Comprehensive Evaluation Model of MOOC Teaching Quality of Accounting Major Based on Rete Algorithm

Li-min Zhang(✉)

School of Economics and Management, Shenyang Institute of Technology, Shenfu Demonstration Zone, Shenyang 113112, China

Abstract. In order to provide auxiliary tools for MOOC teaching of accounting major and improve the application effect of traditional teaching quality evaluation model, a comprehensive evaluation model of MOOC teaching quality of accounting major based on Rete algorithm is designed. This paper analyzes the MOOC teaching mode of accounting major and uses Rete algorithm to match teaching data. On this basis, the evaluation standard of teaching quality grade is determined, the comprehensive evaluation index of teaching quality is set and the weight of evaluation index is calculated. Through the comprehensive solution of quantitative index and weight value, the comprehensive evaluation of teaching quality of accounting specialty is realized. Through the practical application of the model designed in this paper, it is found that the model can restrict the MOOC teaching quality of accounting major and indirectly improve the MOOC teaching effect of accounting major.

Keywords: Rete algorithm · Accounting teaching · MOOC teaching · Teaching quality · Comprehensive evaluation model

1 Introduction

Accounting major is the knowledge of how to recognize income and assets in a certain business cycle. In addition to preparing financial statements and recording business transactions, accountants are more important to be able to participate in the merger between enterprises, quality management, the application of information technology in finance, tax strategy and management decision-making activities of many enterprises. Accounting major involves a wide range of fields, including assurance, audit, taxation, company accounting, management accounting, financial management, bankruptcy liquidation, forensic accounting, budgeting, business consulting, etc. In order to break the limitation of time and space, improve the teaching level of accounting major, and provide high-quality accounting talents for enterprises in the society, the teaching course of accounting major is set up on the MOOC platform [1]. MOOC platform, namely large-scale open online courses, is the product of "Internet plus education". The teaching of accounting major under MOOC platform focuses on the cultivation of accounting practical skills

W. Fu et al. (Eds.): eLEOT 2021, LNICST 390, pp. 379–391, 2021.
https://doi.org/10.1007/978-3-030-84386-1_31

and literacy. MOOC teaching mode is used in accounting major of higher vocational colleges to make students' professional knowledge points and contents different from the traditional teaching mode. It is not based on students' one-time achievements, but generated many times according to students' learning situation. MOOC teaching mode not only emphasizes the teaching and learning of knowledge content, but also pays attention to the cultivation of accounting practical skills and literacy, which makes students have a more profound and direct understanding of practical skills and theoretical professional knowledge, and effectively solves the problem of accounting major's emphasis on theoretical knowledge teaching in Higher Vocational Colleges. Students are easy to produce new thinking and views in network learning, which is more meaningful it is conducive to students' personalized learning.

Due to the special performance of MOOC teaching platform, it is necessary to evaluate the teaching quality on the basis of MOOC. Teaching quality is the reflection of teaching activity and teaching effect, and it is the interrelated concept of the need and expectation of teaching activity. Teaching quality evaluation refers to the evaluation of teachers' academic professional level, teaching methods and teaching attitude. One of the basic contents of educational measurement is how to evaluate the teaching quality, but so far there is no unified standard. The teaching quality of a course is closely related to many factors, such as the teaching quality of each course in the early stage, the cooperation of each teaching link, the teaching effect of teachers, the quality of students and learning attitude.

Foreign MOOC started earlier, and the research on MOOC quality evaluation is more mature than that in China. Combing the existing MOOC quality evaluation abroad, its related research can be divided into macro level, meso level and micro level, that is, the evaluation standard with the state as the main body, the evaluation standard with institutions and universities as the main body, and the evaluation standard proposed by experts and scholars [2]. With the development of MOOC in China, there are more and more researches on MOOC quality evaluation, which can be divided into three categories according to the main body of the evaluation standard: the evaluation standard of online teaching quality issued by government agencies; the evaluation standard independently developed by the MOOC platform construction team; and the evaluation standard of MOOC teaching quality developed by scholars.

