

Comparative Analysis of Cross-Cultural Teaching Management in Big Data Environment

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Abstract—Cross-cultural teaching management in the big data environment not only enhances the quality and effectiveness of education but also promotes global cooperation and exchange in education, which has important practical significance and value. Existing methods for analyzing effectiveness and practicality are usually qualitative analysis methods. While this method emphasizes the complexity and diversity of educational phenomena, it may lead to subjectivity and instability in data processing and result presentation, affecting the reliability and objectivity of the analysis results. In this paper, a quantitative comparative analysis of the effectiveness and practicality of cross-cultural teaching management in the big data environment is conducted, which helps educators better understand the needs of students from different cultural backgrounds and develop more targeted teaching plans to improve the quality of education. First, the content of cross-cultural teaching management in the big data environment is explained, and the reasons and implementation process of the comparative analysis of effectiveness and practicality are provided. The evaluation indicators for the effectiveness and practicality of cross-cultural teaching management in the big data environment are determined, and the evaluation methods are given. Experimental analysis results are presented with examples to validate the effectiveness of the proposed method.

Keywords—big data, cross-cultural teaching, teaching management, effectiveness evaluation, practicality evaluation

1 Introduction

In the context of diverse and interactive global cultures, cross-cultural teaching management in the big data environment can better meet the needs of students from different cultural backgrounds, improve teaching quality and effectiveness [1–4]. By utilizing big data analysis, we can gain deeper insights into students' learning needs, interests, and backgrounds, and develop more accurate and personalized teaching strategies [5–9]. This will help cultivate students' cross-cultural awareness, sensitivity, and insight, making them high-quality talents with cross-cultural communication abilities, and thus able to meet the challenges and requirements of cross-cultural teaching in the

new century [10–13]. Cross-cultural teaching management in the big data environment not only enhances the quality and effectiveness of education, but also promotes education cooperation and communication on a global scale, with significant practical significance and value.

Many Western countries advocate for cross-cultural education (CCE) as a means of addressing cultural diversity and promoting trust, tolerance, and interaction among individuals from different backgrounds. Lv [14] first collected data from Chinese students and divided them into two groups: control class (CC) and experimental class (EC). Then, extreme gradient boosting (XGBoost), a machine learning-based technology, was used to predict the performance of the two groups of students. The flower pollination algorithm (FPA) optimization method was then used to improve the predictive performance of XGBoost. Based on the descriptive research results, students who adhered to the proposed teaching strategies showed more interest in learning than students who adhered to the existing strategies. English cross-cultural communication is crucial in global trade, technology transfer, and cultural exchange, as there are not only language differences between different cultures, but also higher knowledge requirements for cross-cultural communication. In order to address the problem of insufficient depth and practicality in English learning for cross-cultural communication, Yue [15] began with the selection of intelligent image sensors, based on CMOS image sensors, setting sensor parameters and characteristics, and building multimedia teaching equipment. Through these methods, an English teaching system for cross-cultural communication was formed, and classroom teaching procedures and methods were proposed. After four months of teaching experiments, educated students made significant progress in cross-cultural communication. In terms of comprehensive performance, the average level of students increased by 17% from before the experiment to after the experiment. Therefore, the teaching system constructed in the literature can help students perform better in cross-cultural English communication. Xiang [16] used computer simulation technology to construct a teaching system for cross-cultural knowledge of university English. At the same time, this paper proposes a cross-cultural communication ability training model suitable for Chinese university English teaching based on the Chinese communication environment and foreign language teaching environment. Finally, this paper constructs a cross-cultural university English teaching system model through computer simulation. The teaching experiment shows that the system constructed in this paper has a certain effect.

Existing analysis methods for effectiveness and practicality in cross-cultural teaching management are typically qualitative analysis methods. The effectiveness and practicality of cross-cultural teaching management can be evaluated by describing, explaining, and interpreting data using qualitative analysis methods. This method emphasizes the complexity and diversity of educational phenomena, but there may be subjectivity and instability in data processing and result presentation, which may affect the reliability and objectivity of the analysis results. Therefore, this paper conducts a quantitative comparative analysis of the effectiveness and practicality of cross-cultural teaching management in the big data environment to help educators better understand the needs of students from different cultural backgrounds, and thus develop more targeted teaching plans to improve education quality.

