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Article

The application of the SPOC teaching model in college elective basketball courses: integrating biomechanical principles for enhanced performance

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Abstract: The SPOC (Small Private Online Course) model is a new teaching model derived from Massive Open Online Courses (MOOC) and is an important direction for the reform and innovation of future higher education. In the practical application of SPOC teaching, subjectivity issues may arise, namely the influence of individual opinions and judgment criteria. The evaluation may focus on certain aspects and neglect others, resulting in incomplete overall assessment results. This paper applies the SPOC teaching model in three time periods: before class, during class, and after class, with a focus on integrating biomechanical principles into the evaluation of student performance in basketball. The study employs various research methods such as literature review, Analytic Hierarchy Process (AHP) analysis, and fuzzy comprehensive evaluation to construct a comprehensive evaluation index system for student ability improvement in SPOC teaching in higher education. This system incorporates biomechanical factors such as movement efficiency, force production, and body mechanics, which are essential for enhancing basketball skills. Based on this, an evaluation method for student ability improvement in college SPOC elective basketball courses is proposed using the AHP-fuzzy evaluation model. This model not only assesses traditional skill metrics but also integrates biomechanical assessments, such as shooting mechanics, dribbling efficiency, and defensive posture. The application of the AHP-fuzzy evaluation model, enhanced with biomechanical insights, demonstrates that his method can effectively improve students basketball abilities. The incorporation of biomechanical principles allows for a more holistic evaluation of student performance, emphasizing the importance of physical mechanics in skill development. The integration of the SPOC teaching model with biomechanical principles in elective basketball courses provides a comprehensive framework for evaluating and improving student performance. By focusing on both skill acquisition and biomechanical efficiency, this approach not only enhances basketball abilities but also fosters a deeper understanding of the physical demands of the sport.

Keywords: SPOC teaching model; elective basketball course; index system; AHP-fuzzy comprehensive evaluation model

1. Introduction

The modern information technology environment has brought more possibilities for the reform and development of higher education. MOOC, as large-scale open online courses, have also shown vigorous development trends both domestically and internationally with the rapid development of the Internet [1]. Due to its characteristic of resource sharing, MOOC continue to attract more and more universities to actively participate in the construction and maintenance of MOOC course resources [2]. After many years of development, MOOC have become a large-scale online education platform with a massive amount of high-quality educational resources. In the teaching practice of different disciplines, SPOC teaching model has

shown a wide range of application prospects. For example, Liu et al. studied the IT English flipped classroom teaching mode based on SPOC and found that this mode can significantly improve students' learning interest and autonomous learning ability, and effectively improve students' English understanding and application ability [3]. In addition, Jia et al. explored the mixed teaching mode of SPOC and MOOC in the experimental teaching of physical chemistry, and the research showed that this mode can significantly improve students' experimental operation skills and understanding of core concepts [4]. These results show that SPOC teaching model has been applied in different subject areas and has achieved positive results, which provides a new idea for teaching reform.

Although MOOC have a wealth of high-quality educational resources and courses, when it comes to applying platform courses to specific teaching practices, it is found that MOOC online courses have constraints that are difficult to overcome. For example, courses lack interactive design between teachers and students, lack monitoring of the learning process, and have low student course completion rates [5, 6]. The low teaching requirements and unscientific evaluation methods make it difficult for students to obtain credit certification. The openness of the courses allows anyone to apply, but the lack of tailored teaching for individual students and difficulty in guaranteeing teaching quality. Professor Xie et al. proposed the SPOC teaching model, which effectively compensates for the limitations of MOOC online courses. This teaching model combines the use of high-quality educational resources from MOOC online platforms with the interactive advantages of offline courses. It emphasizes student participation in the classroom, ensuring their role as active learners, and focuses on personalized and targeted classroom content. By fully utilizing the advantages of online and offline teaching integration, it enhances the quality and effectiveness of classroom teaching and better achieves the intended teaching goals [7]. Hui explored the impact of the SPOC teaching model on student motivation and performance [8]. The research results showed that courses using the SPOC teaching model can improve student motivation and performance. Zhu studied university English reading teaching based on the SPOC model and evaluated its impact on students' reading comprehension abilities. The research results show that the use of the SPOC teaching model can effectively improve students' reading comprehension ability [9].

This article is based on the implementation of the SPOC model for elective basketball courses, and specifically describes how the SPOC model is applied to online and offline basketball elective courses from three aspects: pre-class, in-class, and post-class. An index system for comprehensive assessment of student ability improvement is constructed. Then, further application of AHP analysis and fuzzy comprehensive evaluation is used to make more detailed and accurate assessments to determine whether students have improved their abilities in this SPOC hybrid teaching model.

