Research Article

Fuzzy Theory-Based Tab Analysis of Art Education Evaluation Index

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Art teaching evaluation is the most important part of the whole art teaching activity, and it is also a part that is easily ignored. The traditional teaching evaluation method ignores the identity of students as evaluators and also ignores the colorful personalities of students in art teaching. The promotion of all students' enthusiasm for art learning, stimulating and maintaining all students' interest in art learning, self-knowledge, and innovation consciousness, is obviously insufficient. Based on the method of fuzzy decision-making, this paper proposes a fuzzy evaluation method of teaching quality, formulates an evaluation index system, ends some problems existing in the traditional method, and achieves good results in teaching practice. The research results of the article show the following: (1) The scores of the four first-level indicators are in a good stage, and the scores are generally maintained above 4.0. Among them, the highest score of art teaching design can reach 5.7, indicating that the influence on art teaching is relatively large, and it should be paid attention to in the process of daily teaching. (2) The model proposed in this article has a running accuracy of 95.61% in the training set and 91.45% in the validation set, although the performance of the three detection models is reduced to a certain extent after the test set is run. However, the accuracy of the model in this paper has the least room for decline, only 4.16%. The decline values of the other two models are 9.47% and 12.72%, respectively, and the detection value of the model in the article is still the highest among all detection models. According to the PR curves of the three models, the balance point of the fuzzy decision-making education model is 0.8, the deep learning model is 0.6, and the BP neural network is 0.4. The balance point of the fuzzy decision-making education model is larger than of the other two models; that is, the fuzzy decision-making model has a performance that is better than the other two models.

1. Introduction

With the development of society, art education has gradually received more and more attention from people and the number of students applying for art exams is increasing every year. Because of the particularity of art education, it is different from the traditional teaching method. Art education must be multifaceted and include creative thinking in order to adapt to the development of the times. Only by continuous improvement and progress can students be fully and efficiently accepted. The outline of art education points out that aesthetic education mainly lies in cultivating student's healthy aesthetic concepts, aesthetic abilities, and noble moral sentiments. The article argues that the lack of innovation in our art education products may be a major setback for the nation's quest for industrial and technological development [1]. The article shows that aesthetic education is not entirely art education, but it refers to the experience of all feelings and aesthetic values coming from life [2]. The article deeply explores the relationship between art design and cultural industry, private enterprises, government, and other social organizations [3]. The article explains that higher education teaching personnel must recognize the importance of art education, understand the goals of art education, and take effective measures to scientifically arrange teaching in order to achieve the best results [4]. The article describes that in the context of postmodernism, the aesthetic quality education of art

presents a diversified development trend [5]. Taking modern ceramic art teaching as an example, the article expounds the effect of ceramic art teaching on the art education of college students and the future journey of the modern ceramic art class, in order to learn from peers [6]. This paper presents the results of a study aimed at exploring the impact of developing instructional technology on improving the quality of arts education in basic schools [7]. This paper considers the problem of improving the quality of arts education in the application of an integrated approach that allows the organization of the educational process at the confluence of functional interactions of different types of professional and artistic activities [8]. This paper argues that art education alone cannot solve the world's challenges and problems [9]. Aesthetic education is an important and healthy way of campus culture, an important way to improve the quality education of college students, and has an important role and positive significance for the quality education of college students [10]. The article presents two related courses examining conservation science and art history of the 17th century Dutch painting. This article focuses on the relationship between painting and architecture through basic design education [11]. Common elements and principles in painting and architecture will be detailed with examples [12]. The authors conduct a "simple" and sincere analysis of the problems they encounter in their pursuit of artistic value and provide a practical experience of the way art is self-discovered [13]. This paper introduces the development trend of multiart culture and its influence on domestic oil painting and analyzes the current situation of oil painting teaching in colleges and universities [14]. The article uses a variety of practical tools and equipment to improve teaching methods and means, establish a fixed external painting practice base, and carry out the demonstration of practical results [15].