However, the current MOOC quality evaluation methods mostly use analytic hierarchy process (AHP) to build the MOOC teaching quality evaluation system of accounting major, and design the MOOC teaching quality evaluation model based on it. Due to the lag of AHP so far, this method has the problems of low evaluation reference value and application performance, Therefore, Rete algorithm is applied to teaching quality evaluation. Rete algorithm is a fast forward rule matching algorithm, and its matching speed has nothing to do with the number of rules. On this basis, by analyzing the teaching mode of MOOC in accounting major, Rete algorithm is used to match teaching data, determine the evaluation standard of teaching quality grade, set comprehensive evaluation index of teaching quality and calculate the weight of evaluation index, and solve the problem through the comprehensive solution of quantitative index and weight value, To realize the comprehensive evaluation of accounting teaching quality. This paper aims to improve the application value of the comprehensive evaluation model of MOOC teaching quality

of accounting major through the application of Rete algorithm, and indirectly improve the teaching quality of MOOC of accounting major.

2 Design of Comprehensive Evaluation Model for MOOC Teaching Quality

Teaching quality is an important cornerstone of a university. It is related to the future and development of the University. It is the core starting point of carrying out a series of other work, and determines the academic ability of the University. The objective and detailed evaluation of teachers' teaching level can provide effective reference for improving the teaching mode and building a more sound teaching team, so as to improve the quality of education and teaching.

2.1 MOOC Teaching Mode of Analytical Accounting

MOOC teaching of accounting major is divided into three steps: online activity, in class activity and after class activity. Online activity is the beginning stage of a course and the most important stage. The smooth implementation of this stage will lay a solid foundation for the improvement of the final teaching results. Therefore, this link is divided into three steps, as shown in Fig. 1.

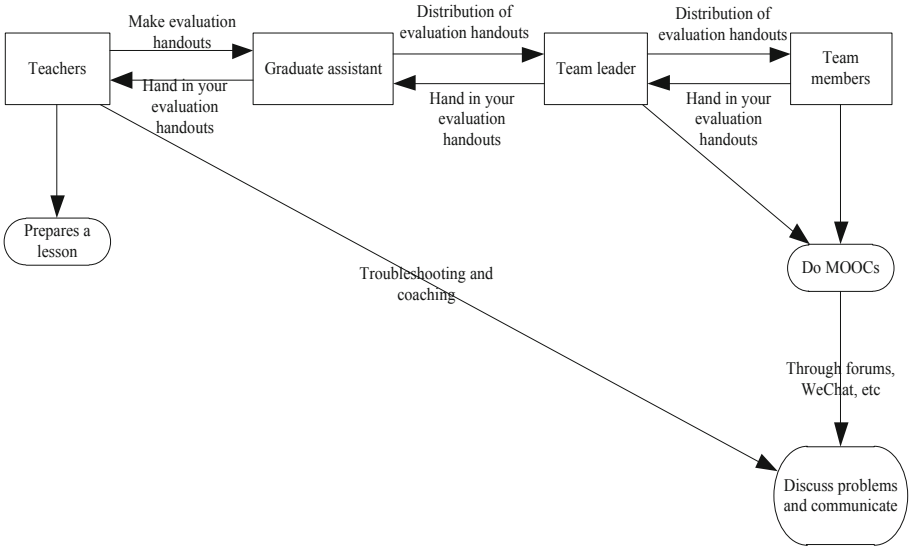

Fig. 1. Flow chart of online activities

In the MOOC learning stage, students can use a variety of mobile devices or PC terminals to learn MOOC courses anytime and anywhere. According to the teaching resources and teaching guidance provided by teachers, they can plan their own learning

rhythm, watch MOOC videos and self-study course materials independently, and complete small tests interspersed in the course. Before the face-to-face course, we should guide the students to study independently to deepen their understanding of knowledge. In the classroom activities, the teacher's activities mainly include: according to the requirements of teaching objectives, combined with the sorting results of evaluation handouts, classroom analysis of the key points and difficulties encountered by students in MOOC learning; teachers organize students to carry out classroom activities in groups in an orderly manner, and organize interaction between groups at the same time. In this process, teachers provide personalized guidance and listen and record the difficulties of learning, observe the overall performance of students, judge whether the teaching objectives achieve the teaching focus [3]. After the discussion, the teachers evaluate the quality of learning task completion and interactive discussion, and complete the teaching activities in class. After class teaching mainly uses the linkage of online consultation system, message board, email, forum, microblog, QQ group and wechat group with mobile phones, so that students can ask questions, answer and discuss at any time and any place [4]. This can not only solve the problems left in the classroom, but also extend the classroom discussion to after class. Through online conversation, students' information expression ability and thinking ability can be further enhanced; students can more freely mine information, put forward more problems, and realize the consolidation and deepening of knowledge.

