Evaluation of the Information-based Teaching Design Abilities of Educators in Blended Teaching

https://doi.org/10.3991/ijet.v17i05.29849

Ya Wang
School of Humanities and international Education, Xi'an Peihua University, Xi'an, China
150543@peihua.edu.cn

Abstract—Information-based teaching is a process where the information technologies are actively integrated with the curriculum system, teaching objectives and teaching content. In order to improve the information-based teaching design abilities of teachers, it is of practical significance to study the criteria and methods for evaluating their information-based teaching design abilities under the online and offline blended teaching model. Based on the visualized measurement results of the keyword co-occurrence network, this paper constructed an evaluation indicator system for the information-based teaching design abilities of teachers under the online and offline blended teaching model, and gave the detailed steps of fuzzy comprehensive evaluation. In order to identify the improvements in the information-based teaching design abilities of teachers, it established a neural network prediction model for the information-based teaching design ability set of teachers based on the given evaluation indicator sample time series. At last, the scientificity of the proposed evaluation indicator system was verified through a test, with the prediction results of the model given.

Keywords—blended teaching model, information-based teaching, teaching design ability evaluation

1 Introduction

With the arrival of the information age, modern information technologies have seen unprecedented development, and its deep integration with teaching has also prompted the update of education models and the extended application of educational informatization [1-7]. The deep integration of information technology and teaching is not simply to use information technologies throughout the teaching process, but also to actively integrate these technologies with the curriculum system, teaching objectives, and teaching content at a deep level [8-13]. To achieve this purpose, teachers are required to design the learning environment related to the teaching content based on the information technologies available, to effectively enhance students' learning interest and achieve better teaching effects [14-16]. With the further development of education informatization, the blended teaching model that combines online and offline teaching elements has gained widespread attention in the academic circles [17-20]. In order to improve the information-based teaching design abilities of teachers, it is of practical significance to study the evaluation criteria and methods for the information-based teaching design abilities of teachers under the online and offline blended teaching model.

Currently, there are some problems regarding information-based teaching that need to be solved by educational researchers, like how to analyze the massive information to support students' in-depth learning, and how to better present teaching content and optimize the teaching process with information technologies. Chen and Liu [21] pointed out that visualization of information involves acquisition, analysis, filtering, mining, expression, modification, and interaction. The information-based teaching abilities of teachers is the key to promoting their professional development. Yang et al. [22] conducted an in-depth investigation on the information-based teaching abilities of the high school teachers in West China, with the teachers from three local high schools in Longchang County as the respondents. According to the characteristics of high school teachers in the western region, the information-based teaching abilities of teachers were divided into 5 aspects, and then 20 teachers were randomly selected as the respondents for a questionnaire survey. After that, the reliability and validity of the 178 questionnaires were tested, and finally 12 teachers from the three schools were selected as the samples for further interview, and the interview results and questionnaire data were analyzed. Chen [23] conducted a questionnaire survey and field interviews with teachers from Jiangxi Agricultural University as the respondents. It analyzed in theory the problems faced by teachers in the development of information-based teaching, and also discussed teachers' attitudes towards and cognition of information-based teaching, how well they mastered the information-based teaching skills, how they practiced information-based teaching, the main problems existing in information-based teaching, and the obstacles hindering the development of their information-based teaching abilities. In order to solve the problems like low accuracy and long duration of the traditional evaluation method for information-based teaching of business English, Yang [24] proposed a new evaluation method for information-based teaching of business English based on the balanced scorecard. On the basis of the teaching data collected, it used the Balanced Scorecard to establish an evaluation model for information-based teaching of business English, calculated the weights of the indicators, and completed the evaluation on the information-based teaching levels of business English.

Through review of the relevant literatures, it can be found that the existing research on the information-based teaching design abilities of teachers under the blended teaching model is not deep and systematic enough, nor is it pertinent and operable, and at the same time, there has been a lack of theoretical and empirical research on the internal evaluation indicators of information-based teaching abilities. Therefore, this paper constructed an evaluation indicator system for the information-based teaching design abilities of teachers under the online and offline blended teaching model. The whole paper is organized as follows: Section 2 constructs the evaluation indicator system for the information-based teaching design abilities of teachers under the online and offline blended teaching model by reference to the visualized measurement results of the keyword co-occurrence network, and gave the detailed steps of fuzzy comprehensive evaluation; in order to identify the improvements in the information-based teaching design abilities of teachers, Section 3 constructs a neural network prediction model for the information-based teaching design ability set of teachers based on the given evaluation indicator sample time series; and after that, the scientificity of the proposed evaluation indicator system is analyzed, and the prediction results of the model are given and analyzed.