2. The application value of the SPOC teaching model

In China, the value advantages of the SPOC teaching model are gradually being recognized, developed, and applied [10]. Scholars such as Qiong conducted SPOC teaching experiments on two elective badminton classes at their university, and the experimental data showed that the SPOC mixed teaching model is superior to the

current traditional teaching model. It can effectively alleviate the contradiction between insufficient "teaching" and "learning" time in offline physical education classrooms, meet students' personalized learning needs, effectively improve students' badminton knowledge and skills learning effectiveness, stimulate their awareness of independent learning, and promote the development of students' good exercise habits [11]. For example, in one study, the experimental study of the SPOC-based flipped classroom in the basketball general course of a sports college showed that the correct rate of the students in the experimental class increased by 20% after the course, showing the significant role of this mode in promoting the learning effect [12].

Scholars such as Chen found through teaching experiments that the "SPOC + flipped classroom" model improved the theoretical knowledge literacy of the tennis major students at their school, stimulated students' initiative in learning, corrected students' attitude towards learning, and helped students develop good study habits, significantly improving the teaching effectiveness of tennis classes [13]. He et al. explored the blended teaching model of "Introduction to Software Engineering" based on the SPOC model and found that this approach effectively improved students' practical skills and classroom engagement [14]. It can be seen that teaching and research practices in domestic and foreign universities all demonstrate the significant value advantages of the SPOC teaching model. Universities must use the most advanced modern teaching methods to improve the quality of course teaching in order to achieve leapfrog development and enhance the overall competitiveness of the university [15, 16]. Through literature analysis, the value advantages of applying the SPOC blended teaching model to physical education teaching can be summarized as follows.

2.1. Improve students' independent learning ability and promote deep learning

The SPOC teaching model takes students as the main body of teaching and always adheres to the concept of "student-centered" education. It integrates teaching resources, designs and produces teaching content, and provides high-quality learning resources that meet the needs of students. It arouses students' learning interests, stimulates their intrinsic motivation for learning, and enhances their independent learning ability. The whole teaching process is mainly based on students' independent learning, and teachers play the role of guiding and supervising. Teachers can ensure the controllability of teaching throughout the SPOC teaching process, supervise the online and offline learning status of students, understand their learning situation in a timely manner, clarify the difficulties encountered in their self-study process, help them build a complete knowledge system, and master the correct technical skills, ensuring the achievement of teaching objectives. The SPOC teaching model emphasizes students' independent learning while also valuing the guidance role of online and offline teachers, effectively promoting deep learning.

2.2. Make up for the lack of time for "teaching" and "learning" in college physical education classes and promote the improvement of teaching effectiveness

The low frequency of elective physical education classes once a week is not conducive to the solid mastery of students' sports knowledge and skills. The diverse teaching methods of SPOC break the traditional time-space constraints of physical education classes, extend the teaching time, and expand the teaching space to meet the learning needs of various stages of knowledge and skill mastery, internalization, and consolidation. During the preview stage before class, students can flexibly choose the time and place to independently learn through the rich and high-quality theoretical knowledge and technical explanation videos on the online SPOC platform, acquire new knowledge, and initially master the knowledge and skills. In the offline classroom, teachers provide targeted explanations and demonstrations for the problems encountered by students during self-learning, organize students to explore learning in small groups, and help students better internalize basic knowledge and movement skills, greatly improving the quality and efficiency of classroom teaching. Finally, after class, students can use the online platform to focus on watching and reviewing the unfamiliar knowledge and skills, strengthen practice, and achieve solid mastery of the learned sports knowledge and skills. The SPOC teaching model makes up for the lack of time for "teaching" and "learning" in college physical education classes, extends and expands the time and space of physical education classes, helps students solidly master knowledge and skills, and promotes the improvement of teaching effectiveness.

2.3. Create various evaluation features to promote more scientific and fair teaching assessment

Incorporate online learning analysis, test feedback, and other digital diversified evaluation functions into the SPOC teaching process. Through learning feedback analysis, optimize teaching resources and achieve mutual growth of teaching and learning. The evaluation standards shift from the traditional summative evaluation of offline courses to a combination of process-oriented and summative evaluation. By analyzing learning duration, engaging in discussions, analyzing assessments, evaluating homework submissions, and student peer evaluations, the feedback from the learning platform data is comprehensively analyzed to assess students' academic performance. In conclusion, this evaluation method, which combines the SPOC intelligent evaluation system with student classroom performance, can help students reflect on the learning process in a timely manner and cultivate their ability to think deeply about problems. It can comprehensively evaluate students' learning and knowledge mastery in this model and promote more scientific and reasonable teaching evaluation.