2 Effectiveness evaluation

The effectiveness of cross-cultural teaching and management in the big data environment is reflected in several aspects, including personalized teaching, improved teaching quality, optimized resource allocation, cultivation of global talents, and prediction and warning. Through big data analysis, educators can better understand the needs, interests, and backgrounds of each student, thereby achieving personalized teaching and improving the quality and effectiveness of education. By collecting and analyzing students' learning data, educators can understand their learning progress and needs in real-time and adjust their teaching strategies accordingly to improve teaching quality. Big data analysis can also help educators better evaluate the effectiveness of teaching resources utilization, optimize resource allocation, and ensure that each student can access appropriate educational resources. Cross-cultural teaching and management in the big data environment can help students better adapt to a multicultural environment and cultivate talents with a global perspective and cross-cultural communication abilities. By using big data analysis, potential learning difficulties and problems of students can be predicted and warned in a timely manner, and measures can be taken to provide support and improve the quality of education. Therefore, this article selects the following evaluation indicators to evaluate the effectiveness of cross-cultural teaching and management in the big data environment:

Indicator 1: Student satisfaction: Evaluate the effectiveness of cross-cultural teaching and management through collecting students' satisfaction with teaching quality, teaching resources, and teaching environment using methods such as questionnaires and interviews.

Indicator 2: Academic performance: Evaluate students' academic performance in a cross-cultural teaching environment, including classroom performance, completion of assignments, and exam scores.

Indicator 3: Cross-cultural communication ability: Evaluate the cross-cultural communication ability developed by students under cross-cultural teaching and management, such as language expression, comprehension ability, and cultural adaptability.

Indicator 4: Teaching quality indicators: Collect data on teaching quality indicators such as teaching methods, curriculum design, and utilization of teaching resources to evaluate the improvement of teaching quality.

Indicator 5: Implementation of personalized teaching: Evaluate the implementation of personalized teaching strategies for students with different cultural backgrounds, such as learning plans, course arrangements, and teaching methods.

Indicator 6: Resource allocation effectiveness: Evaluate the effectiveness of educational resource allocation in the big data environment, such as the use of textbooks, classroom equipment, and online resources.

Indicator 7: Student participation: Evaluate students' participation in a cross-cultural teaching environment, such as classroom discussions, teamwork, and extracurricular activities.

Indicator 8: Teacher training and development: Evaluate the effectiveness of teacher training programs for cross-cultural teaching and management, such as training satisfaction and improvement of teaching abilities.

Indicator 9: International cooperation and communication: Evaluate the achievements of schools in international cooperation and communication, such as the number of international cooperation projects and students' participation in exchange programs.

Indicator 10: Student development tracking: Conduct long-term tracking of graduates to evaluate their performance in career development, cross-cultural communication abilities, and the cultivation of global talents.

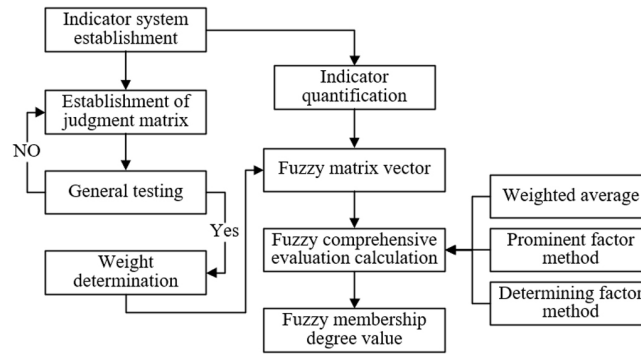


Fig. 1. Process of fuzzy comprehensive evaluation method

The fuzzy comprehensive evaluation method is an evaluation method based on fuzzy mathematics theory that can handle uncertainty and ambiguity issues well. It is suitable for evaluating the effectiveness of cross-cultural teaching and management with multidimensional and hierarchical characteristics. Figure 1 shows the process of the fuzzy comprehensive evaluation method used in this article are described in detail below:

Step 1: Establish the evaluation level set G for the effectiveness of cross-cultural teaching and management, represented by $G = \{G_1, G_2, G_3, \dots, G_n\}$, and determine the corresponding evaluation level set vector represented by $H = \{H_1, H_2, H_3, \dots, H_n\}$. The evaluation level for the effectiveness of cross-cultural teaching and management is set to five levels.

Step 2: Establish the factor set for the effectiveness of cross-cultural teaching and management, that is, the indicator set X . The 10 evaluation indicators mentioned above are the first-level indicator set, represented by $X = \{X_1, X_2, X_3, \dots, X_m\}$. The first-level indicator set can be further divided into several categories to form the second-level indicator set, represented by $X_1 = \{X_{11}, X_{12}, X_{13}, \dots, X_{1r}\}$. Similarly, the third-level indicator set is the subordinate category of the second-level indicator set, represented by $X_{11} = \{X_{111}, X_{112}, X_{113}, \dots, X_{11w}\}$.