2 Construction of the evaluation indicator system for the information-based teaching design abilities of teachers

Information-based teaching, which utilizes information technologies as the auxiliary means in teaching, is an emerging modern form of teaching, consisting of four core elements: teachers, students, teaching content, and information media. The interactions among the above elements in the online and offline blended teaching environment will produce certain teaching effects. Figure 1 shows the relationships between the four elements of information-based teaching. With the development of information technologies, the blended teaching model that combines multiple teaching elements online and offline has become an inevitable trend in the development of higher education. Therefore, the information-based teaching design abilities of teachers under the online and offline blended teaching model are becoming increasingly important.

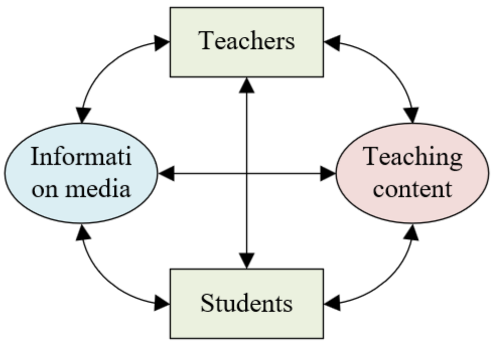

Fig. 1. Relationships between the four elements of information-based teaching

The keywords "blended teaching model" and "information-based teaching design abilities" were selected for literature search and visualized measurement. Figure 2 shows the keyword co-occurrence network, from which, the search terms that co-occur with the keywords and their correlation directions are revealed.

According to the definition and characteristics of the information-based teaching design abilities of teachers under the online and offline blended teaching model as well as the constraints hindering their development, based on the existing research results about evaluation indicator systems and the visualized measurement results of the keyword co-occurrence network, an evaluation indicator system for the information-based teaching design abilities of teachers under the online and offline blended teaching model was established. By the principles of scientificity, comprehensiveness, rationality, operability and accessibility, 4 primary indicators and 14 secondary indicators were finally determined. The details are as follows:

Primary indicators: DA_1=teachers' information awareness; DA_2=teachers' information processing awareness; DA_3=teachers' information analysis abilities; DA_4=teachers' information-based teaching design abilities;

Secondary indicators: DA_{11}=actively using information tools; DA_{12}=understanding and applying information-based teaching concepts; DA_{21}= able to collect various online learning resources based on information tools; DA_{22}= able to identify, analyze, and select information resources; DA_{23}= able to process and integrate the information resources required; DA_{31}= able to analyze the learning situations under the online and offline blended teaching model; DA_{32}= able to balance the use ratio of online and offline teaching models; DA_{33}= able to select appropriate multimedia equipment based on the teaching content; DA_{34}= able to allocate relevant information resources in accordance with the sequence of teaching content; DA_{41}= able to design various teaching strategies and implement the online and offline blended teaching model; DA_{42}= able to incorporate multiple forms such as micro-lectures, images, audio and animation, etc. into the design of the teaching plan; DA_{43}= able to design novel teaching activities with information technologies; DA_{44}= able to make full use of information technologies to create simulated situations related to the teaching content; DA_{45}= able to develop students' autonomous learning, communication and collaboration abilities.

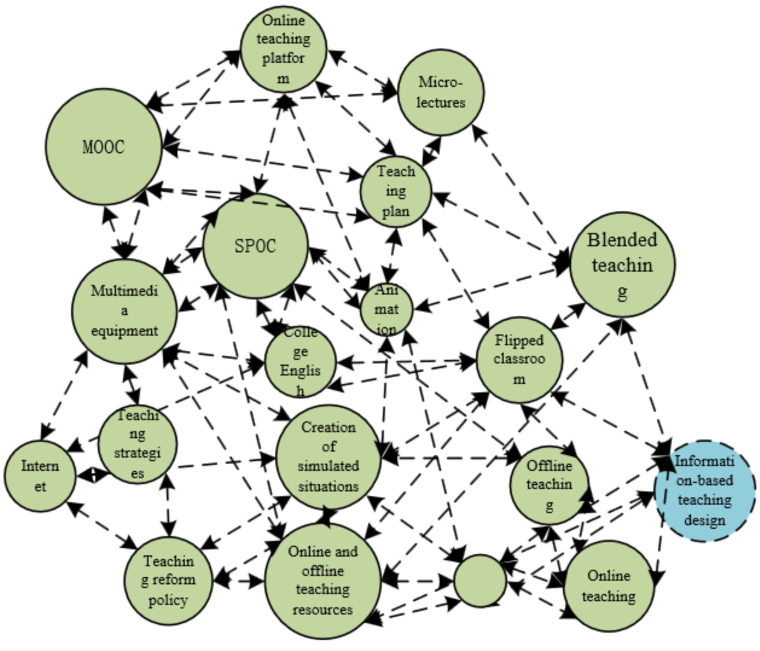

Fig. 2. Figure 2 Keyword co-occurrence network

Figure 3 shows the construction process of the evaluation indicator system. After the indicators are selected, the eigenvalues and eigenvectors of the judgment matrix are calculated based on the principles of scientificity and measurability, and the weights of the evaluation indicators for information-based teaching design abilities of teachers are further determined. First, normalize the column vectors of the judgment matrix *X*:

