

Construction of an English Teaching Quality Evaluation System Based on IoT and AI

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Abstract: With the closer economic ties between regions, the demand for English talents from society and enterprises is becoming more and more urgent, which puts forward higher requirements for the quality of English teaching in schools. The development of English teaching quality evaluation helps school administrators to formulate scientific and reasonable teaching plans in a timely manner, and helps teachers adjust and improve teaching strategies, which has a positive significance for English teaching quality. However, at this stage, the evaluation of English teaching quality still has some shortcomings, such as the lack of students' in-depth participation in the teaching evaluation process, the limitation of the subject and object of the teaching evaluation, and the backwardness of the teaching evaluation technology, which affect the quality of the school's training of English talents. In the face of this situation, this paper studied the evaluation system of English teaching quality. The following conclusions were drawn from the investigation of the evaluation of English teaching quality in three schools in Z city. The majority of teachers did not know the evaluation system and documents. 96.31% of the students thought that they did not participate in the quality evaluation.

1. Introduction

At this stage, the demand for English talents is becoming more and more urgent. In English subjects, teaching evaluation is an indispensable link. It can assess teachers' teaching achievements, and make teachers better understand their own teaching quality, thus promoting the improvement and optimization of their teaching strategies.

Many scholars have studied teaching evaluation. Hammonds Frank discussed the teaching quality evaluation with students as the main participants [1]. Zhang Wei proved through experiments that there was a certain potential relationship between teaching assessment and teachers' gender, age and teaching content [2]. Gunn Andrew proposed a method for evaluating the teaching quality of schools [3]. De Jager Thelma evaluated the teaching quality of teachers in South Africa and concluded that the teaching practice implemented by these teachers did not meet expectations [4]. Ali Jawad described interval valued dual hesitation fuzzy sets and discussed their role in teaching quality evaluation [5]. Liu Zhengyuan studied the assessment of English classroom teaching level in schools, and established an evaluation index system by analyzing the selection principles of evaluation indicators of English classroom teaching level [6]. Fawns Tim studied the

digitalization of teaching quality and proposed the assessment direction of teaching quality from the perspective of educational ecology [7]. Feistauer Daniela used the cross classification multi-level model to test the reliability of the teaching quality evaluation participated by students [8]. Goos Maarten believed that student teaching evaluation methods were often used to measure teaching quality, and discussed teaching quality evaluation methods based on student teaching evaluation [9]. The above scholars have studied teaching evaluation and put forward valuable suggestions.

To improve the effectiveness of English quality assessment, this article investigated the shortcomings of English teaching quality evaluation. The teaching quality evaluation system combined with IoT and AI and the method of evaluating students' classroom behavior were briefly introduced. The evaluation system under the background of IoT and AI, including teacher evaluation, has been constructed [10-11].

2. Significance and theoretical basis of English teaching quality evaluation

2.1 Significance of English teaching quality evaluation

1) Guaranteeing the construction of school teaching system

Teaching quality evaluation ensures the normal operation and continuous optimization of the school's teaching system.

2) Promoting the talent cultivation of the school

Effective evaluation helps administrators and education departments understand teaching quality, driving reform and innovation, while also fostering a harmonious classroom atmosphere and emotional interaction that benefit both teachers and students [12–13].

3) Providing basis for English teaching reform

Ongoing evaluation offers irreplaceable support for identifying factors that affect teaching quality and supplies data for system innovation, content enrichment, and pedagogical enhancement. Teachers can track students' progress, real learning levels, and the fit of teaching strategies, enabling them to adjust instruction accordingly [14].

4) Effectively improving teaching quality

The ultimate goal is to produce more English talents [15]. Evaluation data allow administrators to set scientific objectives and plans, ensuring orderly progress; it also stimulates teachers' sense of honor and achievement among those who excel.

5) Providing reference for teaching quality evaluation

The development of English teaching quality evaluation enriches theory and practice in the English field and offers a theoretical reference for quality evaluation in other subjects, encouraging broader exploration across disciplines.

2.2 Theoretical basis of English teaching quality evaluation

1) Taylor evaluation theory

Taylor's evaluation theory believes that the essence of curriculum evaluation is the process of determining the change degree of teaching behavior. Therefore, the frequency of evaluation should not be too low, and evaluation should become a continuous activity.

2) Constructivism theory

Constructivism holds that teaching activities cannot emphasize the process of teachers' information transmission. The assessment of teaching quality under constructivism should emphasize the assessment of the process of students' knowledge acquisition rather than only the summative assessment.

3) Humanism

Traditional teaching quality evaluation often uses unified evaluation indicators to measure the teaching activities of schools, which facilitates the observation and comparison of evaluation results, but is not conducive to giving play to teachers' autonomy. A humanistic approach to teaching quality evaluation should take both identity and individuality into consideration, and allow for flexible methods tailored to different teaching situations.