2. Art Education Evaluation of Fuzzy Decision-Making

2.1. The Development Status of Art Education in Our Country.
The traditional teaching concept has been deeply ingrained in many people's hearts, and the intention of art education is not valued by people. Art education has always been in the position of a subdiscipline. Many students chose to apply to art schools because of unqualified cultural courses. As a means of admission, art education in our country is in a rather inconvenient position. Art teaching in many colleges and universities has deviated from the original intention of art teaching, and the only standard to measure the quality of teaching seems to be awards in various competitions. Many students in primary and junior high schools receive art education limited to the concept stage of art teaching, while most colleges and universities adopt a guided teaching concept, which mainly cultivates students' autonomous learning ability and innovation ability, which they have experienced in childhood. Art students who are taught by ideas find it difficult to adapt to this educational model, and their observation skills and artistic feelings are relatively lacking. At the same time, although many colleges and universities have a clear division of art education majors, they are still insufficient in emotional education and ideological orientation and cannot meet the needs of today's social development.

2.2. The Significance of Art Education Evaluation.
Art education is an important part of school education and an important means of cultivating professional talents. Education should be people-oriented. The significance of art education is to guide students through certain technical means and promote their autonomous learning ability and aesthetic ability. To improve the comprehensive quality of students in the first place, we must improve the students' self-cultivation. Art education evaluation is helpful for teachers to change their teaching concepts and update their educational concepts in a timely manner. It can also help teachers to summarize their own shortcomings and constantly improve themselves through mistakes, thereby improving the overall teaching level. It can also shorten the relationship between teachers and students, and student's teaching evaluation information can be fed back in time, thereby improving students' enthusiasm for learning. The construction of art education evaluation indicators is shown in Table 1.

3. Fuzzy Evaluation Model and Method

3.1. Principle and Method of Fuzzy Comprehensive Evaluation.
Let the eigenvalues of the m evaluation indicators of the j-th scheme be represented by vectors as

$$X_j = \left\{x_{1j}, x_{2j}, \ldots, x_{mj}\right\}^T. \tag{1}$$

Then, the evaluation index of the n scheme is represented by the eigenvalue matrix as

$$X = \begin{pmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{pmatrix} = \left(x_{ij}\right)_{m \times n}. \tag{2}$$

Among them, x_{ij} represents the eigenvalue of the j-th scheme and the i-th indicator; $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, n$.

It is converted to a relative membership matrix [21]:

$$R = \begin{pmatrix} r_{11} & \cdots & r_{1n} \\ \vdots & \ddots & \vdots \\ r_{m1} & \cdots & r_{mn} \end{pmatrix} = \left(r_{ij}\right)_{m \times n}. \tag{3}$$

Let the fuzzy comprehensive evaluation matrix be [22]

$$U = \begin{pmatrix} u_{11} & \cdots & u_{1n} \\ \vdots & \ddots & \vdots \\ u_{m1} & \cdots & u_{mn} \end{pmatrix} = \left(u_{hj}\right)_{m \times n}. \tag{4}$$

The standard value fuzzy matrix is expressed as

TABLE 1: Art education evaluation index system.

First-level indicator	Secondary indicators	Evaluation description
Attitudes of art educators	Art teacher's professional belief	Whether you have a firm professional belief and are willing to engage in art teaching [16]
	Caring for students	Whether to pay attention to student's learning and healthy growth
	Dedication and dedication	Whether classroom teaching and extracurricular tutoring are serious, and whether personal gain or loss is valued [17]
	Complete art education materials	The practice data collection is complete and complete
Art teaching design	Art teaching design concept	The teaching concept is advanced and in line with the direction of art teaching reform and development
	The purpose of art teaching design	The purpose of instructional design is clear, and it is in line with the needs of art teaching and students [18]
	Art teaching design ideas	The teaching design is novel and unique, the design ideas are clear, and the degree of difficulty is moderate
	Art teaching methods and means	Using modern teaching methods, teaching methods conform to the concept of modern teaching reform and development
Art classroom teaching	Art teaching materials	Select high-quality, practical self-edited art teaching materials
	Art teaching content	The proportion of the teaching hours of art practice teaching in the total teaching hours is reasonable, and the teaching content is rich and varied [19]
	Art teaching class	The teaching methods are flexible and diverse, and the multimedia teaching methods are used to achieve the structure of skill training and ability training
	The effect of art teaching	The teaching effect is good, and the teachers and students have high evaluation
Art education teaching research	Research objectives	Have a sense of innovation; meet the needs of art quality education and the direction of education development [20]
	Research plan	The research plan is scientific and perfect
	Research results	The achievements are outstanding and innovative, and the achievement award certificate has been obtained
	Social acceptance	The internship unit has high evaluation, wide application, and good social evaluation

$$S = \begin{pmatrix} s_{11} & \cdots & s_{1n} \\ \vdots & \ddots & \vdots \\ s_{m1} & \cdots & s_{mn} \end{pmatrix} = (s_{ih})_{m \times c}. \quad (5)$$