Step 3: The degree of membership of the j -th indicator X_j in the l -th level G_l of the evaluation level set G is represented by S_{jl} , which satisfies $0 < S_{jl} < 1$. Then the evaluation matrix S of the fuzzy relationship can be established, as given by the following formula:

$$S = \begin{pmatrix} s_{11} & s_{12}, \dots & s_{1n} \\ s_{21} & s_{22}, \dots & s_{2n} \\ s_{m1} & s_{m2} & s_{mn} \end{pmatrix}$$

Step 4: Determine the weight coefficients of each level evaluation indicator of the cross-cultural teaching management effectiveness evaluation and the weight vector $F = \{F_1, F_2, F_3, \dots, F_r\}$ of X .

Step 5: Determine the membership degree vector. Assuming that the synthesis algorithm is represented by “ ∇ ”, the membership degree vector LSD can be obtained by synthesizing F and S :

$$LSD = F \nabla S \tag{1}$$

where, “ ∇ ” represents the product and bounded sum algorithm.

$$LSD_n = \min \left\{ 1, \sum F_{j \cdot s_{jn}} \right\} \tag{2}$$

The fuzzy comprehensive evaluation result vector of the cross-cultural teaching management effectiveness can be obtained through calculation, represented by $LSD = \{LSD_1, LSD_2, LSD_3, \dots, LSD_n\}$.

Step 6: Determine the final comprehensive evaluation score of the cross-cultural teaching management effectiveness. Assuming that the final comprehensive evaluation score is represented by N , the membership degree vector is represented by LSD , and the evaluation level set vector is represented by H , the following formula is used for calculation:

$$N = \sum_{p=1}^n LSD_p H_p \tag{3}$$

3 Practicality evaluation

The practicality and effectiveness of cross-cultural teaching management in the big data environment have some differences. Effectiveness mainly focuses on teaching quality, student satisfaction, and the improvement of cross-cultural communication abilities. Practicality pays more attention to the actual application effects of teaching methods, resource allocation, and teacher training. Specifically, the practicality of cross-cultural teaching management emphasizes meeting the needs of students from different cultural backgrounds by developing appropriate teaching strategies that are more tailored to their actual needs. At the same time, the practicality of cross-cultural teaching management focuses on optimizing the allocation of teaching resources in the big data environment to ensure that students can access suitable educational resources and improve the efficiency of resource utilization. In terms of teacher training and development, the practicality of cross-cultural teaching management emphasizes providing targeted training and development opportunities for teachers in cross-cultural teaching management to enhance their teaching skills and cross-cultural communication abilities. In terms of teaching evaluation and feedback, the practicality of cross-cultural teaching management attaches importance to collecting relevant data during the teaching process through big data technology to assess the teaching effect in real-time and provide a basis for teaching improvement. The practicality of cross-cultural teaching

management also emphasizes cooperation with enterprises during the cross-cultural teaching management process, conducting practical projects to improve students' practical operational and cross-cultural application abilities. Therefore, this article chooses the following evaluation indicators when evaluating the practicality of cross-cultural teaching management in the big data environment:

Indicator 1: Degree of Innovative Teaching Methods: Evaluate the degree of innovative teaching methods promoted in the big data environment and their application.

Indicator 2: Resource Utilization Efficiency: Analyze the efficiency of resource utilization after optimizing resource allocation, such as the utilization of teaching materials, classroom equipment, online resources, and other aspects.

Indicator 3: Teacher Training Effectiveness: Evaluate the actual effectiveness of teacher training programs in cross-cultural teaching management, such as training satisfaction and improvement of teachers' teaching ability.

Indicator 4: Practical Teaching Results: Evaluate the results of practical teaching and project cooperation in improving students' practical operational and cross-cultural application abilities.

Indicator 5: Teaching Improvement Effectiveness: Analyze the effectiveness of teaching improvement measures in improving the practicality of teaching through the evaluation and improvement of the teaching process.

The sequential relationship analysis method is an evaluation method based on grey system theory, which can reveal the inherent relationship among various evaluation indicators and help to better understand the influencing factors of the practicality of cross-cultural teaching management. This method can discover the correlation rules among various indicators in the evaluation process, providing targeted improvement suggestions for educational managers. Unlike the fuzzy comprehensive evaluation method, the sequential relationship analysis method emphasizes the correlation analysis between various evaluation indicators. Therefore, using the sequential relationship analysis method to evaluate the practicality of cross-cultural teaching management in the big data environment has certain feasibility and scientificity. The basic model and steps of the sequential relationship analysis method used in this study are elaborated below.