2.2 Using Rete Algorithm to Match Teaching Data

Figure 2 shows the basic structure of MOOC teaching.

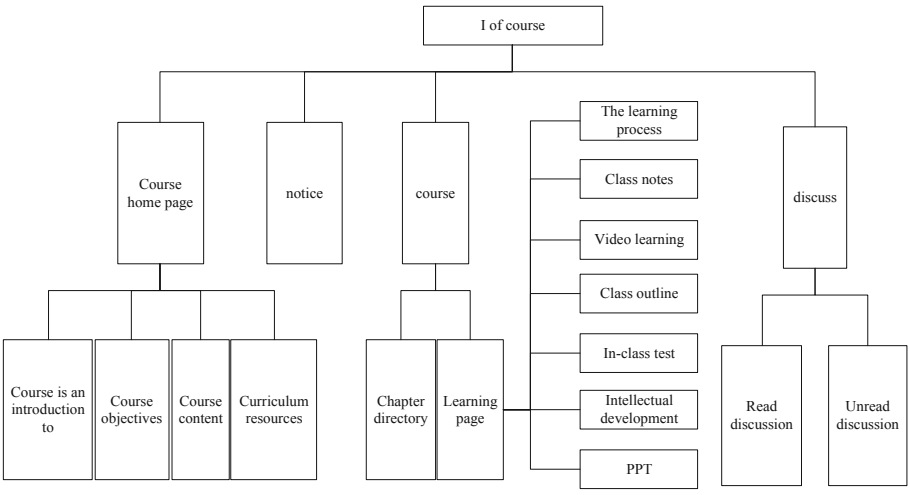

Fig. 2. MOOC teaching structure of accounting major

In the teaching structure shown in Fig. 2, the real-time teaching data is collected, and on this basis, the Rete algorithm is used for data matching. Rete algorithm needs a state

memory and a rule memory. The elements stored in the state memory are represented as WME, each WME represents a state of the system, and the state memory can be a global database, which represents the whole state of the system [5]. WME can be used as the input of one-input node or the right input of two-input node. Token refers to the WME binding list that has been matched in the rule. The list contains one or more wmes, which can be used for the left input of the two-input node. If the WME is passed to the left end of the two-input node, the WME is encapsulated as a token with only one WME as the left input of the two-input node. The process of pattern matching between WME or token and node is shown in Fig. 3.

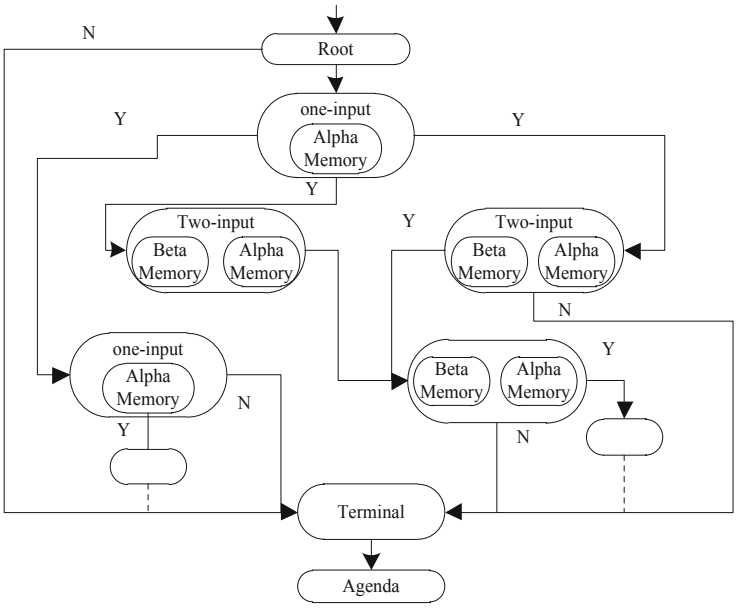

Fig. 3. Rete algorithm pattern matching flow chart

WME and the successor node of root are matched by type. If the matching is successful, the WME is transferred to the successor node to continue matching, otherwise the matching ends. If the WME is transferred to the one-input node, the pattern corresponding to the node is matched. If the matching is successful, the fact will be saved in the alpha storage area corresponding to the one-input node, and the WME is transferred to the successor node to continue matching, no then end the matching [6]. If WME is passed to the right end of the two-input node, it will be added to the alpha storage area of the node and matched with the token in the beta storage area of the node. If the match is successful, WME will be added to the token, and then the token will be passed to the next node. Otherwise, the match ends. If the token is passed to the left end of the two-input node, it will be added to the beta storage area of the two input node and matched with the WME in the alpha storage area. If the match is successful, the token will encapsulate the matched WME to form a new token and pass it to the next node. Otherwise, the match

ends [7]. If the token is passed to the end node, the rule corresponding to the root node is activated, and the action corresponding to the rule is put into the agenda for execution [8].

