Research on key Technology of Classroom Teaching Evaluation Based on Artificial Intelligence

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Abstract: There are many defects in current classroom teaching evaluation, which is not conducive to the implementation of quality education. Therefore, the AI-based classroom teaching evaluation technology is proposed, using artificial intelligence theory, from the perspective of serving quality education, analyzing the problems in teaching evaluation, exploring effective classroom teaching evaluation, and ultimately promoting the development of students. Starting from the theory of artificial intelligence, it discusses the necessity of constructing a multi-evaluation system for the teaching process, which improves students’ language application ability and humanistic quality, and applies artificial intelligence theory to construct teaching from the aspects of evaluation methods, evaluation methods, evaluation objects, and evaluation subjects. Evaluation System. Experimental results show that this technology can accurately evaluate teaching effects and improve teaching quality.

Keywords: artificial intelligence, classroom, teaching evaluation

1. Introduction

Classroom teaching evaluation is a process in which teachers’ classroom teaching is taken as the research object, and the teaching process and teaching effect are objectively measured and evaluated according to certain methods and standards. "New curriculum teaching requirements" clearly points out: "teaching evaluation is an important basis for teachers to obtain teaching feedback information, improve teaching management, and ensure teaching quality[1]. It is an effective means for students to adjust learning strategies, improve teaching methods and improve learning efficiency, and is the key to achieve the goal of learning, science and education." However, the traditional teaching evaluation is often based on the summative assessment and evaluation. It is customary to measure students' test results, that is, to measure the quality of teachers' classroom teaching[2]. The essence of evaluation is to realize the promotion of construction by evaluation, and to provide feedback and promotion to the teaching process. Test scores cannot reflect the overall effect of the teaching process, nor are they the only purpose of teaching. Evaluation based on summative test and evaluation is unscientific and difficult to effectively promote the development of teaching. Based on this, this paper puts forward the evaluation method of classroom teaching based on artificial intelligence. Guided by the theory of artificial intelligence, combined with the teaching requirements and personnel training objectives, this paper discusses how to construct a multi-evaluation teaching system.
2. Key technology of classroom teaching evaluation

2.1 Optimization of classroom teaching evaluation content

Traditional evaluation methods can not objectively and fairly evaluate students' learning process and achievements. The application of artificial intelligence evaluation method can not only stimulate students' interest in learning, improve their enthusiasm to participate in the evaluation, but also comprehensively and objectively evaluate, and improve the effectiveness and reliability of evaluation[3]. The theory of artificial intelligence brings us a new education view: education should make every student have confidence and hope to see their own development. It can open the door of their wisdom and make them have the spirit of participation and competence in learning. Classroom teaching evaluation is a complex and arduous task, and its evaluation method is closely related to the reliability and validity of the assessment and the curriculum degree. As far as the evaluation method is concerned, we should turn from result test to process prevention, from screening to diagnosis and improvement[4]. We should combine classroom teaching evaluation with pre and post evaluation to form a complete evaluation system. Through the analysis of the evaluation results and feedback to the school leaders, the school can better improve the teaching mechanism and promote the development of teaching and school. On the basis of the above analysis, the following multi-evaluation model is proposed, as shown in Fig.1:

As far as the content of evaluation is concerned, classroom teaching evaluation is to judge whether classroom teaching meets the needs of students. The key to classroom teaching lies in whether teachers can effectively teach and edify students, and whether students can effectively absorb and develop students[5]. The current evaluation activities only rely on classroom performance to evaluate, such as whether teachers use multimedia teaching in the classroom, whether they have the opportunity, whether they often ask questions, but ignore the role and value of multimedia teaching[6]. If the classroom teaching evaluation pays too much attention to the representative indicators, it is easy to lose the essence of the evaluation. Based on this, we further optimize the diversified teaching evaluation system structure as follows:
Fig.2 Optimization of diversified teaching evaluation system structure

Traditional teaching evaluation mainly evaluates students' knowledge and language skills through examinations. The teaching goal is to cultivate students' comprehensive ability to enhance their autonomous learning ability and comprehensive cultural literacy[7]. It can be seen that the teaching purpose required by the course is not only to improve students' language knowledge and skills, but also to cultivate students' humanistic quality, cross-cultural communication ability and autonomous learning ability. The Enlightenment of artificial intelligence theory is that the evaluation content of students should comprehensively consider the individual differences and imbalance of students, including the individual differences of intelligence, professional differences, regional differences and so on[8]. Therefore, the evaluation objectives should include the assessment of language knowledge and skills, learning ability and attitude, innovation ability, autonomous learning ability and team cooperation consciousness. This assessment content combines the cultivation of language knowledge and skills, the cultivation of comprehensive quality, the cultivation of innovation consciousness and comprehensive professional ability, which can not only consider the actual needs of learners, but also meet the needs of future social career development, and meet the requirements of talent cultivation in the new period of the country and society.