Step 1: Determine the ordinal relationship of evaluation indicators. Based on the definition of ordinal relationship, if the importance of a cross-cultural teaching and management practical evaluation indicator A_n relative to the evaluation criteria of cross-cultural teaching and management practicality is greater than that of A_m , that is, $A_n > A_m$, then A_n and A_m are said to have an ordinal relationship established by “>”.

For the cross-cultural teaching and management practical evaluation indicator set $\{A_1, A_2, \dots, A_m\}$, select the most important indicator as B_1 , and then select the most important indicator from the remaining $m-1$ indicators as B_2 . After $m-1$ selections, the remaining indicators are denoted as B_m . The unique ordinal relationship of $\{A_1, A_2, \dots, A_m\}$ can be established through the above steps, expressed by the following equation:

$$B_1 > B_2 > \dots > B_m \quad (4)$$

Step 2: Rationally assign the importance ratio of adjacent indicators for cross-cultural teaching and management practical evaluation. Let the weight coefficient of indicator A_l be represented by Q_l , and the weight coefficient of indicator B_l be represented by U_l .

The importance ratio between B_{l-1} and B_l , two adjacent indicators, can be expressed as U_{l-1}/U_l . Rational assignment can be made to U_{l-1}/U_l , and the following equation must be satisfied by s_{l-1} and s_l :

$$S_l = U_{l-1}/U_l, l = 2, 3, \dots, m \tag{5}$$

$$S_{l-1} > 1/S_l, l = 2, 3, \dots, m \tag{6}$$

Step 3: Calculate the weight coefficients of evaluation indicators for cross-cultural teaching and management practicality. According to the theorem of ordinal analysis method, it can be derived as:

$$U_m = \left(1 + \sum_{l=2}^m \prod_{i=l}^m s_i\right)^{-1}, s_l = U_{l-1}/U_l (l = 2, 3, \dots, m) \tag{7}$$

The weight coefficients $U_1, U_2, U_3, \dots, U_m$, U_m corresponding to the practical evaluation indicators $B_1, B_2, B_3, \dots, B_m$, B_m can be calculated in order. According to the correspondence between the evaluation indicator sets $\{A_1, A_2, A_3, \dots, A_m\}$ and $\{B_1, B_2, B_3, \dots, B_m\}$, the weight coefficients $Q_1, Q_2, Q_3, \dots, Q_m$ corresponding to $U_1, U_2, U_3, \dots, U_m$ can be obtained.

When there are multiple decision-makers, they may reach consensus on the ordinal relationship, but there may be differences in rational assignment. In this case, the arithmetic average of the rational assignments of $C_e (1 \leq C_e \leq C)$ decision-makers can be calculated as the final rational assignment.

Another situation is that decision-makers have different opinions on the ordinal relationship. In this case, the weight coefficients of each indicator under each ordinal relationship can be calculated separately. Then, the arithmetic average of all weight coefficients for the same indicator can be obtained to obtain the weight coefficients of all indicators in the evaluation indicator set. In both cases, the weight coefficients of indicator B_l are represented by U_l^* and U_l^{**} , respectively.

Let $l_1 = C_0/C$ and $l_2 = (C - C_0)/C$. The ultimate weight coefficient of the cross-cultural teaching and management practical evaluation indicator B_l can be determined by solving the above situations separately, expressed by:

$$U_l = l_1 U_l^* + l_2 U_l^{**} \tag{8}$$

4 Experimental results and comparative analysis

Combining with the descriptive statistics data shown in Table 1, we can conclude that in the effectiveness evaluation of cross-cultural teaching management in big data environment, the mean value of cross-cultural communication ability (Indicator 3) is the highest, reaching 3.5712, indicating that students have achieved good results in cross-cultural communication. The mean value of student development tracking (Indicator 10) is the lowest, only 2.6357, indicating that there is still room for improvement in student development tracking. The mean values of other indicators are distributed between 2.7 and 3.2. Among them, the mean values of student satisfaction (Indicator 1)

and implementation of personalized teaching (Indicator 5) are relatively high, at 3.1735 and 3.2134, respectively, indicating some effectiveness in meeting student needs and implementing personalized teaching. However, the mean values of teaching quality (Indicator 4) and resource allocation effect (Indicator 6) are relatively low, at 2.7175 and 2.8645, respectively, indicating that there is still room for improvement in improving teaching quality and optimizing resource allocation. Overall, in the effectiveness evaluation of cross-cultural teaching management in big data environment, each indicator performs differently, with advantages and disadvantages, and targeted improvement is needed according to actual situations.