3. Teaching implementation of basketball electives under SPOC mode

3.1. Preparation before teaching

Build a basketball SPOC teaching platform. The SPOC teaching platform is a prerequisite and key link for the implementation of the basketball SPOC blended teaching model. The basketball teacher selects high-quality teaching resources on the MOOC platform based on the course syllabus and teaching objectives, combines them with self-made teaching resources, uploads them to the SPOC platform, and sequentially completes the course introduction, course outline, teacher introduction, and course content construction. The teacher then imports the list of students who meet the course requirements into the platform system to complete the construction of the basketball SPOC platform. Specifically, for course content, the uploaded teaching resources include ideological and political study content, basketball micro-lecture videos, PowerPoint (PPT) courseware, discussion topics for each class, test question banks, and expanded teaching resources for assignments, etc. All content can be adjusted and modified in a timely manner based on teaching practices in order to ensure real-time optimization of course content in the interactive teaching and learning process between teachers and students.

3.2. Teaching implementation stage

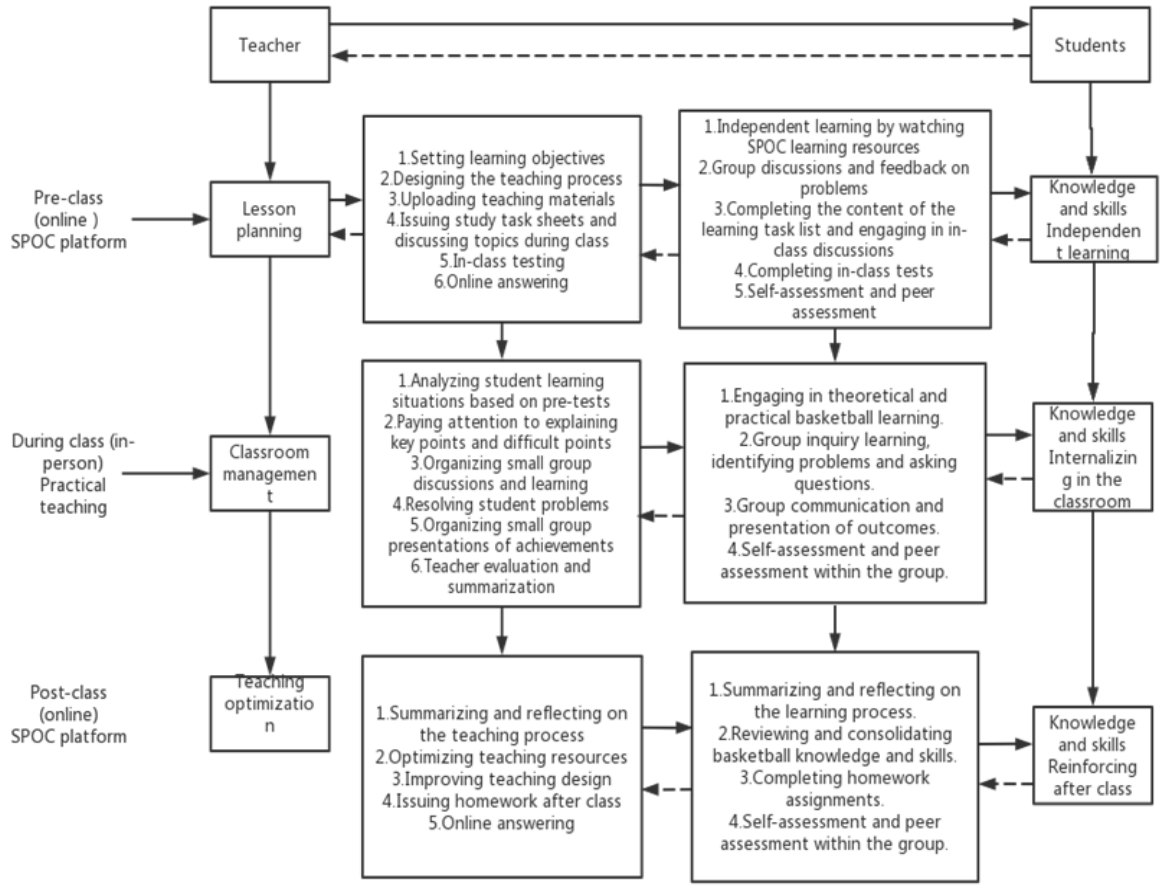

Figure 1. Teaching process flowchart for college elective basketball course based on the SPOC model.