2.2 Optimization of classroom teaching evaluation algorithm

In the process of teaching evaluation, the evaluation object should not be positioned in a certain aspect of intelligence, but a comprehensive evaluation view based on multiple evaluation should be established. Every student has his own superb intellectual field, only students from different directions have no difference[9]. Therefore, the construction of modern teaching evaluation concept which is in line with the theory of artificial intelligence should not focus on a single aspect, but should focus on promoting students' potential and personality development through evaluation. To construct a multidimensional modern teaching evaluation concept in line with the theory of artificial intelligence is to grasp the relationship between subject and object of value. The evaluation reference system in the process of spiritual activities is centered on the purpose of evaluation[10]. It consists of four parts: value subject, evaluation perspective, evaluation vision and evaluation standard. Especially for the education
evaluation standard, we need to have the following two elements: the evaluation index system. Under
the guidance of the evaluators, the evaluators decompose the evaluation objectives layer by layer to
form an effective education evaluation index system established by the judges[11]. The evaluation
index system mainly includes evaluation index, weight system and evaluation standard system. The
weight system reflects the relationship among the parts of the evaluation index, and the evaluation
standard is the standard and scale to measure the overall value of the evaluation object. Based on this,
we further standardize the evaluation index of classroom teaching as follows:

| factor       | index                      | Typical exploration                                                                 |
|--------------|----------------------------|--------------------------------------------------------------------------------------|
| teaching     | Teaching strategy          | Teachers occasionally explain, but students will participate in the inquiry to promote a deep understanding of the concept |
|              | Teaching sequence          | The teacher asks the students to explore the concept, and then the student gives the explanation (although it may be guided by the teacher) |
|              | Teacher's role             | Teachers continue to play the role of facilitator, and students continue to learn actively (highly involved in the classroom, obviously committed to learning tasks) |
|              | Student role               | Students' learning shows a deep understanding of scientific content and process skills |
|              | knowledge acquisition      |                                                                                      |
| discuss      | Problem level              | Ask students questions at various levels, including analytical level or higher, to promote learning |
|              | Problem complexity         | Questions require students to explain, reason and / or judge, and students are expected to question other people's answers |
|              | Discussion environment     | Teachers constantly and effectively urge students to think about open questions, discuss, explore and / or reflect. The communication between teachers and students is conversational, and students' questions often lead to discussions |
|              | Form of communication      | Teachers promote constructive classroom dialogue continuously and effectively. The evidence, hypothesis and reasoning put forward by students are questioned by teachers and other students |
|              | Classroom interaction      |                                                                                      |
| assessment   | Existing knowledge         | Teachers evaluate students' existing knowledge and adjust teaching accordingly         |
|              | Concept development        | Teachers encourage process focused learning activities and critical thinking that links learning activities to other concepts |
|              | Students' reflection       | Teachers encourage students to reflect on their learning in different periods of classroom teaching, and encourage them to think at a higher level of understanding |
|              | Assessment type            | Consistent and effective use of formal, informal assessment methods for real measurement |
|              | The role of assessment     | Teachers frequently and effectively assess students' understanding and adjust teaching accordingly: challenging evidence and conclusions: encouraging curiosity and openness |
| curriculum   | Learner Center             | An important, clear and definite connection is established between the content and the big picture, and the content is discussed in depth |
|              | Integrating content        | The classroom provides flexibility for students to design and engage in inquiry         |
|              | investigation              | In the classroom, the scientific content and students' exploration activities are well integrated |
|              | Organization and records   | Students organize and record information in a non prescriptive way so that they can communicate effectively |