Table 1. Descriptive statistics of effectiveness evaluation indicators for cross-cultural teaching management

	N	Minimum Value	Maximum Value	Mean	Standard Deviation
Indicator 1	204	1.21	5.00	3.1735	0.24726
Indicator 2	204	1.04	5.00	2.9356	0.45213
Indicator 3	204	1.33	5.00	3.5712	0.30811
Indicator 4	204	1.11	5.00	2.7175	0.59125
Indicator 5	204	1.16	5.00	3.2134	0.22389
Indicator 6	204	1.09	5.00	2.8645	0.40271
Indicator 7	204	1.16	5.00	3.1124	0.29657
Indicator 8	204	1.21	5.00	2.8765	0.40257
Indicator 9	204	1.07	5.00	3.1207	0.32348
Indicator 10	204	1.37	5.00	2.6357	0.50347
Effective N	204				

To explore the relationship between the practical evaluation indicators of cross-cultural teaching management in big data environment, this study conducted Pearson correlation analysis on five evaluation indicators. Regarding this research question, the following overview of null hypothesis and research hypothesis is provided: 1) Null hypothesis (H0): $p = 0$, that is, it is believed that the correlation coefficient between practical evaluation indicators is zero, which means that there is no significant relationship between them. 2) Research hypothesis (H1): $p \neq 0$, that is, it is believed that the correlation coefficient between practical evaluation indicators is not zero, and there is a significant relationship between them. In this analysis, the significance level is set to $\alpha = 0.05$. When the p-value is less than 0.05, we will reject the null hypothesis and accept the research hypothesis, that is, we believe that there is a significant relationship between these indicators. Conversely, when the p-value is greater than 0.05, we do not reject the null hypothesis, that is, we believe that there is no significant relationship between these indicators.