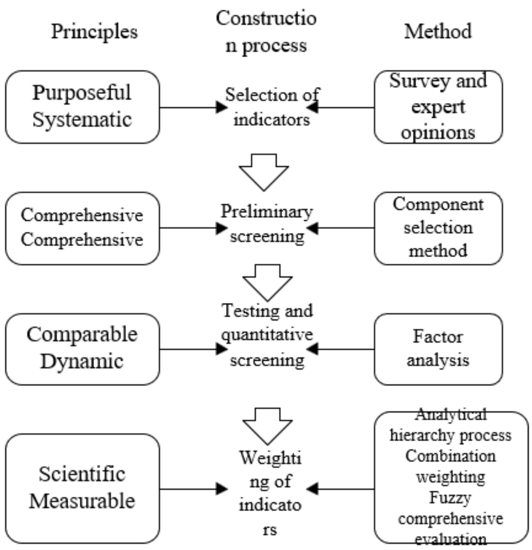

Fig. 3. Construction process of the evaluation indicator system

$$Q'_{1j} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \tag{1}$$

Sum up Q'_{ij} row-wise, and there is:

$$Q'_{1} = \sum_{j=1}^{m} Q'_{ij} \tag{2}$$

Normalize Q'_{τ}, and then there is:

$$Q_i = \frac{Q'_k}{\sum_{j=1}^{m} Q'_k} \tag{3}$$

Then, there is the eigenvector:

$$Q'_1 = \begin{pmatrix} Q_1 \\ \cdots \\ Q_m \end{pmatrix} \tag{4}$$

Calculate the maximum characteristic root μ_{max} by the following formula:

$$\mu_{max} = \sum_{i=1}^{m} \frac{XQ_i}{mQ_i} \tag{5}$$

In order to ensure that the relationships between the evaluation indicators are logical, the constructed judgment matrix needs to be tested for consistency, which takes three steps - calculating the consistency index, calculating the consistency ratio and performing the overall hierarchical ranking. The following formula can be used to calculate the consistency index *YZ*:

$$YZ = \frac{\mu_{max} - m}{m - 1} \quad (6)$$

When the two evaluation indicators are completely consistent, *YZ* is equal to 0. The higher the consistency of the two evaluation indicators, the smaller the value of *YZ*. Based on the calculation result of *YZ*, the corresponding average random consistency index *DB* can be further obtained by looking up the table. The consistency ratio *ZD* is calculated by the following formula:

$$ZD = \frac{YZ}{DB} \quad (7)$$

When *ZD* is greater than 0.1, it can be deemed that the logic of relations between the evaluation indicators is unreasonable, and that the judgment matrix fails the consistency test and needs to be adjusted.

In order to obtain a reasonable overall hierarchical ranking, it is necessary to obtain the weights of the evaluation indicators on the same layer relative to those on the lower layer from the criterion layer to the scheme layer. Suppose that the upper layer which the evaluation indicators are on is layer *X*, and that the ranking results of all the indicators are $x_1,...x_n$; that the lower layer is *Y*, and that the weights of the indicators relative to the indicator X_j on the upper layer are $y_{1j},...,y_{mj}$. The following formula shows how to calculate the weight of each evaluation indicator in layer *Y* relative to layer *X*:

$$y_i = \sum_{j=1}^{n} y_{ij} x_j \, , i = 1, \dots, m \quad (8)$$

Finally, perform the consistency test on the overall hierarchical ranking:

$$ZD_{AR} = \frac{\sum_{j=1}^{n} YZ(j) x_j}{\sum_{j=1}^{n} DB(j) x_j} \quad (9)$$

When *ZD* is less than 0.1, the overall hierarchical ranking passes the consistency test.

Below are the detailed steps to perform fuzzy comprehensive evaluation on the information-based teaching design abilities of teachers under the online and offline blended teaching model. Assuming that the total number of evaluation indicators is represented by m_{EI}, the evaluation indicator set is first determined as follows:

$$V = \left(v_1, v_2, \dots, v_{m_{EI}}\right) \quad (10)$$

Assuming that the *j*-th evaluation result is represented by u_j, where $j=1,2,\dots,n$, and that the total number of evaluation results by m_{CO}, the total set of possible ratings including excellent, good, medium and poor is defined as follows:

$$U = \left(u_1, u_2, \dots, u_{m_{CO}}\right) \quad (11)$$

Let the fuzzy weight distribution vector obtained in the previous section be represented by $Y=(y_1, y_2,...y_{mEI})$, and the weight of the i-th indicator by y_i, and suppose that $0<x_i<1$ and that $\Sigma x_i=1$. Here, the weight of each indicator has been obtained in the previous section.