Tab.1 classroom teaching evaluation index
Furthermore, the weight of the evaluation index is calculated by using the hierarchical crossover algorithm:

\[
\begin{align*}
A(x) &= A(x-1) + A(x) \\
A(x') &= PA_1(x') + PA_2(x') + PA_3(x') \\
A_1(x') &= \|Ax\| - \|Ax(W(x')) \cdot N(x')\| - \|Ax(W(x')) \cdot N\| \\
A_2(x') &= \sum W(x)W(x' - 1) \cdot N(x' - 1) \\
A_3(x') &= |P(x') - P(x' - 1)|
\end{align*}
\]

In the formula: A is the student achievement data; P is the correction coefficient; W is the orientation parameter; n is the difference parameter of the score; X is the evaluation result; X' is the ideal parameter; \(\Delta x\) is the difference value of the evaluation data. Further, in the process of teaching evaluation indicators, the first level indicators mainly include teaching design, teaching process and teaching effect. According to the evaluation results of the expert group, fuzzy analytic hierarchy process is used to establish the fuzzy consistency matrix.

\[
A_1 = \begin{bmatrix}
0.5 & 0.3 & 0.7 \\
0.7 & 0.5 & 0.9 \\
0.3 & 0.1 & 0.5
\end{bmatrix}
\]

\[
A_2 = \begin{bmatrix}
0.5 & 0.3 & 0.4 \\
0.7 & 0.5 & 0.7 \\
0.6 & 0.1 & 0.5
\end{bmatrix}
\]

\[
A_3 = \begin{bmatrix}
0.5 & 0.3 & 0.2 \\
0.4 & 0.5 & 0.8 \\
0.6 & 0.1 & 0.5
\end{bmatrix}
\]

The weight vector is further calculated

\[
W_{A_1} = (0.203, 0.425, 0.372)
\]

\[
W_{A_2} = (0.263, 0.352, 0.385)
\]

\[
W_{A_3} = (0.271, 0.407, 0.322)
\]

Comprehensive consideration of these three weight vectors, we can get the standard evaluation weight vector parameters. The objectives and requirements that must be achieved in the evaluation activities are the premise and basis for determining the evaluation objectives; the evaluation objectives are the concrete results obtained under the guidance of the evaluation objectives, and are the specific objectives of the evaluation; the evaluation indicators are still abstract and should be decomposed layer by layer (zero level indicators) to make them specific and operational. It is the so-called evaluation index system[12]. Therefore, the index system is a series of correlation statistical indicators that comprehensively reflect things, phenomena or processes. Or a comprehensive index, reflecting the characteristics of some aspects of the evaluation object. After the establishment of the evaluation index system, evaluation standards should be formulated. Evaluation standard is the standard and scale to measure the object to be evaluated to achieve the evaluation purpose. The principles of quantification, non quantification and qualitative description should be followed in the formulation of concretisation, behaviourisation and operability of the lowest level indicators. Through the analysis of the above-mentioned inquiry teaching evaluation mode, the basic situation of the following index system is summarized[13]. The evaluation objectives of the above evaluation models are quite different. Some
are the evaluation of the quality of classroom inquiry teaching, some are the evaluation of teaching quality after long-term implementation of inquiry teaching, and some are the evaluation of the implementation effect of inquiry teaching.

2.3 The realization of classroom teaching evaluation

The evaluation standard is a specific indicator reflecting the quality of investigation. In classroom teaching, whether it is in line with the characteristics of scientific inquiry is judged from the quality and quantity. When designing the elements of inquiry scheme, teachers guide students to explore step by step, which means that the quality of inquiry is low; students' independent design of inquiry steps means that the quality of inquiry is higher, because the latter is more open than the former, which can provide better learning opportunities for learners and improve their cognitive and scientific reasoning ability. But inquiry teaching quality and inquiry teaching quality are two different concepts. However, in physics class, if students lack of inquiry experience and basic knowledge, they will occupy a large number of class hours in the design of inquiry steps, that is, they have not designed a reasonable and feasible inquiry scheme, which runs counter to the basic requirements of effective teaching[14]. Comprehensive evaluation standard is the basic standard reflecting the teaching quality of all physics courses. To determine whether classroom teaching meets the basic requirements of effective teaching. Among them, all levels of indicators should be decomposed and corresponding evaluation standards should be formulated; the evaluation of inquiry quality and teaching quality should be coordinated from two aspects of general rules and special rules. Based on this, the evaluation method of classroom teaching is further optimized as follows:

![Optimization of classroom teaching evaluation method](image)