2.3 Determine the Evaluation Standard of Teaching Quality Grade

The MOOC teaching quality comprehensive evaluation grade standard of accounting major is set as the comparison standard of comprehensive evaluation model, and the teaching quality is divided into five grades. The corresponding standards and quantitative evaluation scores of each grade are shown in Table 1.

Table 1. Comprehensive evaluation grade standard of teaching quality

Teaching quality grade	Quantitative scoring	Teaching standards
Excellent	90–100	The concept of accounting major is clear, the teaching framework is clear, the teaching mode is in line with the practical operation mode of accounting major, and there is no teaching error
Good	80–89	The concept of accounting major is relatively clear, the teaching framework is relatively clear, and the teaching mode is relatively in line with the practical operation mode of accounting major
Secondary	70–79	The concept of accounting major is basically clear, the teaching framework is basically clear, and the teaching mode is basically in line with the practical mode of accounting major. There are 1–2 teaching errors
Pass	60–69	The concept of accounting major is fuzzy, the teaching framework is fuzzy, but there is a certain degree of organization, the teaching mode and the practical operation mode of accounting major are partially overlapped, and there are 2–3 teaching errors
Fail	<60	There are more than three teaching errors, such as inaccurate explanation of accounting professional proper nouns, unable to build a complete and clear teaching framework independently, teaching mode not in line with accounting practice mode

2.4 Setting up Comprehensive Evaluation Index of Teaching Quality

The evaluation of teaching quality is a complex problem, which is not only restricted by the evaluation object and the evaluation goal, but also influenced by the evaluation

subject's values. Therefore, the construction of evaluation model must be carried out according to some principles [9]. Among them, the comprehensive principle requires that the main factors affecting the teaching quality of accounting major should be taken into account when constructing the evaluation index system, which can reflect the effect of theoretical teaching and the quality of practice, and provide necessary data; the systematic principle requires that these elements of the index system should not be simply arranged and piled up without regularity, but must be considered The inner connection and mutual influence between them. The principle of scientificity refers to the establishment of the index items, the formulation of the evaluation criteria, the establishment of the index weight, the implementation of the evaluation process and the evaluation results, which should not only conform to the reality of the evaluation object, but also conform to the objective law of teaching activities. In order to make the MOOC teaching quality evaluation of accounting major scientific, the evaluators should grasp the situation of the evaluation object thoroughly, carefully, comprehensively and objectively, make realistic and fair judgment, seek and explore the way of improvement for the evaluation object from the perspective of the evaluation object, and put forward pertinent, targeted and feasible opinions. When constructing the evaluation system, the selected indicators should not only be collectable and quantifiable, but also be able to carry out effective measurement or measurement, that is, when collecting data, whether qualitative or quantitative, they should be easy to obtain, and they can be processed by certain statistical methods to get the required data [10].

According to the design principles of the teaching quality evaluation system and on the basis of the existing research results in the theoretical circle, the specific indicators are selected from the aspects of teaching objectives, teaching conditions, teaching links, teaching management and teaching results, some of which are shown in Table 2.

In the evaluation index system of teaching quality, teaching content is the main information intentionally transmitted in the process of interaction between teaching and learning. In the MOOC teaching quality evaluation of accounting major, the evaluation of "teaching content" mainly includes course overview, teaching design and teaching resources. First of all, the course page should provide teachers and teaching team introduction, course content introduction, and clearly explain the assessment method, credit and certification requirements of the course. At the same time, considering the universality of learners and the difference of knowledge background, it should explain to learners the basic physics knowledge and operation skills they should have when learning the physics course. Secondly, the teaching team should pay attention to the three links of "pre teaching test", "curriculum framework and key and difficult points" and "class hour design" in the teaching design. Before the formal teaching, the basic information of learners should be collected by means of questionnaires and so on. On this basis, the teaching steps and contents should be appropriately adjusted, and personalized guidance should be given [11]. MOOC teaching resources of accounting major are rich, which usually include "teaching video resources", "video auxiliary resources" and "teaching practice resources". According to the needs of the course, the teaching resources should be used reasonably to ensure the teaching quality of MOOC of accounting major. In the process of quality evaluation, the indicators of course access are the number of times of course platform access and the number of applicants, the course learning situation is