Next, the fuzzy single-factor evaluation is performed on the information-based teaching design abilities of teachers, that is, the evaluation is carried out with one indicator to determine the degree of membership of the evaluation target to U. After the hierarchical fuzzy subsets are constructed, the evaluated target is quantified from each evaluation indicator v_i, and the obtained fuzzy relation matrix is expressed as follows:

$$GX = \begin{pmatrix} s_{11} & \cdots & s_{1n} \\ \vdots & \ddots & \vdots \\ s_{m_{EI}1} & \cdots & s_{m_{EI}n} \end{pmatrix} \tag{12}$$

where,

$$s_{ij} = \frac{\text{Number of experts rating the indicator } i \text{ relative to indicator } j}{\text{Total number of experts}} \tag{13}$$

Based on the weighted average fuzzy operator, synthesize Y and GX, and then the corresponding fuzzy comprehensive evaluation results are obtained. Assuming that the degree of membership of the evaluation target as a whole to U_j is represented by r_j, there is:

$$R = Y \cdot GX = \left(y_1, y_2, ..., y_{m_{EI}}\right) \begin{pmatrix} s_{11} & s_{12} & \cdots & s_{1n} \\ s_{21} & s_{22} & \cdots & s_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ s_{m_{EI}1} & s_{m_{EI}2} & \cdots & s_{m_{EI}n} \end{pmatrix} = \left(r_1, r_2, ..., r_{m_{EI}}\right) \tag{14}$$

The result of fuzzy comprehensive evaluation is usually a fuzzy vector, which provides rich information. To compare and sort multiple evaluation targets, it is necessary to process the fuzzy comprehensive evaluation result $R=(r_1,r_2,...,r_m)$ using the weighted average principle. According to the formula $D_i=R_i \cdot M$, the comprehensive scores of evaluation indicators at all levels can be obtained.

3 Prediction of the information-based teaching design abilities of teachers

The information-based teaching design abilities of teachers are trained by stage. In order to identify the improvements in the information-based teaching design abilities of teachers, this paper first briefly introduced the feedforward neural network used, and then constructed a neural network prediction model for the information-based teaching design ability set of teachers based on the given evaluation indicator sample time series. Figure 4 shows the structure of the feedforward neural network used.

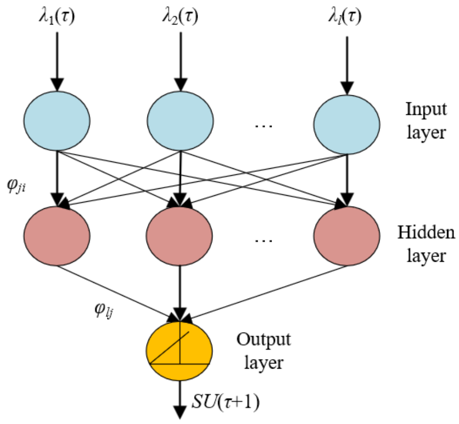

Fig. 4. Structure of the feedforward neural network

In the sample learning process of the feedforward neural network used, the neurons in the input layer receive the input of the evaluation indicator sample data, and propagate them forward to each neuron in the hidden layer. Suppose that the connection weight between the *i*-th neuron in the input layer and the *j*-th one in the hidden layer is represented by φ_{ji}, that the input sample data series by λ_i, that the bias of the *j*-th neuron in the hidden layer by ω_j, the output of the *j*-th neuron in the hidden layer by b_j, and that the activation function of the neurons in the hidden layer by $g(.)$. The following formula shows how to calculate the output of each neuron in the hidden layer:

$$b_j = g\left(\sum_{i=1}^{n} \phi_{ji}\lambda_i - \omega_j\right) = g\left(net_j\right) \tag{15}$$

The input of the output layer is the output of the hidden layer. Suppose that the connection weight between the hidden layer and the output is represented by φ_{lj}, that the bias of the neuron in the output layer by ω_l, that the final output of the *i*-th neuron in the output layer by $SU(\tau+1)$, and that the activation function of the output layer by $h(.)$. The following formula shows how to calculate the output of each neuron in the hidden layer:

$$SU(\tau + 1) = h\left(\sum_{j=1}^{k} \phi_{lj} b_j - \omega_l\right) \tag{16}$$