The teaching implementation stage of the blended teaching mode of college basketball course based on SPOC includes three stages: pre-class, in-class, and post-class. The pre-class independent learning and post-class review and consolidation are completed by students independently online through the SPOC platform. The in-class

part is offline classroom practice teaching, mainly to internalize students' basketball knowledge and skills. The whole process relies on the SPOC platform and effectively exerts the integration advantages of online and offline blended teaching of basketball (as shown in **Figure 1**).

3.2.1. Before class (online—SPOC platform)

The pre-class stage aims to achieve students' self-directed learning through the SPOC platform, laying a theoretical foundation for classroom practice and clarifying learning objectives. Teachers need to carefully design online learning resources, including video breakdown of basic basketball movements, electronic courseware explaining theoretical knowledge, and exercise question banks for teaching focuses and difficulties. These resources should be designed with students' learning habits in mind, and video lengths are usually limited to 8 to 10 minutes to maintain the focus of the content and facilitate students to use fragmented time to complete learning. In order to guide students to study more efficiently, teachers will also publish a task list on the platform, specifying the weekly learning content, such as "complete the three-step layup technical learning and related theory tests". During the learning process, students can ask questions or share insights in the platform discussion board, while teachers monitor students' participation and completion in real time through the background to identify common weak points.

The pre-class task design is not only limited to the learning of knowledge points, but also encourages students to think deeply through open questions. For example, when learning the basic theory of passing, the discussion board may have a question such as "How to complete an accurate pass under defensive pressure", and students will enter the class with an understanding after independent exploration, so as to be fully prepared for the next stage of practical activities. Teachers can use the learning reports generated by the platform (such as video viewing time, test scores and discussion participation) to fully grasp the pre-learning situation of students and adjust the classroom teaching content accordingly.

3.2.2. During class (in-person—Practical teaching)

Classroom practice stage is the core link to realize the combination of theory and skills, focusing on practical operation to help students consolidate knowledge and internalize skills. According to the feedback of students before class, the teacher first reviews the basic theoretical knowledge, and explains the difficult points and common problems in detail. For example, when students generally perform poorly on a "quick pass" theory test, the teacher starts the class with a disaggregated movement demonstration and emphasizes its application skills in conjunction with a competition situation. Students then work in groups, which can be assigned according to skill level to ensure balance and competition in teamwork.

Classroom activities not only focus on skills training, but also add situational simulation to strengthen the learning effect. For example, in the teaching module of "zone defense", students are required to conduct offensive and defensive drills in designated areas, and teachers help them adjust their movements and strategies in time through observation and guidance. After each round of practice, groups of students are required to present and exchange suggestions for improvement through group evaluation. This approach not only improves class participation, but also stimulates

students' active exploration and interest in skills. At the end of the class, the teacher summarized the teaching effect according to the students' performance, and assigned the students an intensive task after class, such as "upload your defensive video and explain the process of tactical application", which laid the foundation for after-class learning.

3.2.3. After class (online—SPOC platform)

The main goal of the after-school stage is to consolidate the knowledge learned in class, further strengthen the skills and complete the closed loop of teaching. Students need to upload their own practice videos according to the teacher's task list, such as zone defense drills in simulated games, and complete mutual evaluation within the group through the platform. This part helps students find out their shortcomings in the process of reflection and get suggestions for improvement through peer evaluation. By analyzing the homework completion data and assessment reports provided by the platform, teachers identify problems in a timely manner and provide personalized guidance. For students with weaker foundations, teachers may recommend additional resources that are more targeted, such as "zone defense skills enhancement videos" or personalized practice recommendations.

At the same time, teachers will reflect and summarize the teaching process, and optimize the teaching resources and activity design according to the classroom feedback. For example, when a particular argument is found to be ineffective, the teacher may re-create a more detailed video explanation or add more analysis of real cases. Another focus of the after-school period is to prepare for the next lesson, such as assigning students the task of watching a video of a classic game and asking them to analyze the use of tactics in the game, setting the stage for subsequent class discussions.

4. Building a comprehensive evaluation index system for students' ability enhancement in university basketball elective courses under the SPOC teaching mode

Currently, there are certain standards and research results for the construction of evaluation index system for SPOC in university basketball elective courses. An and Qu proposed a hierarchical learning model based on deep learning and applied it to the SPOC and flipped classroom, enhancing students' learning outcomes [13].Based on these references, this article designs a set of evaluation index system for SPOC teaching quality in university basketball elective courses, taking into account the practical experience of SPOC in university basketball elective courses, as well as research methods such as questionnaire survey and Delphi expert interview to analyze the characteristics that students need to improve in university basketball elective courses under the SPOC teaching mode and the requirements of fuzzy comprehensive evaluation method. This index system emphasizes student-centeredness, emphasizes data statistics and evaluation of student behavior, and covers all aspects of the course to improve teaching quality. See **Table 1** for details.