Table 2. MOOC teaching quality evaluation index of accounting major

First level indicators	Secondary indicators	Third level indicators
Teaching conditions	Teaching purpose	Definition
		Recognition
		Completion
Teaching conditions	Teaching team	Title of speaker
		Quality and ability of teaching staff
	Teaching environment	Teaching facilities
		Financial support
Teaching methods and means	Teaching content integrity and richness	
	Teaching method	Diversity of methods
	Teaching devices	Demonstration experiment, multimedia teaching, etc
	Proportion of theoretical and practical hours	
Teaching activities	Teacher activities	Knowledge explanation, classroom organization, question and answer interaction, etc
	Student activities	Course access, course learning, online interaction, etc
Teaching achievements	Homework evaluation	Job qualification rate, job completion rate, job design, job feedback
	Classroom assessment	Course qualification rate and course completion rate
	Proportion of students' awards and certificates	
	Rate of employment	

the length of course learning and video viewing. These quantitative indicators can be directly obtained by reading the background data of MOOC platform, while the quantitative processing of the proportion of theoretical and practical class hours, the qualified rate of homework, the proportion of students' awards and qualification certificates can be improved expressed as:

$$\begin{cases} \eta_T = \frac{T_L}{T_S} \\ \eta_h = \frac{n_h}{n_h + n_b} = \frac{n_h}{n_{tol}} \\ \eta_j = \frac{n_m}{N} + \frac{n_z}{N} \end{cases} \tag{1}$$

In formula (1), T_L and T_S are the number of class hours of theory and practice courses in MOOC courses of accounting major, respectively. n_h, n_b and n_{tol} correspond to the number of qualified assignments, the number of unqualified assignments and the total number of assignments. In addition, n_m and n_z represent the number of students who have obtained awards and accounting professional qualification certificates, and N is the total number of students who have participated in teaching. Similarly, we can get the quantitative processing results of other indicators in the constructed teaching quality evaluation index system.

2.5 Calculate the Weight of Comprehensive Quality Evaluation Index

Different indicators have different effects on MOOC quality. According to the importance of the indicators, weight is given. The calculation formula of comprehensive index weight is as follows:

$$\begin{cases} M = (0.2Q_1, 0.3Q_2, 0.2Q_3, 0.1Q_4, 0.2Q_5) \\ Q_i = \left(a_i^1 A_{i1}, a_i^2 A_{i2}, \ldots, a_i^n A_{in}\right) \end{cases} \tag{2}$$

Among them, Q_i is the weight set of the bottom indicators under the i first level indicators, a_i^n is the weight set of the n second level indicators under the i first level indicators, and A_{in} is the weight set of the third level indicators under the n second level indicators under the i first level indicators [12, 13].

2.6 To Realize the Comprehensive Evaluation of Accounting Teaching Quality

After calculating the weight value, we can get the weight matrix M of MOOC teaching quality comprehensive evaluation model based on Rete algorithm.

$$P = \sum_{i=1}^{n} D_i \times M_i \tag{3}$$

Where: D_i and M_i are the quantitative results and weight values of the indicators respectively [14, 15]. By comparing the evaluation results in formula (3) with the teaching quality grade standards set in Table 1, the final comprehensive evaluation results of MOOC teaching quality of accounting major can be obtained.

3 Comparative Experimental Analysis

The comprehensive evaluation model of MOOC teaching quality of accounting major based on Rete algorithm is developed by using ASP and SQL Server technology and B/S three-tier architecture. It aims to provide users with online teaching evaluation, real-time view, statistics, analysis, background maintenance and other functions. The major of accounting and finance in three schools is selected as the research object. The MOOC of the three universities is mainly responsible for associate professor or above. The division of curriculum team is clear. The three universities have specialized teachers

responsible for courseware production, video photography and answering questions, and professional personnel responsible for post production, curriculum development, platform maintenance and data statistics.