Suppose R is the set of rules for the first-order transformation between the previous term and the next term in the time series, and that the set of rules with the dynamic range O_i in the previous term of the time series is represented by R_i. Suppose that, when the dynamic range of the current time series is O_i, the probability of the dynamic range of the next time series being O_j is represented by $GS(O_j/O_i)$, and that the total number of occurrences of the transformation rule $O_i \rightarrow O_j$ is represented by $N(O_i \rightarrow O_j)$, then $GS(O_j/O_i)$ is expressed as follows:

$$GS\left(O_j/O_i\right) = \frac{N\left(O_i \rightarrow O_j\right)}{\sum_{\forall l} N\left(O_i \rightarrow O_l\right)} \tag{17}$$

The set R_i can be expressed as:

$$R_i = \{O_i \rightarrow O_l | GS(O_l/O_i) > 0\} \quad (18)$$

Given the dynamic range of the current time series O_i, in order to predict the dynamic range of the next time series, an *RBF* neural network model was designed that allows all rules in the set R_i to be triggered simultaneously. Suppose that the dynamic range of the time series containing the current system input is O_i. In order to avoid the error caused by the neural network not being trained according to the rules containing O_i in the previous term, this paper used *RBF* neurons as pre-selector. Assuming that the input of *RBF* neurons is represented by a, and that the median value of O_i by n_i, the following formula shows how to calculate the output ξ_i of the i-th neuron in the hidden layer:

$$\xi_i = d^{-\alpha(|a^2 - n_i^2|)} \quad (19)$$

Given the current data point $SU(\tau)$, assuming that the dynamic range of the time series containing the current time series data point $SU(\tau)$ is represented by O_z, if O_z exists in the previous term in any training rule set of the neural network, then the neural network is enabled after receiving an enable signal resulting from a logical or operation output by the *RBF* neurons.

Through weighting and calculation of the output of the neural network triggered by the pre-selector, the final prediction $SU^*(\tau+1)$ about the information-based teaching design abilities of teachers can be obtained. Assuming that the output of the neural network triggered is denoted as $p_1, p_2....p_u$, that the probability of o_{pi} occurring as the dynamic range of the next time series as $\xi(o_{pi}/o_z)$, and that the dynamic range of the corresponding time series is $o_{p1}, o_{p2}....o_{pu}$, then the following formula shows how to calculate the prediction value finally output by the network:

$$SU'(\tau + 1) = \sum_{i=1}^{u} \left(p_i \times \xi\left(o_{pi}/o_z\right)\right) \quad (20)$$

In order to obtain better prediction results about the information-based teaching design abilities of teachers, this paper used time-series data points to assign the dynamic ranges of the time-series, and took each time-series dynamic range as a fuzzy set. Obviously, each time-series dynamic range is associated with a fuzzy membership function. So the membership value corresponding to each time-series data sample point was used to train the neural network. The advantage of this method is that it can effectively obtain the inherent fuzziness in the evaluation on the information-based teaching design abilities of teachers. The following formula expresses the membership function corresponding to the i-th time-series dynamic range:

$$v_i(a) = d^{-\frac{(a - n_i^2)}{2\varepsilon_i^2}} \quad (21)$$

The neural network was trained using the improved fuzzy rules shown in Figure 5. The specific steps are given below:

- Step1: Determine the dynamic range of the time series;
- Step2: Establish the set of rules for first-order transformation between the previous term and the next term in the time series for neural network training. The training

set Φ built on the first-order transition rules after fuzzification is expressed as $\Phi=\{(\lambda_1(n_{iw}), \lambda_2(n_{iw}),...,\lambda_l(n_{iw}),n_{jw}\}|w\in\{1,2,...,s\}$, where the median values corresponding to the time-series dynamic ranges O_{iw} and O_{Jw} are represented by n_{iw} and n_{jw}, respectively, and the membership value of a in the fuzzy set is represented by $\lambda_k(a)$;

- Step3: Train the neural network based on Φ and predict the information-based teaching design abilities of teachers;
- Step4: Complete the prediction.

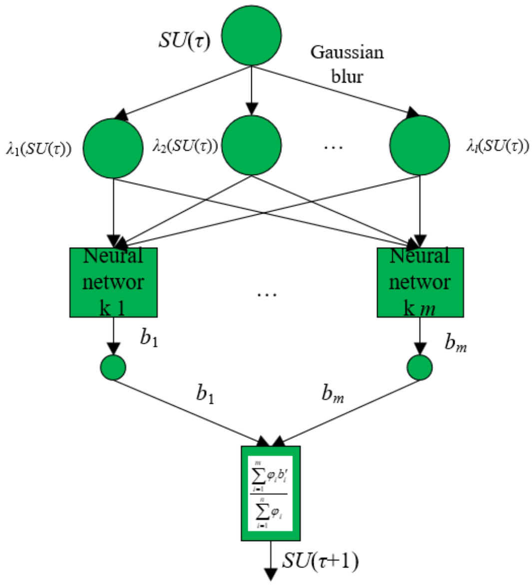

Fig. 5. Structure of the neural network prediction model for the information-based teaching design abilities of teachers

