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Development of an evaluation system for secondary school soccer instruction based on the CIPP model

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Abstract: There are various methods for evaluating middle school soccer courses; however, they suffer from relatively low accuracy and insufficient dynamic assessment outcomes. Adopting the CIPP model for monitoring and analysis of these courses can enhance the accuracy of such evaluations, thereby ensuring the improvement of the courses and the development of students' comprehensive qualities. This article applies this model to evaluate soccer courses in order to obtain the most accurate information.

Keywords: CIPP model; soccer courses; curriculum evaluation; educational philosophy

1 Introduction

Soccer instruction in middle school is an important component of the physical education curriculum and is crucial to students' future development. The quality of curriculum implementation directly impacts students' development; therefore, it is necessary to evaluate how the curriculum is being implemented [1]. By applying the CIPP model, the accuracy of curriculum evaluation can be improved, leading to more detailed conclusions. Consequently, this paper explores this topic to identify key findings and promote the efficient evaluation of middle school soccer curricula.

2 Brief overview of the CIPP evaluation model

This model emphasizes evaluation throughout the entire project, primarily providing a set of guidelines for project design and implementation, and offering dynamic information support to decision-makers [2]. Widely adopted in the field of education, this model, when applied to the evaluation of junior high school soccer instruction, allows for better assessment of the achievement of instructional objectives and provides sound support for the subsequent implementation of such curricula.

3 Selection and establishment of comprehensive evaluation indicators for middle school soccer instruction

3.1 Determining weights for the evaluation system

3.1.1 Analytic hierarchy process (AHP)

The specific steps are primarily divided into the following stages.

① Construct an evaluation indicator system to provide a foundation for subsequent weight determination, systematic analysis [3].

② Construct a judgment matrix. Using the Delphi method, pairwise comparisons of indicators at the same level are carried out on the basis of the hierarchical model. Specifically, the relative importance between two indicators, denoted as i and j, is compared. The importance of indicator i relative to indicator j is K_{ij}, where $K_{ij} = 1$; conversely, the importance of j relative to i is $K_{ji} = 1/K_{ij}$. Relevant conclusions can be drawn from these relationships [4]. Based on this procedure, the process is iterated until a complete decision matrix K is ultimately constructed.

$$\lambda \max = \sum_{i=1}^{n} \frac{(kw)_i}{nw_i}$$

③ Using the above formula, the maximum eigenvalue is λ_{max}, the judgment matrix is K, and the eigenvector is W.

④ Conduct a consistency check [5]. In AHP calculations, the consistency index (*CI*) is primarily used for the assessment and evaluation of matrix consistency. The calculation formula is:

$$CI = \frac{\lambda \max - n}{n-1}$$

At the same time, the Random Index (*RI*) is introduced. RI is a fixed constant. The value of *RI* varies with the order of judgment matrix. Table 1 presents the specific numerical values.

Table 1. Values of the random index

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

⑤ Calculate the consistency ratio (*CR*), which is defined as the ratio of the consistency index (*CI*) to the random index (*RI*), as shown in the formula below.

$$CR = \frac{CI}{RI}$$

If the consistency ratio (*CR*) exceeds 0.1, this indicates that the judgment matrix lacks consistency, and the pairwise comparison results contained in the judgment matrix need to be re-examined and revised to achieve better consistency [6]. When the consistency ratio (*CR*) is less than 0.1, the judgment matrix satisfies consistency requirements, and the derived column-normalized eigenvector *W* represents the weight vectors for each indicator.

3.1.2 Calculate the weights of the indicators

Based on the score assignment by experts regarding the importance of each indicator, a pairwise comparison matrix for the first-level indicators was constructed.

The resulting judgment matrix is

$$K = \begin{bmatrix} 1 & 1/2 & 1/3 & 1/3 \\ 2 & 1 & 1/3 & 1/3 \\ 3 & 3 & 1 & 1 \\ 3 & 3 & 1 & 1 \end{bmatrix}$$

Using the YA-AHP software to perform AHP analysis on the data in the judgment matrix, the maximum eigenvalue λ_{max}= 4.061 was obtained, with $CI = 0.020$ and $CR = 0.023 < 0.10$. This indicates that the judgment matrix has consistency. Using the row-by-row normalization method on the eigenvectors of the four indicators, the weights *W* for the four indicators were obtained as 0.1069, 0.1514, 0.3708, and 0.3708, respectively [7-8]. Based on the preceding calculations of indicators at each level of the evaluation system for secondary school soccer teaching activities under the CIPP model, the

final weights are determined as follows.