Under the MOOC teaching platform of accounting major, the personnel participating in the comparative experiment can be divided into five types: teachers, students, experts, system administrators and teaching administrators. Among them, teachers can log in this system to evaluate the teaching performance of colleagues, and can view the specific situation of participating in the evaluation, and can also conduct self-evaluation and query the evaluation results and ranking. Students log in to the system to grade the teachers and query the evaluation details. Expert: log in the system to evaluate the accounting professional teachers, give the corresponding score, and query the specific situation of personal evaluation. The system administrator can set the questionnaire, indicators and other related data through the system login, manage the evaluation objects and the evaluated objects, query, analyze and count the final scoring results, control the evaluation process and manage users at all levels. Teaching administrator: view the situation of department personnel participating in the evaluation, view the final results, and uniformly manage the evaluation data of relevant departments.

Due to the application of Rete algorithm in the evaluation model, it is necessary to build rete network in the experimental environment, as shown in Fig. 4.

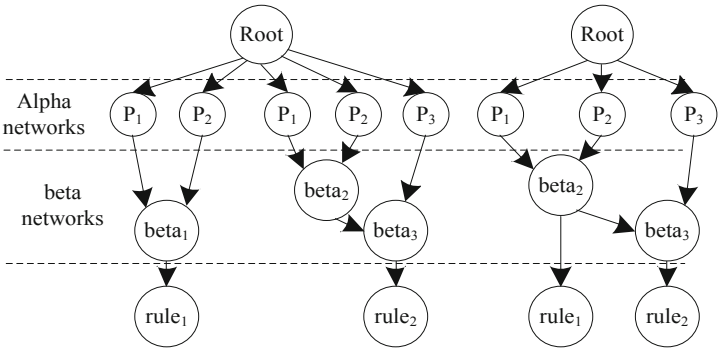

Fig. 4. Rete network structure

The purpose of this experiment is to verify the application effect of the designed teaching quality evaluation model in MOOC teaching of accounting major. Therefore, taking the students' performance of the research school as the quantitative comparative data, the change of accounting major students' professional performance before and after the application of the teaching quality evaluation model is obtained. Using the comprehensive evaluation model of MOOC teaching quality of accounting major based on Rete algorithm to evaluate the current teaching work, the results are shown in Fig. 5.

According to the evaluation results in Fig. 5, the optimization method of teaching quality is formulated and implemented. After a period of time, the changes of accounting students' scores before and after the application of the evaluation model are obtained. Several students are randomly selected, and the comparison results are shown in Table 3.

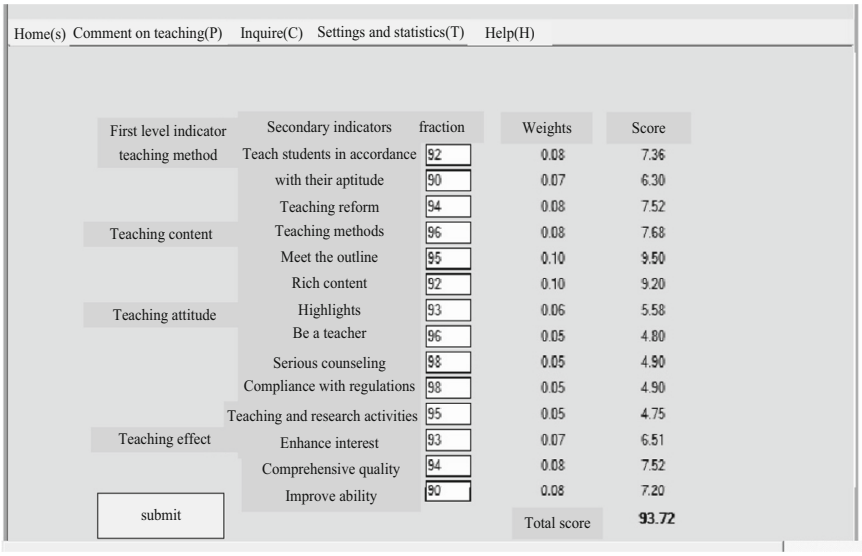

Fig. 5. MOOC teaching quality evaluation results of accounting major

Table 3. Application test results of teaching quality evaluation model

Accounting student number	Score/score of accounting major before applying teaching quality evaluation model	The score/score of accounting major after applying teaching quality evaluation model
01	82.3	91.5
02	88.6	96.7
03	79.4	90.4
04	75.5	91.2
05	80.2	93.3
06	81.4	92.8
07	66.7	89.7
08	90.3	95.6
Total score	644.4	741.2

It can be seen from the data in Table 3 that through the application of the MOOC teaching quality comprehensive evaluation model of accounting major based on Rete algorithm, the scores of accounting major students have been improved to varying degrees, and the average comprehensive scores of students have been improved by about 12.1 points, which proves that the designed teaching quality comprehensive evaluation model has a positive effect on students' professional learning.