4 Simulation and test results

Tables 1 - 4 show the judgment matrices of the primary indicators – teachers' information awareness, teachers' information processing awareness, teachers' information analysis abilities and teachers' information-based teaching design abilities and the consistency test results thereof. It can be seen that the results of the analytic hierarchy process have relatively ideal consistency, that is, the distribution of the weight coefficients of the indicators is relatively reasonable. Based on the following calculation results, the total weights of the indicators about the information-based teaching design abilities of teachers can be further calculated.

Table 1. Judgment matrix DA1-X for teachers' information awareness

DA_1	DA_{11}	DA_{12}
DA_{11}	1	/
DA_{12}	2.14	1
$Q^{'}$	3.62	1.75
Q	0.1472	0.0842
DA_1Q	0.4758	0.2362
μ_{max}	4.185	
YZ	0.047	
ZD	0.0495	

Table 2. Judgment matrix DA2-X for teachers' information processing awareness

DA_2	DA_{21}	DA_{21}	DA_{23}
DA_{21}	1	/	/
DA_{22}	0.28	1	/
DA_{23}	5.17	3.62	1
$Q^{'}$	12.48	35.29	2.57
Q	0.1328	0.3625	0.0184
DA_2Q	0.8574	3.3265	0.1958
μ_{max}	4.185		
YZ	0.047		
ZD	0.0495		

Table 3. Judgment matrix DA3-X for teachers' information analysis abilities

DA_3	DA_{31}	DA_{31}	DA_{33}	DA_{34}
DA_{31}	1	/	/	/
DA_{32}	2.27	1	/	/
DA_{33}	8.02	6.15	1	/
DA_{34}	6.14	4.27	0.23	1
$Q^{'}$	28.15	17.49	2.35	9.25
Q	0.2615	0.1627	0.0315	0.0842
DA_3Q	2.4848	1.3285	0.1582	0.4628
μ_{max}	7.6282			
YZ	0.1325			
ZD	0.0859			

Table 4. DA4-X judgment matrix DA4-X for teachers' information-based teaching design abilities

DA_4	DA_{41}	DA_{41}	DA_{43}	DA_{44}	DA_{45}
DA_{41}	1	/	/	/	/
DA_{42}	0.52	1	/	/	/
DA_{43}	5.26	7.49	1	/	/
DA_{44}	4.15	5.18	0.62	1	/
DA_{45}	2.85	4.57	0.35	0.51	1
$Q^{'}$	14.28	16.23	2.4595	3.58	6.2748
Q	0.3184	0.3625	0.0748	0.0685	0.2847
DA_4Q	1.6285	2.1627	0.3625	0.5748	0.758
μ_{max}	5.2481				
YZ	0.0362				
ZD	0.0295				

It can be seen from the scatter diagram for factor analysis of information-based teaching design abilities of teachers in Figure 6 that, after the 8th core evaluation indicator, the curve tends to flatten, indicating that these 8 core evaluation indicators are more important than the rest.

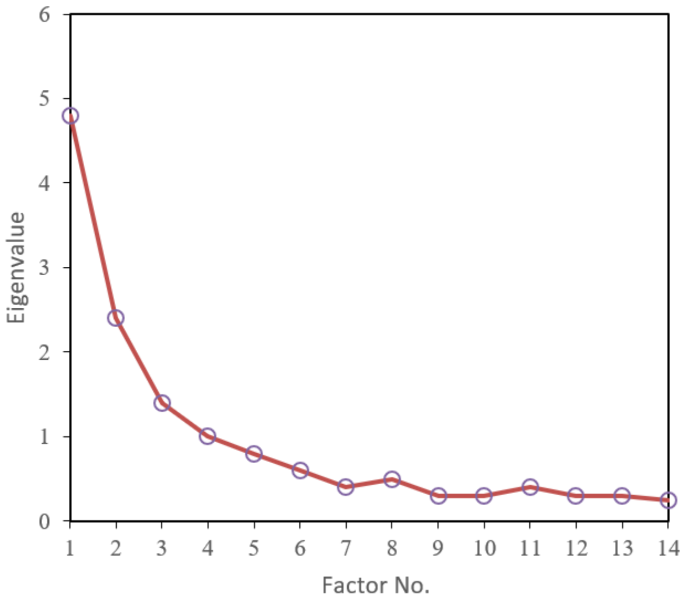

Fig. 6. Scatter diagram for factor analysis of information-based teaching design abilities of teachers

Figure 7 shows the prediction of the information-based teaching design abilities of teachers. It can be seen that, among the 8 core evaluation indicators DA_{11}, DA_{21}, DA_{22},

DA_{23}, DA_{33}, DA_{34}, DA_{43}, DA_{44}, DA_{34} (able to allocate relevant information resources in accordance with the sequence of teaching content) and DA_{43} (able to design novel teaching activities with information technologies) received high scores, and DA_{44} (able to make full use of information technologies to create simulated situations related to the teaching content) also received a relatively high score.