Art scheme evaluation index weight [23] is

$$W = \{w_1, w_2, \ldots, w_m\}^T, \sum_{i=1}^{m} w_i = 1. \quad (6)$$

The fuzzy vector of the art evaluation scheme is expressed as

$$r_j = \{r_{1j}, r_{2j}, \ldots, r_{mj}\}^T. \quad (7)$$

The membership value of the art standard evaluation scheme is

$$h_j = \{h_{1j}, h_{2j}, \ldots, h_{mj}\}^T. \quad (8)$$

The weighted distance between the art evaluation plan and the standard evaluation plan is

$$d_{jh} = \sqrt[p]{\sum_{i=1}^{m} \left[w_i (r_{ij} - s_{ih}) \right]^p}. \quad (9)$$

The generalized weighted distance value between the art evaluation plan and the standard evaluation plan is

$$D_{jh} = u_{hj}^p \sqrt{\sum_{i=1}^{m} \left[w_i (r_{ij} - s_{ih}) \right]^p}. \quad (10)$$

3.2. Model Establishment. Take the set of judgment subjects [24] as

$$E = \{e_n\}, \ (n = 1, 2, \ldots, N). \quad (11)$$

Then, if $E \in R^{1 \times N}$, judge the subject's weight:

$$W_0 = \{w_{0n}\}, W_0 \in R^{1 \times N}. \quad (12)$$

Take a set of first-level indicators [25]:

$$X = \{x_i\}, \ (i = 1, 2, \ldots, I). \quad (13)$$

Then, when $X \in R^{1 \times t}$, the weight of the first-level indicator is

$$W_0 = \{W_{1i}\}, W_1 \in R^{1 \times t}. \quad (14)$$

Select a secondary indicator set:

$$Y = \{y_j\}, \ (j = 1, 2, \ldots, J). \quad (15)$$

Then, if $Y \in R^{1 \times J}$, the weight of the secondary indicator is

$$W_2 = \{w_{2j}\}, W_2 \in R^{1 \times j}. \quad (16)$$

Select a review set:

$$P = \{P_k\}, (k = 1, 2, \ldots, I), P \in R^{1 \times K}. \tag{17}$$

4. Simulation Experiments

4.1. Data Collection. Teaching evaluation is the fundamental guarantee for cultivating art education professionals. In order to find out the important index factors that affect the quality of art education, the experiment divides the quality of art education into 4 first-level indicators and 16 second-level indicators. The experiment was mainly carried out in the form of questionnaires. The questionnaires were distributed in the class as a unit. The content of the questionnaires included multiple-choice questions and short-answer questions. The collected questionnaires were divided into 10 groups, and the evaluation data were summarized. Combined with the results of art teaching evaluation, we identify important reference factors that affect art teaching. The evaluation grades are shown in Table 2:

4.1.1. Attitudes of Art Educators. The data are shown in Table 3.

According to the data in Figure 1, the scores of the educational attitude evaluation data are all greater than 3.0, which are in the excellent and good grades. Among them, the art teachers' professional belief and art education materials have higher scores, and the art teacher's professional belief score reaches the highest with 5.2 points. The maximum score for the improvement of art education materials is 5.3 points, and the highest scores for caring for students and professional dedication are 4.4 points and 4.1 points, respectively. The score values of the 10 samples are distributed evenly. The scores of the four test indicators are all greater than 3, which is above the good level, which also shows that the attitude of art educators has a greater impact on the art teaching situation.

4.1.2. Art Teaching Design. The design data are shown in Table 4.

As shown in Figure 2, the scoring data of art teaching design are all greater than 4, the overall scoring status is high, and the scores of the four test indicators are relatively average. Among them, the four test indicators of sample 7 have scores greater than 5.0 and they are in the excellent grade. The highest score for art teaching concept design is 5.6, the highest score for art teaching design purpose is 5.7, the highest score for art teaching design ideas is 5.6, and the highest score for art teaching methods and means is 5.5. The overall rating data also shows that art teaching design is a very important factor affecting the quality of art teaching. In art teaching work, attention should be paid to the content of art teaching design.