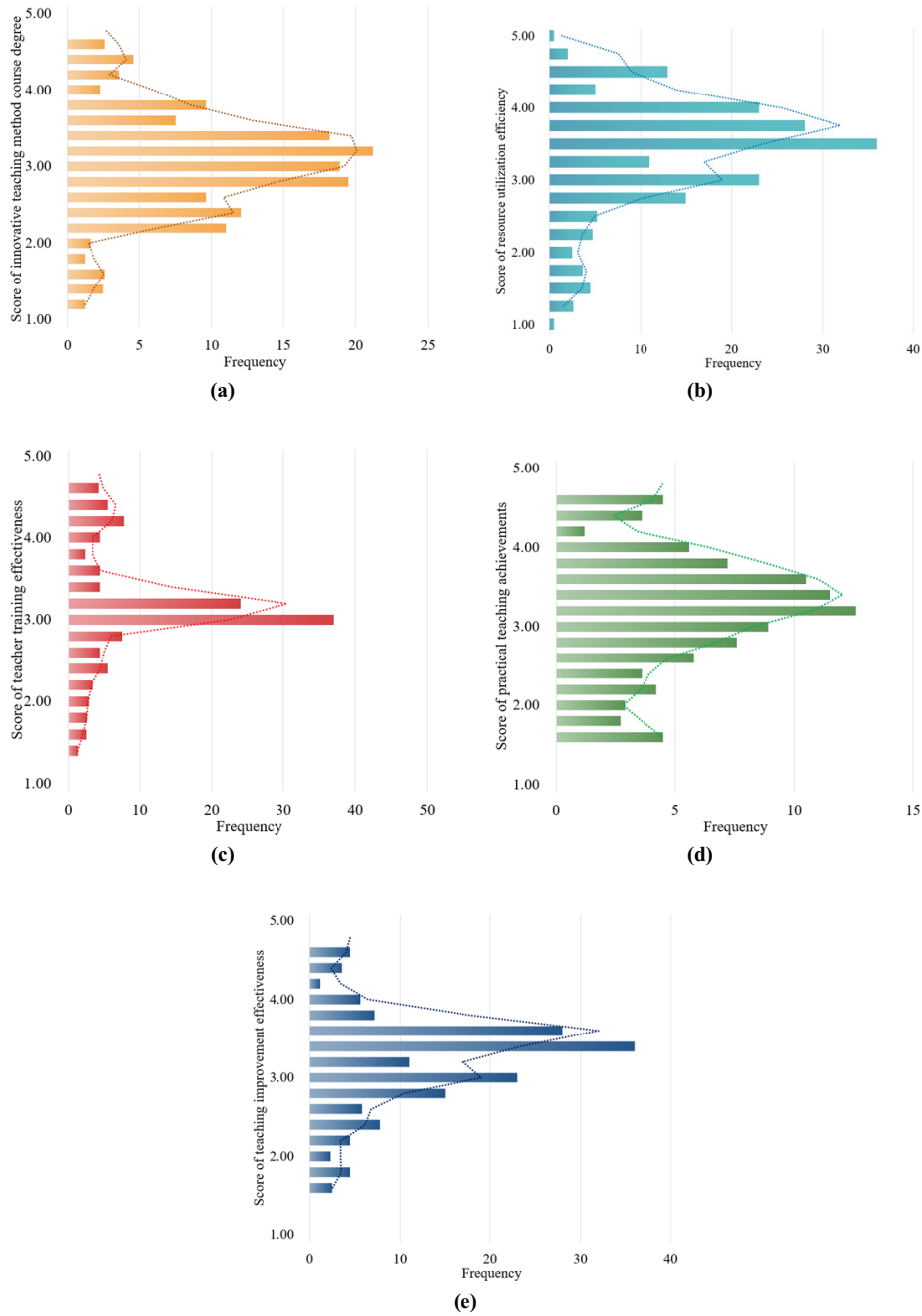


Fig. 2. Frequency distribution histogram of practical evaluation indicators for cross-cultural teaching management

It is very important to ensure that the data conforms to a normal distribution before conducting Pearson correlation analysis. To verify whether the data follows a normal distribution, this study chose to use a frequency distribution histogram. If the shape of the histogram presents a bell-shaped curve, the data roughly follows a normal distribution.

From the five graphs in Figure 2, it can be seen that the frequency distribution histograms of the five practical evaluation indicators show a “high in the middle, low on both sides” shape, with approximate symmetry on both sides, which can be considered a normal distribution. Table 2 provides the results of the correlation analysis of the practical evaluation indicators.

Table 2. Results of correlation analysis of practical evaluation indicators

		Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5
Indicator 1	<i>Pearson Correlation</i>	1				
	<i>Sig.(2-tailed)</i>					
	<i>N</i>	187				
Indicator 2	<i>Pearson Correlation</i>	0.285*	1			
	<i>Sig.(2-tailed)</i>	0.000				
	<i>N</i>	204	204			
Indicator 3	<i>Pearson Correlation</i>	0.271*	0.702***	1		
	<i>Sig.(2-tailed)</i>	0.000	0.000			
	<i>N</i>	204	204	204		
Indicator 4	<i>Pearson Correlation</i>	0.608**	0.862***	0.871***	1	
	<i>Sig.(2-tailed)</i>	0.000	0.000	0.000		
	<i>N</i>	204	204	204	204	
Indicator 5	<i>Pearson Correlation</i>	0.521**	0.795***	0.781***		1
	<i>Sig.(2-tailed)</i>	0.000	0.000	0.000	0.000	0.000
	<i>N</i>	204	204	204	204	204

Notes: ***, **, * respectively indicates that they passed the significance test at the level of 1%, 5%, 10%.

Through Pearson correlation analysis of these practical evaluation indicators, it can be seen that the degree of innovation in teaching methods (Indicator 1) is positively correlated with the other four indicators, and there is a strong correlation with resource utilization efficiency (Indicator 2), teacher training effectiveness (Indicator 3), and practical teaching achievements (Indicator 4) (0.285, 0.271, and 0.608), and a slightly weaker correlation with teaching improvement effectiveness (Indicator 5) (0.521). This indicates that innovative teaching methods play a significant role in improving resource utilization efficiency, teacher training effectiveness, and practical teaching achievements.

Resource utilization efficiency (Indicator 2) is strongly correlated with the other indicators, especially with teacher training effectiveness (Indicator 3), practical teaching achievements (Indicator 4), and teaching improvement effectiveness (Indicator 5) (0.702, 0.862, and 0.795). This suggests that improving resource utilization efficiency is important for enhancing teacher training effectiveness, practical teaching achievements, and teaching improvement effectiveness.

The correlation between teacher training effectiveness (Indicator 3) and practical teaching achievements (Indicator 4) and teaching improvement effectiveness (Indicator 5) is 0.871 and 0.781, respectively, indicating that teacher training effectiveness has a significant influence on improving practical teaching achievements and teaching improvement effectiveness.

The correlation between practical teaching achievements (Indicator 4) and teaching improvement effectiveness (Indicator 5) is 0.871, indicating that practical teaching achievements are closely related to teaching improvement effectiveness, and improving practical teaching achievements will have a positive impact on teaching improvement effectiveness.

In summary, in the practical evaluation indicators for cross-cultural teaching management in the big data environment, there are significant positive correlations between each indicator, indicating that these indicators play an important role in improving the practicality of cross-cultural teaching management.