It can be seen from the above predictions that, the teachers evaluated still cannot effectively identify, analyze, select, process and integrate the information resources, nor can they use multimedia equipment to their satisfaction due to the limitations of the actual teaching environment. In addition, their awareness of using information tools actively and abilities of collecting online learning resources using information tools also need to be improved.

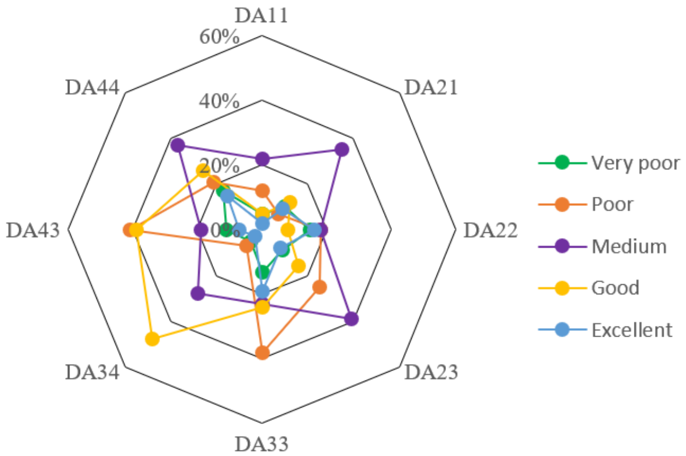

Fig. 7. Prediction results of the information-based teaching design abilities of teachers

5 Conclusions

This paper studied the evaluation on the information-based teaching design abilities of teachers under the online and offline blended teaching model. First, by reference to the visualized measurement results of the keyword co-occurrence network, the evaluation indicator system for the information-based teaching design abilities of teachers under the online and offline blended teaching model was constructed, and the detailed steps of fuzzy comprehensive evaluation were given. Then, the neural network prediction model for the information-based teaching design ability set of teachers based on the given evaluation indicator sample time series was established, which made it possible to identify the improvements in the information-based teaching design abilities. In the Simulation and test results section, the judgment matrices of the primary indicators, namely teachers' information awareness, teachers' information processing awareness, teachers' information analysis abilities and teachers' information-based teaching design abilities and the consistency test results thereof were provided, and the total weights of the indicators in the evaluation on information-based teaching design abilities of teachers were obtained. The scatter diagram for factor analysis of information-based teaching design abilities of teachers was plotted, based on which, 8 core evaluation indicators - DA_{11}, DA_{21}, DA_{22}, DA_{23}, DA_{33}, DA_{34}, DA_{43} and DA_{44} were selected. Finally, the proposed prediction model was used to predict the 8 core evaluation indicators, and the prediction results were analyzed, based on which, suggestions were given for improving the information-based teaching design abilities of teachers.

6 References

[1] Sugandi, L., Kurniawan, Y. (2018). The influence of information technology on the information and service quality for the teaching and learning. International Journal of Emerging Technologies in Learning (iJET), 13(12): 230-237. https://doi.org/10.3991/ijet.v13i12.8665

[2] Elfaki, A.O., Bassfar, Z. (2020). Construction of a software development model for managing final year projects in information technology programmes. International Journal of Emerging Technologies in Learning, 15(21): 4-23. https://doi.org/10.3991/ijet.v15i21.15401

[3] Kuang, C. (2021, May). Thoughts on information technology's transformation of financial digital teaching. In Journal of Physics: Conference Series, 1915(4): 042065. https://doi.org/10.1088/1742-6596/1915/4/042065

[4] Latham, K.F., Gorichanaz, T. (2018). The Basics Revisited: Nontextual Approaches to Teaching in Information Studies. Education for Information, 34(1): 3-5. https://doi.org/10.3233/EFI-189001

[5] Li, L. (2020, July). Problems and countermeasures of information technology in college English teaching. In International Conference on Frontier Computing, pp. 2051-2056. https://doi.org/10.1007/978-981-16-0115-6_242

[6] Zhang, W. (2020). Micro Teaching Online System Based on Teaching Information. In International conference on Big Data Analytics for Cyber-Physical-Systems, pp. 1494-1498. https://doi.org/10.1007/978-981-33-4572-0_216