Table 1. Comprehensive evaluation index system for elective basketball courses in universities under the SPOC teaching mode.

Target level	Criterion level	Program level	Program-level indicator description
Assessment Indicators for the Improvement of Student Abilities in College Basketball Elective Courses Under the SPPOC Teaching Model.	Technical capability	Dribbling(A_1)	It refers to the ability of students to master and apply various dribbling techniques, such as basic dribbling, directional dribbling, and dribbling past defenders.
		Shooting(A_2)	The ability to accurately shoot during a game and master different shooting techniques and angles.
		Passing(A_3)	The ability to accurately pass the ball, including direct passes, diagonal passes, and body passes.
		Defense(A_4)	The ability to effectively defend during a game and master various defensive techniques and tactics.
	Mental qualities/mental resilience	Decision-making ability(B_1)	The ability to make decisions and adapt to changes during a game
		Self-confidence(B_2)	The level of confidence an individual has in their abilities and performance
		Concentration(B_3)	The ability to maintain focus and sustain concentration during a game
		Stress management(B_4)	he ability to cope with pressure and difficulties in competitive games
	Physical fitness	Speed(C_1)	The explosiveness and acceleration of a student in a game, such as their ability to make quick starts and run rapidly
		Endurance(C_2)	The ability of a student to maintain stamina and energy consistently throughout a game
		Strength(C_3)	The muscular strength and explosiveness that a student possesses in a game, such as the ability to make powerful shots and compete for rebounds
		Agility(C_4)	The reaction speed and agility of a student in a game, such as their flexibility in changing direction, turning, and evading

Using the AHP to determine the weights of each indicator

Building a scientific and reasonable evaluation index system is important, but the contribution of each indicator may vary for different types of courses. Therefore, it is necessary to assign different weights to each indicator. In this study, the was used to scientifically assign weights to the indicators. AHP is a qualitative and quantitative integrated, systematic, and hierarchical analysis method that is suitable for decision-making problems with complex structures, numerous decision criteria, and difficulties in quantification.

Comparisons between each factor and a certain criterion in the previous layer are made in pairs to construct the judgment matrix of this layer. In this study, ten SPOC experts and experienced SPOC teachers were invited to compare and score the judgment matrix, and the average value was calculated. The judgment matrix and weight results are shown in **Table 2**.

Table 2. AHP hierarchy analysis results.

Item	Feature vector	Weight value	Largest eigenvalue	CI value
Technical capability	0.480	0.141	3.054	0.027
Psychological quality	1.145	0.332		

A hierarchical index system based on teaching objectives is established, and the improvement of students' ability is divided into three first-level indicators: technical ability, psychological quality and physical quality; Each level has a number of secondary indicators, such as technical ability including dribbling, shooting, passing and defense. On this basis, 10 experts in the field of teaching and evaluation, including college SPOC teaching practitioners and senior basketball coaches, were invited to form a panel. According to the importance of students' ability improvement, experts compare and score each index in pairs, so as to construct a judgment matrix.

Secondly, **Tables 3–5** respectively show the judgment matrix and weight distribution results of the three first-level indicators and their corresponding second-level indicators. For example, **Table 3** lists the weight calculation process in the technical ability indicator, with "shooting" having the highest weight value (0.563), while "defense" has a smaller weight value (0.055) due to its low practical difficulty. **Table 4** lists in detail the weight distribution of psychological quality indicators, among which "attention concentration" has the highest weight (0.507), indicating its critical role in students' competition performance. **Table 5** makes a quantitative analysis of the weight of physical quality, and "speed" occupies the first place with the weight of 0.563, indicating its importance in basketball competition. According to the Consistency Ratio (CR) test, the CR value of all judgment matrices is less than 0.1, indicating that the weight allocation process has logical consistency.

In addition, **Table 6** shows the fuzzy relationship matrix of students' feedback after class, which is used to analyze the specific performance of students in various ability indicators. For example, in the distribution of students' mastery of "shooting", the proportion of "excellent" is higher (30%), while the distribution of "defense" ability is more uniform, reflecting that there is room for improvement in their learning effect. Combined with student feedback data and platform learning data (such as learning time and test results), the rationality of expert scoring and weight allocation is further verified.

The final results show that the weight of technical ability is the largest (48%), followed by psychological quality (33%), and physical quality is relatively small (19%). This kind of distribution not only reflects the actual teaching demand of basketball course, but also emphasizes the importance of psychological quality in competitive sports.