3.2 Determining evaluation content and evaluation subjects

3.2.1 Background evaluation

Based on a weight of 0.1069 for the background evaluation, the converted score is computed as 8.20 (see Table 2)[9].

Table 2. Background evaluation score table

	Average	Weight	Converted Score
Background Assessment	76.67	0.1069	8.20

3.2.2 Input evaluation

The first-level input assessment indicator consists of faculty qualifications, teaching facilities, and teaching resources. Therefore, students are the specific subjects of assessment within the input assessment framework. Then, based on the input assessment weight of 0.1514, the score is calculated as 14.51 (as shown in Table 3).

Table 3. Input evaluation score table

	Average	Weight	Converted Score
Input Evaluation	95.83	0.1514	14.51

3.2.3 Process evaluation

The the process evaluation can be specifically divided into teaching content, teaching methods, and evaluation of teaching activities. Given that the weight for process evaluation is 0.3708, the converted score is 35.40 (as shown in Table 4).

Table 4. Process evaluation score table

	Average	Weight	Converted Score
Process Evaluation	95.46	0.3708	35.40

3.2.4 Outcome evaluation

The outcome evaluation includes the effectiveness of soccer instruction, specifically measured by course satisfaction and student learning outcomes. Based on the evaluation indicator weight of 0.3708, the calculated score is 31.59 (as shown in Table 5).

Table 5. Outcome evaluation score table

	Average	Weight	Converted Score
Outcome evaluation	85.20	0.3708	31.59

4 Analysis of results

4.1 Analysis of results by indicator level

We obtained the specific scores for each level in this empirical study. The score for the background evaluation was 8.20, the input evaluation scored 14.51, the process evaluation was 35.40, and the outcome evaluation was 31.59. Compared to the maximum possible scores for each respective level, these represent 76.67%, 95.83%, 95.46%, and 85.20%. In terms of the proportion relative to each dimension's full score, the input evaluation had the highest score proportion, followed by the process evaluation, then the outcome evaluation, while the background evaluation had the lowest score proportion.

Among the secondary indicators under the background evaluation, the score for "Curriculum Philosophy" is 26.67, representing 80% of the corresponding maximum score, while the score for "Policy Environment" is 50.00, representing

75% of the corresponding maximum score. In terms of these two aspects—curriculum philosophy and policy environment, the policy environment requires further improvement, and efforts should be accelerated to establish a long-term mechanism for physical education theory courses [10].

Among the sub-indicators under the input evaluation, the score proportions for teacher competence and teaching resources are very similar, and both have reached a high level, at 95.84% and 95.81%, respectively. Among the sub-indicators under process evaluation, the scoring ratios for the three indicators—teaching content, teaching methods, and teaching assessment—are similar and all maintain high levels.

In outcome evaluation, the score was 31.59, slightly lower than the process evaluation. Among the sub-indicators under the outcome evaluation, the score for course satisfaction was 31.72, while the score for student learning outcomes was 53.48. The data above indicate that, in soccer instruction, the teaching content lacks sufficient variety, the effectiveness of instruction is generally moderate, the application of teaching methods needs to be optimized, and mechanisms for teaching feedback and evaluation need to be established and improved.

4.2 Analysis of overall results

An evaluation mechanism for junior high school soccer instruction was developed based on the CIPP model, and the scoring standard was determined to be 89.7. Based on the scoring criteria, the results can be categorized into four levels: Excellent, Good, Satisfactory, and Unsatisfactory, each corresponding to a specific score range. The data presented in this paper indicate that the evaluation results for the soccer teaching activities in this study were rated as "Good", suggesting that the soccer teaching outcomes were satisfactory, although there is still considerable room for improvement.

5 Conclusion

The outcomes of middle school soccer instruction have a corresponding impact on students' development; therefore, there is an urgent need to identify a high-quality assessment model. An assessment mechanism based on the CIPP model can yield more precise results. However, due to the relatively narrow scope of the data in this study, certain limitations remain. Therefore, future research should expand the scope of the data and employ a variety of methods for comparison in order to obtain more precise results.

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Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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