4.1.3. Art Classroom Teaching. The art classroom teaching data are shown in Table 5.

According to the data in Figure 3, we can know that the score data of art classroom teaching evaluation are generally

TABLE 2: Evaluation level.

Score	Evaluation level
>5	Excellent
3–5	Good
2–3	Middle
1–2	Pass
<1	Failed

high and there are many scores greater than 5, indicating that the influence of art classroom teaching is the greatest. Among them, the highest score of art teaching materials is 5.2, the highest score of art teaching content is 5.6, the highest score of art teaching class is 5.2, and the score of art teaching effect is higher than 5.5, indicating that the overall effect of art teaching is good.

4.1.4. Research on Art Education and Teaching. Evaluation data of art education teaching research are shown in Table 6.

According to the data in Figure 4, the overall score data of art education and teaching are also maintained above 4.0, among which the score of social recognition is maintained above 5 points, the highest can reach 5.5 points, the highest score of research objectives is 5.3, and the research plan points and the highest ratings for research outcomes were 5.1 and 5.3, respectively. According to the above test results, we can conclude that the scores of the four first-level indicators are in a good stage, indicating that these four first-level indicators have a greater impact on art teaching.

4.2. Model Comparison Study. Model evaluation classification is the last step in building a model; it can effectively help us choose an excellent classifier and improve its performance and plays a very important role. In order to test the performance of the education evaluation model of the article, the model proposed in the article and the other two models are run on the training set and the validation set, respectively, and the performance of different models is observed. Among them, the training set is used to train the model, mainly to update the weight parameters, so that the model can be further optimized and have better performance after passing through the training set of each batch. Generally speaking, the validation set is extracted from the training set, with representative data to verify the quality of the trained model. Its main function is to update the hyperparameters through the verification of demerits, such as reducing the learning rate and increasing the number of iterations, and also to observe whether there is over-fitting. After the three models are run on the training set and the validation set, respectively, the running status of the respective models can be detected and the models can be revised according to the situation and finally run on the test set. The test set is used to finally test the performance of the model. The PR curves of 3 different models were recorded, and the performance of the models can also be evaluated from the PR curves. The evaluation indicators of the observation model are shown in Table 7.

TABLE 3: Educational attitude evaluation data.

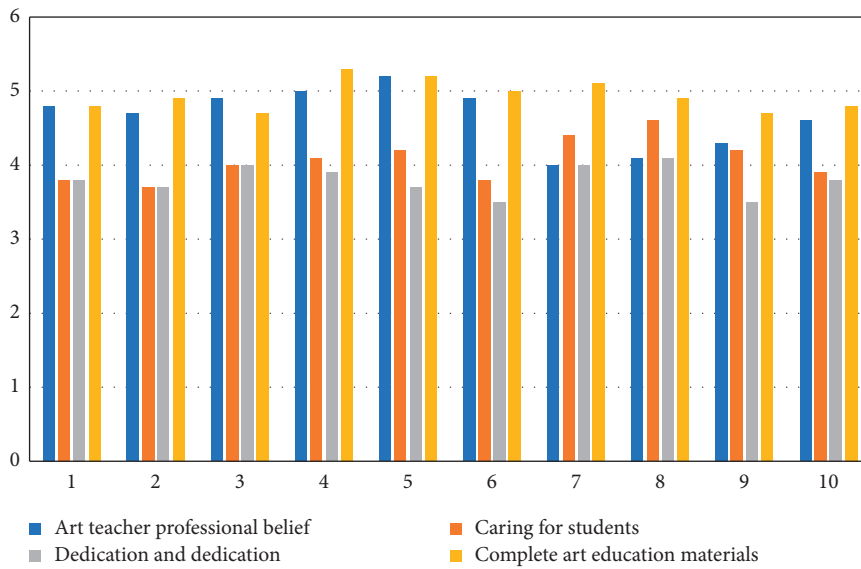| Sample number	Art teacher's professional belief	Caring for students	Dedication and dedication	Complete art education materials
1	4.8	3.8	3.8	4.8
2	4.7	3.7	3.7	4.9
3	4.9	4.0	4.0	4.7
4	5.0	4.1	3.9	5.3
5	5.2	4.2	3.7	5.2
6	4.9	3.8	3.5	5.0
7	4.0	4.4	4.0	5.1
8	4.1	4.6	4.1	4.9
9	4.3	4.2	3.5	4.7
10	4.6	3.9	3.8	4.8

FIGURE 1: Statistics of sample data on educational attitude.

