [10] S. M. Contakes, "Misconduct at the lab? A performance task case study for teaching data analysis and critical thinking," *Journal of Chemical Education*, vol. 93, no. 2, pp. 314–317, 2016.
- [11] A. Smits, A. Lopes, R. Bekkers, and K. Galaal, "Body mass index and the quality of life of endometrial cancer survivors-A systematic review and meta-analysis," *Gynecologic Oncology*, vol. 137, no. 1, pp. 180–187, 2015.
- [12] A. S. Stang and B. M. Wong, "Patients teaching patient safety: the challenge of turning negative patient experiences into positive learning opportunities," *BMJ Quality and Safety*, vol. 24, no. 1, pp. 14–18, 2015.
- [13] J. A. Rendeiro, C. Rodrigues, L. Rocha, R. S. B. Rocha, M. L. da Silva, and K. da Costa Cunha, "Physical exercise and quality of life in patients with prostate cancer: systematic review and meta-analysis," *Supportive Care in Cancer*, vol. 6, no. 3, pp. 1–9, 2021.
- [14] J. R. Grandis, M. F. Melhem, E. L. Ba Rnes, and D. J. Tweardy, "Quantitative immunohistochemical analysis of transforming growth factor- α and epidermal growth factor receptor in patients with squamous cell carcinoma of the head and neck," *Cancer*, vol. 78, no. 6, pp. 1284–1292, 1996.
- [15] N. Matsumoto, T. Nakamura, Y. Yasui, and J. Torii, "Analysis of muscle proteins in acute quadriplegic myopathy," *Muscle & Nerve*, vol. 23, no. 8, pp. 1270–1276, 2000.