The scientific nature of these weight allocation comes from the following points: First, it combines the double basis of expert opinions and student data analysis to ensure that the allocation results have theoretical and practical support; Second, through the data display and consistency test in **Tables 3–6**, the transparency and credibility of the distribution results are improved; The third is to pay attention to the achievement of teaching objectives, apply the distribution results to actual teaching, and further verify its feasibility and effect with the fuzzy comprehensive evaluation model.

Table 3. AHP hierarchy analysis results.

Item	Feature vector	Weight value	Largest eigenvalue	CI value
Dribbling(A1)	1.495	0.263	4.117	0.039
Shooting(A2)	0.669	0.117		
Passing(A3)	3.201	0.563		
Defense(A4)	0.312	0.055		

Table 4. AHP hierarchy analysis results.

Item	Feature vector	Weight value	Largest eigenvalue	CI value
Decision-making ability(B1)	0.607	0.152	4.013	0.004
Self-confidence(B2)	1.052	0.263		
Concentration or focus(B3)	2.028	0.507		
Stress management(B4)	0.313	0.078		

Table 5. AHP hierarchy analysis results.

Item	Feature vector	Weight value	Largest eigenvalue	CI value
Speed(C1)	1.495	0.263	4.117	0.039
Endurance(C2)	0.669	0.117		
Strength(C3)	3.201	0.563		
Agility(C4)	0.312	0.055		

Table 6. Questionnaire assessment of teaching quality for elective basketball courses in SPOC mode universities.

Membership degree R	Excellent	Good	Average	Passing	Fail
A1	0	0.2	0.6	0.2	0
A2	0	0.8	0.2	0	0
A3	0	0.3	0.2	0.2	0.3
A4	0.1	0.3	0.3	0.3	0
B1	0.3	0	0.3	0.4	0
B2	0	0.2	0.2	0.5	0.1
B3	0	0	0.8	0.2	0
B4	0	0.3	0.4	0.3	0
C1	0	0.1	0.5	0.1	0.3
C2	0	0.4	0.6	0	0
C3	0	0.4	0.5	0.1	0
C4	0.2	0.8	0	0	0

5. Building an AHP-fuzzy comprehensive evaluation model for the teaching quality of SPOC

Due to the existence of many fuzzy economic phenomena in modern economic life, fuzzy comprehensive evaluation is a judgment model and evaluation method designed for this “fuzziness”. The basic principle is to first evaluate separately

according to indicators of a certain level, and then make a comprehensive evaluation according to all the first-level indicators. Fuzzy comprehensive evaluation combines quantitative and qualitative aspects, providing both strict quantitative description and subjective qualitative description for fuzzy phenomena that are difficult to analyze quantitatively. Qualitative description and quantitative analysis are appropriately combined.

Due to the inherent fuzziness in the evaluation of SPOC teaching quality, this study constructs an AHP-fuzzy comprehensive evaluation model for the evaluation of SPOC teaching quality, to obtain the hierarchy of SPOC teaching quality and achieve quantitative evaluation of SPOC teaching quality. The basic steps of constructing the SPOC teaching quality AHP-fuzzy evaluation model in this paper are as follows: (1) Determine the evaluation factor set U (based on **Table 1**), the evaluation level set V = (excellent, good, fair, pass, fail), and the weight coefficient set W (based on **Table 2**). (2) Answer the questions in the designed questionnaire to obtain the rating results for each indicator, establish the fuzzy relationship matrix R between the evaluation factors and evaluation levels, and determine the corresponding weight set Wi. (3) Calculate the hierarchical evaluation matrix B by using the AHP-fuzzy evaluation model to transpose the fuzzy relationship matrix, which can be calculated using the formula $B = wW.R$. (4) According to the maximum membership principle, obtain the evaluation conclusion, which is our final evaluation of the evaluation target.

6. Simulating experiments for the AHP-fuzzy comprehensive evaluation model of teaching quality in SPOC

"Statistics" is a compulsory course for all economic management majors in universities. It is a scientific discipline that seeks to understand unknown phenomena through data collection and analysis. It has a wide range of applications in various industries. In my years of teaching experience, I have strived to tailor my teaching methods to individual students based on the requirements of professional development goals. I have focused on cultivating students' statistical thinking and improving their statistical analysis and application abilities. However, due to the difficulty of some course knowledge, students often lack interest in learning in traditional classrooms. Especially due to limitations such as class hours and teaching resources, only combined teaching can be used, which directly affects the quality of teaching. In view of this, the implementation of "statistics" SPOC is undoubtedly an effective method to solve the above problems. Since the implementation of SPOC teaching in all management majors of our university, the teaching effect has been significantly improved, but there are also some problems to varying degrees. How to scientifically and effectively evaluate the quality of SPOC teaching has always been a problem that I have been actively exploring.