Fig.3 Optimization of classroom teaching evaluation method

The concept of effective teaching and its understanding of classroom teaching evaluation directly affect the design of evaluation index system and evaluation standard. As long as teaching is effective, we should pay attention to the role of teaching in promoting students' development. Curriculum evaluation should focus on the development of students and teachers, teachers' teaching behavior, students' learning performance and classroom atmosphere created by teachers and students. In the process of decomposing all levels of indicators and formulating evaluation standards, we should consider the reflection of students' behavior, teachers' behavior and the common behavior of teachers and students[15]. Evaluation mode management module is mainly responsible for the establishment and update of teaching evaluation mode, including index database maintenance, mode customization, mode
browsing, etc. To evaluate teachers' teaching, we should first determine the evaluation mode, and then deal with it according to the evaluation mode. The operator of the module is the system administrator. Mainly complete the user-defined teaching evaluation index and index database maintenance. Managers select the evaluation model according to the index definition, input the model name, and save it in the index database to facilitate the selection of indicators. Managers can add or remove indicators from existing models in the model library to achieve the desired results. According to the teaching needs, different evaluation modes can be customized to meet different teaching needs.

3. Analysis of experimental results

In order to verify the actual application effect of the key technology of classroom teaching evaluation based on artificial intelligence, conduct investigation, analysis and comparative testing, and compare and analyze student satisfaction and evaluation accuracy. The research object is the first-year postgraduate students of grade 2018 in a university. The course is "SPSS education statistical analysis". Statistical analysis requires students to study and operate SPSS theoretical knowledge and software tools independently before class, which is very suitable for classroom teaching mode. In order to ensure the research effect, the evaluation content of classroom teaching mode is standardized, as shown in the following table:

| content                 | Test content       | Teaching quality                      |
|-------------------------|--------------------|---------------------------------------|
| Teacher’s role          | demonstration      | Demonstration + action                 |
| Student role            | Passive acceptance | Active acceptance                     |
| Teaching methods        | Teaching by teachers | Focus on students' learning            |
|                         | Teaching as a supplement | In a variety of ways                  |
| Teaching tools          | teaching material  | Textbook + PPT + network resources    |
| Teaching form           | Explanation + Practice | Micro lecture before class + Classroom explanation + Asking questions freely |
| Classroom content       | teach              |                                      |
| Audit method            | examination        | Evaluation of learning process         |
| ultimate objective      | Learn knowledge    | Learn + apply knowledge                |

Tab.2 content specification of classroom teaching mode evaluation

Further study the practicability of the proposed process teaching evaluation index system in classroom teaching evaluation. Process teaching evaluation is mainly to evaluate students' learning effect and teachers' teaching. Therefore, the subject of evaluation is students, and teachers are also an important part of evaluation indicators. Based on this, the survey results are comprehensively counted and plotted, and the satisfaction of teachers and students on classroom teaching and the teaching evaluation accuracy of the two methods are recorded respectively, as shown in the following figure:
Satisfaction\%  Accuracy\%

perfect contentment  satisfied  commonly  dissatisfied

Accuracy of traditional methods  The method of this paper  The accuracy of this method  traditional method

Fig. 4 Analysis of survey and test results

The above figure can clearly reflect students' satisfaction with learning activities. Most of them think that the teaching methods and activities provided by teachers in classroom teaching can achieve teaching objectives. Students can complete the knowledge learning and system construction of this class through individual inquiry and group cooperative learning, and can learn knowledge from other students to make up for their own shortcomings. And in the process of teaching quality rating, the evaluation accuracy of this method compared with the traditional evaluation method has also been significantly improved, which proves that the classroom teaching evaluation technology based on artificial intelligence has a relatively better effect in the actual application process, and fully meets the research requirements.

4. Conclusion

The concept of classroom teaching evaluation under the guidance of artificial intelligence theory is to improve each student's own advantages and intelligence. Only students with different development directions exist, and there is no "poor student". Under the guidance of the theory of artificial intelligence, each student's self-confidence is established. Quality education advocates the development of students' various qualities and emphasizes the cultivation of students' artificial intelligence. From this point of view, it can be said that artificial intelligence theory provides a strong theoretical basis for quality education. Under the guidance of the trend of quality education, teaching evaluation based on artificial intelligence theory should be the development direction of teaching evaluation at present and in the future, so as to better realize the research requirements of accurate and effective evaluation of teaching quality.
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