4 Concluding Remarks

By using Rete algorithm to evaluate the MOOC teaching quality of accounting major, we can get a better comprehensive evaluation index of MOOC teaching quality of accounting major, and provide a scientific basis for the comprehensive evaluation of MOOC platform. Although the model can be very close to the teaching characteristics of MOOC course and reasonably evaluate the quality of the course, the teaching quality of the course is not only reflected in the selected evaluation index, but also affected by the characteristics of learners and the comprehensive management of the platform. Therefore, the evaluation of MOOC teaching quality of accounting major should consider the overall situation, comprehensively consider various factors, and make a scientific and correct judgment. Only good teaching quality evaluation of MOOC can make MOOC platform develop better.

References

1. Liu, H., Zhu, Y.: Research on the construction of teaching quality evaluation system. J. Phys: Conf. Ser. **73**(1), 25–27 (2020)
2. Zhang, M., Yu, X.: The construction of teaching quality evaluation system of modern apprenticeship based on big data. J. Phys: Conf. Ser. **78**(5), 28–30 (2020)
3. Dong, Q.W., Wang, S.M., Han, F.J., et al.: Innovative research and practice of teachers' teaching quality evaluation under the guidance of 'innovation and entrepreneurship.' Procedia Comput. Sci. **154**(1), 770–776 (2019)
4. Li, Z.: Evaluation of teaching effectiveness based on Gray Markov chain in the context of MOOC. IOP Conf. Ser.: Mater. Sci. Eng. **56**(9), 42–52 (2019)
5. Liu, G., Cai, Q., Ren, H.: A novel fuzzy evaluation method on teaching quality of college English based on preference selection index. IOP Conf. Ser.: Mater. Sci. Eng. **80**(1), 12–27 (2020)
6. Wang, Z., Tian, Q., Duan, X.: Research on the evaluation index system of college students' class teaching quality based on association algorithm. Cluster Comput. **22**(6), 13797–13803 (2019). https://doi.org/10.1007/s10586-018-2100-8
7. Ma, W., Yang, Z.: Evaluation of teaching quality in higher vocational colleges based on quantum behaviour particle swarm optimization. J. Phys: Conf. Ser. **29**(1), 32–42 (2020)
8. Abdelhadi, A., Nurunnabi, M.: Engineering student evaluation of teaching quality in Saudi Arabia. Int. J. Eng. Educ. **35**(1), 262–272 (2019)
9. He, M., Wu, L., Sun, Y., et al.: study on the integrative practice of university teaching space and information platform——taking Xi'an Eurasia University as an example. J. Phys: Conf. Ser. **21**(1), 69–77 (2020)
10. Li, X., Mo, X.: Application of AHP based on mathematical operational research in teaching evaluation system. J. Phys: Conf. Ser. **50**(3), 15–26 (2020)
11. Fen, Y., Biying, W.: The establishment of the teaching quality evaluation system for diversified courses in higher vocational colleges. Equipment Manufact. Educ. **33**(2), 39–41 (2019)
12. Debroy, A., Ingole, A., Mudey, A.: Teachers' perceptions on student evaluation of teaching as a tool for faculty development and quality assurance in medical education. J. Educ. Health Promot. **8**(1), 218–225 (2019)
13. Trskan, D.: Quality indicators, a new method for evaluation of teaching practice in teacher education programmes in Slovenia: example of quality indicators for school mentors – external mentors. Rev. Electrónica Interuniversitaria De Formación Del Profesorado **20**(2), 63–77 (2017)

14. Meng, Q.X., Xie, Y.H., Zhou, S.T.: Research on the comprehensive evaluation of MOOC teaching quality based on the improved hierarchical model. Educ. Modernization **7**(16), 62–64 (2020)
15. Guo, X., Zhang, M.H., Wu, L., et al.: Research and implementation of comprehensive evaluation algorithms for teaching quality in colleges and Universities. Comput. Modernization **18**(06), 121–126 (2019)