[7] Kadir, N.I.A., Tasir, Z. (2020). Students' perceptions and information-sharing patterns in learning authoring system course through blogging. International Journal of Emerging Technologies in Learning, 15(19): 187-199. https://doi.org/10.3991/ijet.v15i19.10950

[8] He, Y., Xin, H., Yali, P. (2021). Teaching Application of Economic Management Course based on Modern Information Technology. In 2021 International Conference on Internet, Education and Information Technology (IEIT), pp. 6-10. https://doi.org/10.1109/IEIT53597.2021.00009

[9] Zhang, Q., Xiao, L.Y., Shi, Y.F. (2021). Extraction and classification of mouth shape features in oral English teaching based on image processing. Traitement du Signal, 38(4): 1013-1021. https://doi.org/10.18280/ts.380411

[10] Blasco, J., Quaglia, E.A. (2018). InfoSec cinema: Using films for information security teaching. In 2018 {USENIX} Workshop on Advances in Security Education ({ASE} 18).

[11] Liu, T., Gao, Z., Guan, H. (2021). Educational Information System Optimization for Artificial Intelligence Teaching Strategies. Complexity. https://doi.org/10.1155/2021/5588650

[12] Li, S.L., Chai, H.Q. (2021). Recognition of teaching features and behaviors in online open courses based on image processing. Traitement du Signal, 38(1): 155-164. https://doi.org/10.18280/ts.380116

[13] Cong, H., Lili, C. (2021). The construction of blended case teaching model in the information technology environment. In Journal of Physics: Conference Series, 1827(1): 012175. https://doi.org/10.1088/1742-6596/1827/1/012175

[14] Hou, Z.R. (2021). Exploration of using modern information technology to realize college english distance teaching. Scientific Programming. https://doi.org/10.1155/2021/3317549
[15] Ibekwe-SanJuan, F. (2018). Combining an arts-informed and textual approach to teaching information and communication theories. Education for Information, 34(1): 39-53. https://doi.org/10.3233/EFI-189005
[16] Puolitaival, T., Kestle, L. (2018). Teaching and learning in AEC Education-the Building Information Modelling factor. Journal of Information Technology in Construction, 23: 195-214. https://hdl.handle.net/10652/4367
[17] Xu, D. (2021). Exploration of Classroom Teaching Methods Under Mixed Teaching Mode. In International Conference on Geometry and Graphics, pp. 771-780. https://doi.org/10.1007/978-3-030-63403-2_70
[18] Zhou, W. (2021). The practice of mixed teaching mode in college english teaching under the mobile internet environment. In The International Conference on Cyber Security Intelligence and Analytics, pp. 18-23. https://doi.org/10.1007/978-3-030-70042-3_3
[19] Fan, D., Zhang, L. (2021). Research on mixed teaching of university computer in MOOC and rain classroom. In E3S Web of Conferences, 236: 05056. https://doi.org/10.1051/e3sconf/202123605056
[20] Luo, J., Yu, Y. (2021). The Mixed teaching practice of" learn-centered" live classroom under the rain classroom information technology. In 2021 4th International Conference on Information Systems and Computer Aided Education, pp. 1007-1010. https://doi.org/10.1145/3482632.3483071
[21] Chen, H., Liu, S. (2018). Practical ability training on visualization teaching design based on information visualization technology. In 2018 International Conference on Intelligent Transportation, Big Data & Smart City (ICITBS), pp. 517-520. https://doi.org/10.1109/ICITBS.2018.00136
[22] Yang, H., Liu, L., Wu, W., Fang, Y., Zhang, R. (2021). Exploring the informatization teaching ability of high school teachers in the western region of China. In 2021 12th International Conference on E-Education, E-Business, E-Management, and E-Learning, pp. 225-231. https://doi.org/10.1145/3450148.3450167
[23] Chen, S. (2021). Discussion on ways for teacher development center to help teachers improve their teaching ability under the background of informatization. In the Sixth International Conference on Information Management and Technology, pp. 1-5. https://doi.org/10.1145/3465631.3465940
[24] Yang, Y. (2021). Research on the evaluation method of business English informatization teaching level based on BSC. In 2021 6th International Conference on Smart Grid and Electrical Automation (ICSGEA), pp. 532-535. https://doi.org/10.1109/ICSGEA53208.2021.00126

7 Author

Ya Wang is Master of Arts, and lecture at Foreign literature and comparative Literature, Xi'an Peihua University, School of Humanities and international Education. Shaanxi 710125, China.

Article submitted 2022-01-31. Resubmitted 2022-02-28. Final acceptance 2022-03-01. Final version published as submitted by the author.