This study takes the course as an example and creates a questionnaire for evaluating the teaching quality of SPOC in the elective basketball course at the university, based on the constructed indicator system. The questionnaire was distributed to a total of 92 people, including teaching supervision experts, course team teachers, and students. The evaluated objects were scored, and 89 valid questionnaires were collected after the evaluation was completed. Finally, the evaluation data was

input into the comprehensive evaluation model to obtain the comprehensive evaluation results.

Based on the collected actual evaluation data, several second-level factor fuzzy relationship matrices (Ri) were constructed. Then, combined with the weights (Wi) of each evaluation indicator, the single-factor evaluation vector (Bi) of the SPOC teaching of "Statistics" was calculated.

(1) Technical competence.

$$A = \begin{bmatrix} 0 & 0.2 & 0.6 & 0.2 & 0 \\ 0.8 & 0.2 & 0 & 0 & 0 \\ 0 & 0.3 & 0.2 & 0.2 & 0.3 \\ 0.1 & 0.3 & 0.3 & 0.3 & 0 \end{bmatrix}$$

$$W = (0.263\ 0.117\ 0.563\ 0.055)$$

$$A1 = W \times R1 = (0.263,0.117,0.563,0.055) \times \begin{bmatrix} 0 & 0.2 & 0.6 & 0.2 & 0 \\ 0 & 0.8 & 0.2 & 0 & 0 \\ 0 & 0.3 & 0.2 & 0.2 & 0.3 \\ 0.1 & 0.3 & 0.3 & 0.3 & 0 \end{bmatrix}$$

$$= (0.1\ 0.3\ 0.263\ 0.2\ 0.3)$$

Calculating the comprehensive utility value:

$$S = B1 \times V^T = (0.1\ 0.3\ 0.263\ 0.2\ 0.3) \times (0.1,0.3,0.5,0.7,0.9)^T = 0.6415$$

Ranging from 0.5 to 0.7.

(2) Psychological qualities

$$B = \begin{bmatrix} 0.3 & 0 & 0.3 & 0.4 & 0 \\ 0 & 0.2 & 0.2 & 0.5 & 0.1 \\ 0 & 0.4 & 0.6 & 0 & 0 \\ 0 & 0.4 & 0.6 & 0 & 0 \end{bmatrix}$$

$$W = (0.750\ 0.250)$$

$$B2 = W \times R2 = (0.750\ 0.250) \times \begin{bmatrix} 0.3 & 0 & 0.3 & 0.4 & 0 \\ 0 & 0.2 & 0.2 & 0.5 & 0.1 \\ 0 & 0.4 & 0.6 & 0 & 0 \\ 0 & 0.4 & 0.6 & 0 & 0 \end{bmatrix} = (0.3\ 0.3\ 0.3\ 0.4\ 0.1)$$

$$S = B2 \times VT = (0.3\ 0.3\ 0.3\ 0.4\ 0.1) \times (0.1,0.3,0.5,0.7,0.9)\ T = 0.678$$

Ranging from 0.5 to 0.7.

(3) Physical qualities.

$$C = \begin{bmatrix} 0 & 0.1 & 0.5 & 0.1 & 0.3 \\ 0 & 0.4 & 0.6 & 0 & 0 \\ 0 & 0.4 & 0.5 & 0.1 & 0 \\ 0.2 & 0.8 & 0 & 0 & 0 \end{bmatrix}$$

$$W = (0.010\ 0.052\ 0.148\ 0.377\ 0.321)$$

$$B2 = W \times R2 = (0.010\ 0.052\ 0.148\ 0.377\ 0.32) \times \begin{bmatrix} 0 & 0.1 & 0.5 & 0.1 & 0.3 \\ 0 & 0.4 & 0.6 & 0 & 0 \\ 0 & 0.4 & 0.5 & 0.1 & 0 \\ 0.2 & 0.8 & 0 & 0 & 0 \end{bmatrix} =$$

$$(0.0778,0.0391,0.5796,0.2610,0.0422)$$

$$S = B2 \times VT = (0.0778,0.0391,0.5796,0.2610,0.0422) \times (0.1,0.3,0.5,0.7,0.9)$$

$$T = 0.529$$

Ranging from 0.5 to 0.7.