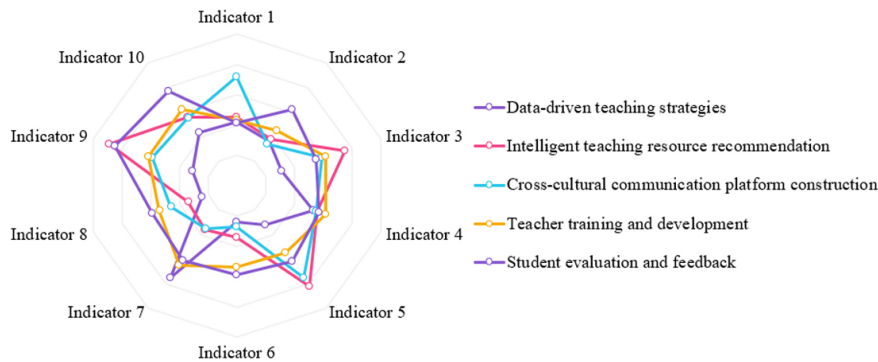


Fig. 3. Comparison of effectiveness evaluation results for core management content

Data-driven teaching strategies, intelligent teaching resource recommendation, cross-cultural communication platform construction, teacher training and development, and student evaluation and feedback are the five core aspects of cross-cultural teaching management in a big data environment. This paper compares and analyzes the effectiveness and practicality of these five aspects through examples. Figure 3 shows the effectiveness evaluation results of the core management content. The indicators 1–10 represent the effectiveness evaluation indicators of cross-cultural teaching management in a big data environment, including student satisfaction, academic achievement, cross-cultural communication ability, teaching quality indicators, implementation of personalized teaching, resource allocation effect, student participation, teacher training and development, international cooperation and communication, and student development tracking.

From the Figure, we can see that data-driven teaching strategies perform best in student participation (Indicator 7, 0.75), indicating that this strategy can effectively improve students' active participation. However, it performs poorly in resource allocation effect (Indicator 6, 0.24), which means that resource allocation methods need to be optimized to improve the effect. Personalized teaching resource recommendation performs excellent in international cooperation and communication (Indicator 9, 0.89), indicating that this method can promote international cooperation and communication. However, it performs weakly in student satisfaction (Indicator 1, 0.45), which may require adjusting teaching resources to improve student satisfaction. The construction of cross-cultural communication platform performs well in student satisfaction (Indicator 1, 0.72), proving that building a communication platform can increase students' satisfaction with cross-cultural teaching. However, it performs poorly in resource allocation effect (Indicator 6, 0.27), suggesting that there is room for improvement in resource allocation. Teacher training and development perform well in teaching quality indicators (Indicator 4, 0.62) and student development tracking (Indicator 10, 0.62), indicating that teacher training plays a positive role in improving teaching quality and focusing on student development. However, it needs improvement in student satisfaction (Indicator 1, 0.43). Student evaluation and feedback perform excellently in international cooperation and communication (Indicator 9, 0.85), indicating that timely evaluation and feedback can promote international communication and cooperation. However, it performs weakly in student satisfaction (Indicator 1, 0.41), which may require adjusting the evaluation and feedback methods to improve student satisfaction.

According to the data in the Figure, each aspect has its advantages and disadvantages in different indicators. Overall, data-driven teaching strategies and personalized teaching resource recommendation perform well in improving student participation and promoting international cooperation and communication. Cross-cultural communication platform construction and teacher training and development play a positive role in improving teaching quality and focusing on student development. However, each aspect needs improvement in student satisfaction and resource allocation effect. To improve the effectiveness of cross-cultural teaching management, it is necessary to pay attention to the shortcomings of each aspect in the indicators and make targeted improvements.

The Figure 4 provides a comparison of the practical evaluation results of core management content. Indicators 1–5 are the practical evaluation indicators for cross-cultural teaching management in the big data environment, namely, the degree of innovation in teaching methods, efficiency of resource utilization, effectiveness of teacher training, practical teaching achievements, and effectiveness of teaching improvement. As shown in the Figure, data-driven teaching strategies perform well in improving the degree of innovation in teaching methods (Indicator 1, 0.42) and efficiency of resource utilization (Indicator 2, 0.45) and to some extent in improving the effectiveness of teaching improvement (Indicator 5, 0.34). However, their impact on improving teacher training effectiveness (Indicator 3, 0.1) and practical teaching achievements (Indicator 4, 0.32) is relatively small. The personalized recommendation of teaching resources has a good effect in improving the degree of innovation in teaching methods (Indicator 1, 0.43), efficiency of resource utilization (Indicator 2, 0.41), practical teaching achievements (Indicator 4, 0.35), and effectiveness of teaching improvement (Indicator 5, 0.42), but