TABLE 4: Evaluation data of art teaching design.

Sample number	Art teaching design concept	The purpose of art teaching design	Art teaching design ideas	Art teaching methods and means
1	4.6	5.3	4.8	5.2
2	5.1	5.1	4.9	5.3
3	5.3	4.9	5.2	4.8
4	4.9	4.8	5.3	4.6
5	5.0	4.9	5.1	4.9
6	4.9	5.0	4.8	5.3
7	5.6	5.3	5.0	5.2
8	5.5	5.2	5.3	5.0
9	5.6	5.7	5.6	5.5
10	5.3	4.8	5.0	5.3

The experimental results are shown in Figure 5 and Table 8. After the model training set is run, the performance of the fuzzy decision-making education evaluation model is the highest among all the test models. The accuracy rate can reach 95.61%, the accuracy can reach 96.13%, the sensitivity can reach 96.15%, and the specificity can reach 96.15%. When the correct rate is 82.14%, the accuracy rate of the deep learning education evaluation model is 90.25%; when the correct rate is 94.71%, the accuracy rate of the BP neural network education model is 85.21%, and when the correct rate is 86.21%, and the BP neural network education evaluation model has the lowest detection performance. The detection result of the deep learning educational model is between the model proposed in the article and the BP neural network educational model.
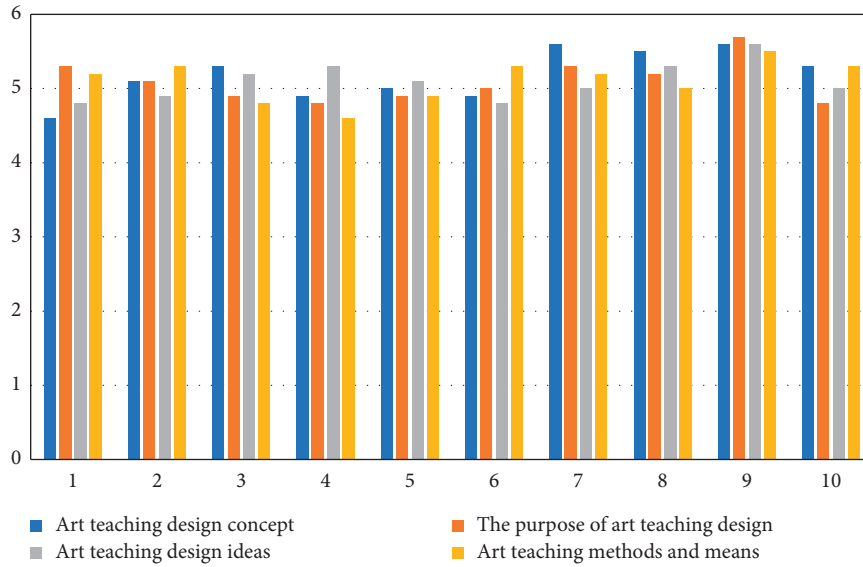
Figure 2: Statistics of art teaching design data.

Table 5: Evaluation data of art classroom teaching.