$$R=\begin{bmatrix} A \\ B \\ C \\ D \\ E \end{bmatrix}$$

$$B = A \times R = (0.047\ 0.070\ 0.077\ 0.151\ 0.146\ 0.210\ 0.301) \times R= (0.0228,0.2383,0.538,0.1906,0.0142,0,5621,0.2781)$$

$$S=B3 \times VT=0.4891$$

In the index of psychological quality, the average score of "concentration" was the highest (0.507), indicating that students could maintain concentration well in the course. However, "stress tolerance" was weak, with only 8 per cent of students achieving the "excellent" level. It is found that students are prone to decision-making errors under the pressure of high-intensity training or competition, which are manifested as deformation of technical movements or increased error rate. In order to solve this problem, pressure simulation training can be introduced into the course design, such as completing specific technical movements under tight timing conditions, so as to gradually improve students' anti-pressure ability. At the same time, the improvement of psychological quality should be combined with ideological and political education, through explaining athletes' anti-pressure cases, encourage students to enhance self-confidence and psychological toughness. In the physical fitness index, "speed" scored the highest, reaching a weight value of 0.563, but "endurance" and "sensitivity" were weak. Feedback from students generally mentioned that the intensity of the course was high and the endurance training was not enough to support the long competition. In this regard, it is suggested to release targeted physical training plans through the SPOC platform after class, such as aerobic running and variable speed running exercises, to help students improve the balance of physical fitness. At the same time, a short period of high-intensity interval training can be added to the classroom teaching to improve students' comprehensive physical ability. According to the results of fuzzy comprehensive evaluation, students' overall ability improvement evaluation score is "good", but the performance of specific ability indicators is significantly different. The evaluation opinion of the teaching experts pointed out that although the students gained a high level of technical and theoretical knowledge in the course, the overall performance in the actual competition was not yet at its best. This result is also confirmed by the platform data, especially in the skills test related to "quick decision making", where students scored an average of only 70 points.

7. Conclusion

Based on SPOC teaching model, this study conducted an in-depth teaching design and evaluation of college basketball elective courses. The experimental results show that SPOC model has obvious advantages in improving students' technical ability,

independent learning ability and psychological quality, and makes up for the limitations of traditional classroom teaching in time and space. However, the study also revealed some concerns.

First, the study showed that students improved significantly in basic technical abilities (such as shooting and dribbling), but they still lacked in complex skills (such as defensive strategy and quick decision making). This result shows that although the SPOC platform provides a wealth of online resources and theoretical support, there is still a need to strengthen targeted training in offline courses for skills that are highly practice-dependent. For example, the teaching of defensive strategy could incorporate more simulated game situations, blending theoretical learning with real-time decision-making to help students internalize these skills more effectively.

Secondly, the score of "anti-pressure ability" in the index of psychological quality is low, indicating that the emphasis on psychological training in the teaching process is still insufficient. In actual courses, although scenario simulation and stress tests can improve students' ability to resist pressure to a certain extent, the cultivation of such ability requires longer-term design. For example, psychological guidance should be added to teaching activities to help students learn emotional management and self-motivation in the face of high-pressure environments. This not only has a direct help for students' basketball performance, but also helps them have a stronger ability to resist pressure in future study and life.

In addition, the study found that there is a certain imbalance in the development of different ability indicators. For example, in the technical ability indicator, "shooting" is significantly better than "defense". This shows that the curriculum design needs to pay more attention to the balance of content, so as to avoid the excessive emphasis on the training of a single skill while neglecting the cultivation of other abilities. In the future teaching design, we can ensure the coordinated development of various abilities by refining teaching modules and dynamically adjusting training time allocation.

The research also shows that SPOC model is outstanding in improving students' autonomous learning ability. In the pre-class stage, students are more active in watching teaching videos, participating in discussions and completing tests through the platform, but there is still a certain gap in the execution of after-class tasks. This suggests that teachers need to further optimize the guiding strategies for after-school learning, such as releasing clearer task objectives and time nodes through the platform, and combining group cooperation to stimulate students' enthusiasm for participation in the after-school stage.

Finally, the results of this study are of great significance to teaching practice. The application of SPOC model fully demonstrates the advantages of the combination of online and offline, which not only optimizes the teaching process of traditional classrooms, but also provides students with a more flexible and personalized learning experience. At the same time, the quantitative evaluation method adopted in the research also provides a reference for the scientific analysis of teaching effect. In the future teaching reform, multi-dimensional data analysis and real-time feedback mechanism can be further combined to explore more innovative teaching models.

To sum up, this study verifies the potential and value of SPOC in higher education by evaluating its application in basketball courses. Future research should continue to explore how to optimize the design and application of this model in different

disciplines in order to promote the improvement of teaching quality more comprehensively.

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