its contribution to teacher training effectiveness (Indicator 3, 0.12) is relatively small. The construction of a cross-cultural communication platform has a significant effect on improving the degree of innovation in teaching methods (Indicator 1, 0.45), teacher training effectiveness (Indicator 3, 0.48), and effectiveness of teaching improvement (Indicator 5, 0.55), but its impact on efficiency of resource utilization (Indicator 2, 0.37) and practical teaching achievements (Indicator 4, 0.18) is relatively small. Teacher training and development have a significant impact on improving teacher training effectiveness (Indicator 3, 0.52), practical teaching achievements (Indicator 4, 0.42), and effectiveness of teaching improvement (Indicator 5, 0.45), but their contribution to the degree of innovation in teaching methods (Indicator 1, 0.24) and efficiency of resource utilization (Indicator 2, 0.12) is relatively small. Student evaluation and feedback have a significant impact on improving the degree of innovation in teaching methods (Indicator 1, 0.50), teacher training effectiveness (Indicator 3, 0.86), and practical teaching achievements (Indicator 4, 0.52), and to some extent, they also improve efficiency of resource utilization (Indicator 2, 0.42) and effectiveness of teaching improvement (Indicator 5, 0.42).

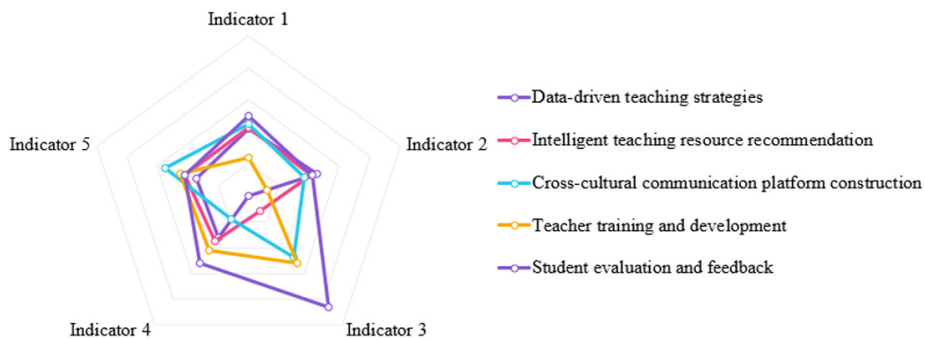


Fig. 4. Comparison of practical evaluation results of core management content

Based on the data in the above table, we can conclude that in the big data environment, student evaluation and feedback have a high impact on improving all aspects, especially in improving teacher training effectiveness. The construction of a cross-cultural communication platform has a significant contribution to the effectiveness of teaching improvement, and also has a relatively large impact on the degree of innovation in teaching methods and teacher training effectiveness. Data-driven teaching strategies and personalized recommendation of teaching resources have good effects in improving the degree of innovation in teaching methods and efficiency of resource utilization, but their contribution to improving teacher training effectiveness and practical teaching achievements is relatively small. Teacher training and development have a significant impact on improving teacher training effectiveness, practical teaching achievements, and effectiveness of teaching improvement. Overall, each teaching management measure has different advantages in different aspects. Therefore, it is necessary to comprehensively consider adopting different teaching management measures according to actual needs and goals to achieve more efficient cross-cultural teaching management.

5 Conclusion

This article conducts a quantitative comparative analysis of the effectiveness and practicality of cross-cultural teaching management in the big data environment, helping educators better understand the needs of students from different cultural backgrounds and thus develop more targeted teaching plans to improve the quality of education. First, the content of cross-cultural teaching management in the big data environment is explained, and the reasons and implementation process for comparing and analyzing the effectiveness and practicality of cross-cultural teaching management in the big data environment are given. The evaluation indicators for the effectiveness and practicality of cross-cultural teaching management in the big data environment are determined, and the evaluation methods are given. Combined with experiments, descriptive statistics of the effectiveness evaluation indicators of cross-cultural teaching management are provided, and the relationship between the practicality evaluation indicators of cross-cultural teaching management in the big data environment is discussed. The frequency distribution histogram of the evaluation indicators is plotted. The Pearson correlation analysis of these practicality evaluation indicators is provided, and the corresponding conclusions are given. Combined with data-driven teaching strategies, intelligent teaching resource recommendation, cross-cultural communication platform construction, teacher training and development, and student evaluation and feedback as the five core aspects of cross-cultural teaching management in the big data environment, the effectiveness and practicality of cross-cultural teaching management are compared and analyzed, and the analysis results are given.

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