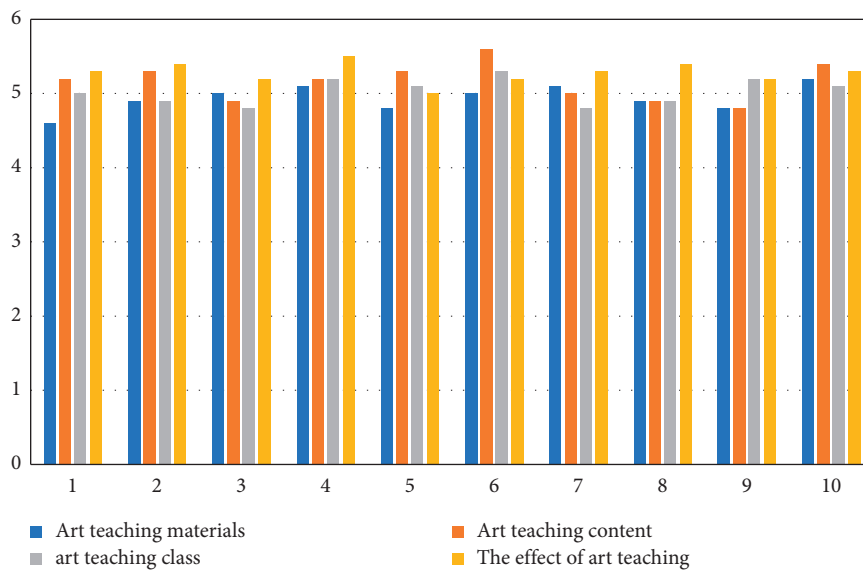| Sample number	Art teaching materials	Art teaching content	Art teaching class	The effect of art teaching
1	4.6	5.2	5.0	5.3
2	4.9	5.3	4.9	5.4
3	5.0	4.9	4.8	5.2
4	5.1	5.2	5.2	5.5
5	4.8	5.3	5.1	5.0
6	5.0	5.6	5.3	5.2
7	5.1	5.0	4.8	5.3
8	4.9	4.9	4.9	5.4
9	4.8	4.8	5.2	5.2
10	5.2	5.4	5.1	5.3

Figure 3: Art classroom teaching evaluation data.

TABLE 6: Evaluation data of art education teaching research.

Sample number	Research objectives	Research plan	Research results	Social acceptance
1	4.9	4.5	5.2	5.2
2	4.8	4.8	4.8	5.3
3	4.9	4.7	4.9	5.0
4	5.2	5.0	5.0	5.1
5	5.0	5.1	5.1	5.2
6	4.8	4.9	5.3	5.5
7	5.2	4.8	4.9	5.3
8	5.3	5.0	5.1	5.2
9	5.1	5.1	5.2	5.2
10	4.8	4.9	5.3	5.1
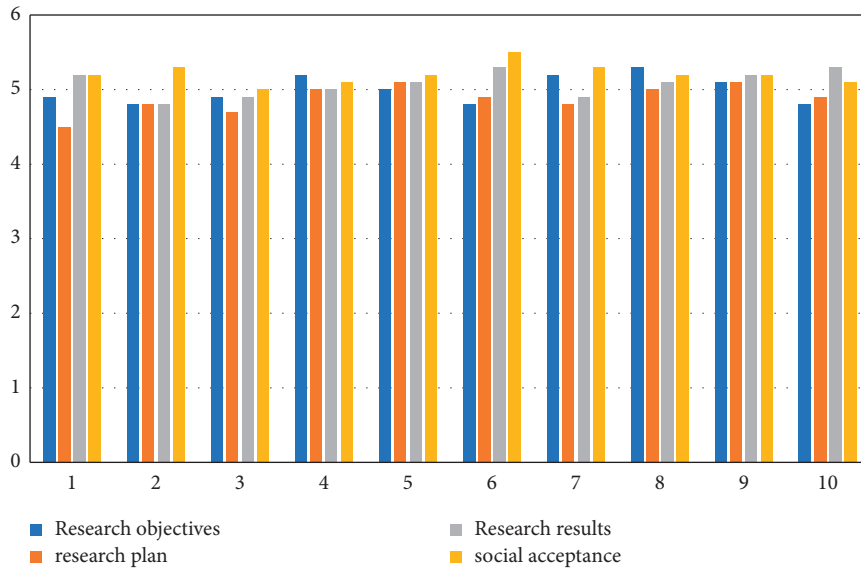
FIGURE 4: Evaluation data of art education teaching research.

TABLE 7: Evaluation index table.

	Formula	Definition
Accuracy	$PPV = TP/(TP + FP)$	Indicates the proportion of the model identified correctly among all results identified by the model as correct samples
Sensitivity	$TPR = TP/(TP + FN)$	Indicates that the model recognizes the correct proportion in the true value of the sample
Specificity	$TNR = TN/(TN + FP)$	Indicates that the model recognizes the correct proportions in which the true value is negative

The experimental results are shown in Figure 6 and Table 9. In the model in this paper, the accuracy rate is 91.45%, the accuracy is 92.26%, the sensitivity is 92.79%, and the specificity is 72.45%. The accuracy rate of the BP neural network education model is 85.21% in the training set and 72.49% in the validation set. Although the performance of the three detection models is reduced to a certain extent after the test set is run, the accuracy of the model in this paper has the least room for decline, only 4.16%, the decline values of the other two models are 9.47% and 12.72%, respectively, and the detection value of the article model is still the highest among all detection models. The experimental results also show that the detection efficiency of the model proposed in this paper is optimal whether it is in the training set or the validation set. After the performance improvement on the 3 models, the P-R plots run on the test set are as given in Figure 7.

If the P-R curve of one learning model completely wraps the P-R curve of the other learning model, the former outperforms the latter. That is, when the recall rate is the same, the higher the precision rate, the better the generalization performance of the model. As shown in Figure 7, the performance of the fuzzy decision-making education evaluation model is the best, followed by the deep learning education evaluation model and BP neural network. The superiority of the online education evaluation modelcan also be evaluated according to the balance point. The balance point is the value equal to the precision rate and the recall
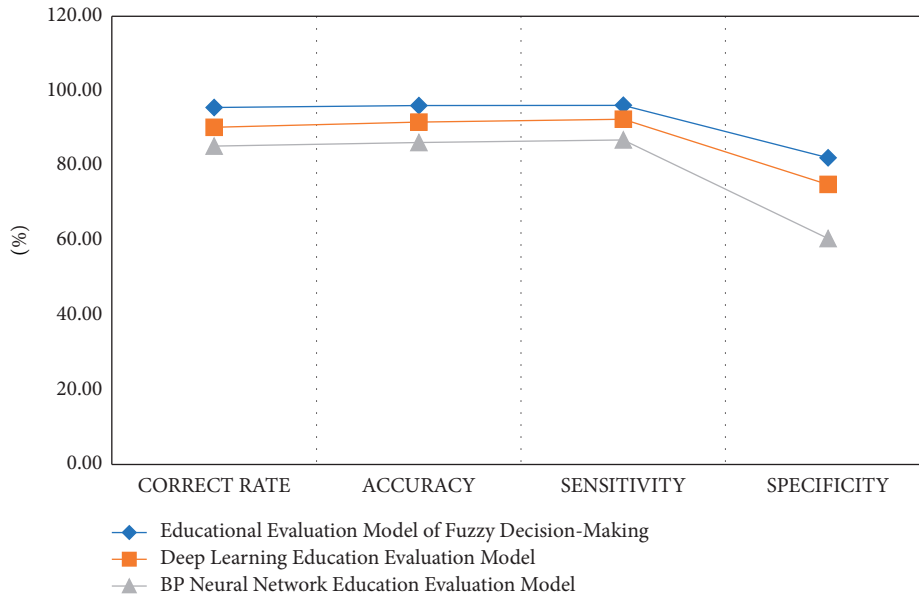
FIGURE 5: Statistics of model evaluation results.

TABLE 8: Training set model evaluation result table.

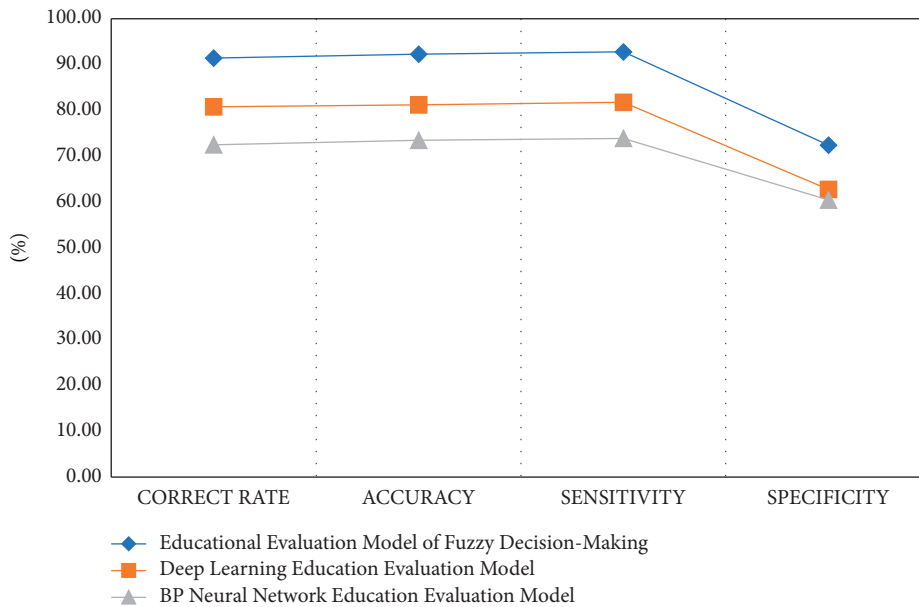| Recognition model	Correct rate (%)	Accuracy (%)	Sensitivity (%)	Specificity (%)
Educational evaluation model of fuzzy decision-making	95.61	96.13	96.15	82.14
Deep learning education evaluation model	90.25	91.71	92.43	74.96
BP neural network education evaluation model	85.21	86.21	86.89	60.53

FIGURE 6: Statistics of model evaluation results.

TABLE 9: Validation set model evaluation effect.

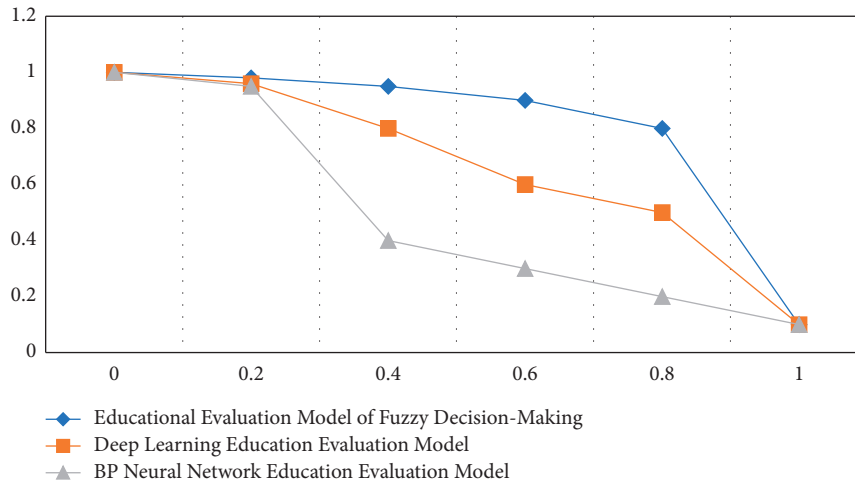| Recognition model	Correct rate (%)	Accuracy (%)	Sensitivity (%)	Specificity (%)
Educational evaluation model of fuzzy decision-making	91.45	92.26	92.79	72.45
Deep learning education evaluation model	80.78	81.24	81.78	62.79
BP neural network education evaluation model	72.49	73.47	73.89	60.48

Figure 7: Model P-R curve.

rate. As can be seen from Figure 7, the balance point of the fuzzy decision-making education model is 0.8, the deep learning model is 0.6, and the BP neural network is 0.4. The balance point of the fuzzy decision-making education model is greater than that of the other two models; that is, the performance of the fuzzy decision-making model is better than that of the other two models.

5. Conclusion

Influenced by the traditional Chinese educational concept, many people feel that art education is only a subdiscipline and art education is in an inconvenient position. Because of the particularity of art teaching, art education is a completely open education, emphasizing that students become the main body of learning, art teaching has no standard answers, and all art evaluations are not comprehensive enough, so a higher level of art teachers is proposed. The educational model proposed in this article has calculated the evaluation results to a large extent, and the accuracy rate can reach more than 95%. It has achieved good results in practice and greatly improved the efficiency of art teaching. Under the background of the development of the times, every art teacher should change his traditional teaching concept, and every front-line teacher should profoundly change his teaching concept, actively explore, and deeply study the diversified and comprehensive evaluation model. Starting from the improvement of students' comprehensive quality, students' all-round development and lifelong development are the ultimate goal. The improvement of comprehensive quality is the starting point, and the overall development and life-long development of students is the ultimate goal. It strengthens the multidirectional and developmental nature of evaluation, process, and interaction of evaluation subjects and plays the role of evaluation in promoting and educating students. Therefore, in classroom teaching, let students participate in the evaluation, evaluate other people's answers to questions, other people's works, and their own learning, find the reasons for their own successes and failures, and give full play to the motivation, guidance, and information feedback of art teaching evaluation.

Data Availability

The experimental 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 regarding this work.

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