4) Theory of multiple intelligences

Based on the theory of multiple intelligences, the evaluation of English teaching quality should avoid single content. It should also implement diversified evaluation methods and focus on the authenticity of evaluation scenarios.

3. Problems in the evaluation of English teaching quality

This article investigates the evaluation of English teaching quality in three schools in Z city. These three schools are called School A, School B and School C. The interview method was used to interview 10 English teachers in each school, and a questionnaire survey was conducted among 100 students in each school. A total of 298 valid questionnaires were obtained. The valid questionnaires of School A, School B and School C are 100, 100 and 98, respectively, with an effective recovery rate of 99.33%.

3.1 Interviews with teachers

Figure 1 shows the teachers' views on the oneness of teaching quality evaluation.

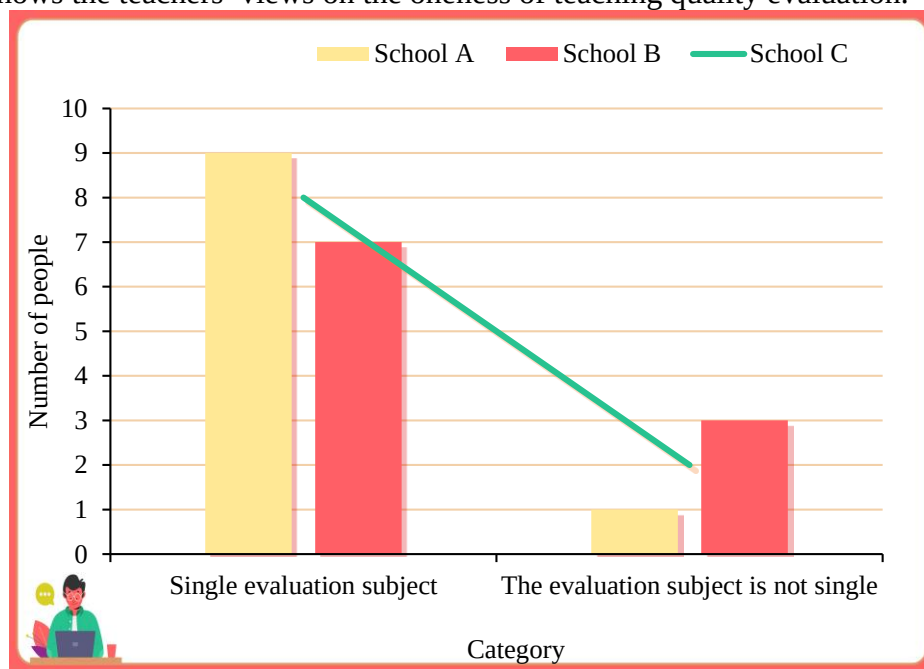


Figure 1. Teachers' Views on the Oneness of Teaching Quality Evaluation

According to the number of teachers interviewed by the three schools, a total of 24 teachers believe that there is a single evaluation subject in the quality evaluation, accounting for 80%.

The teachers' understanding of the school evaluation system and evaluation documents is shown in Figure 2.

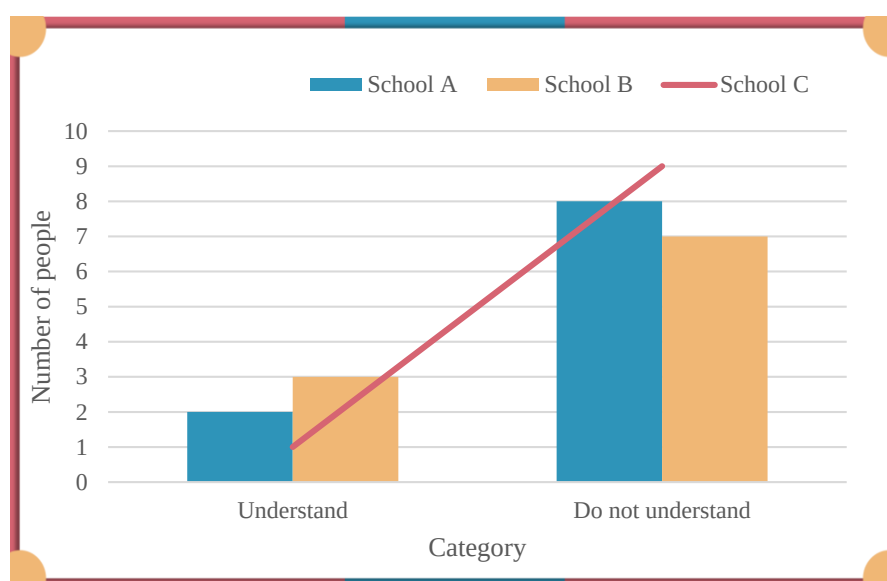


Figure 2. Teachers' Understanding of School Evaluation System and Evaluation Documents

As shown in Figure 2, among the 10 teachers interviewed in School A, 2 teachers say they understand the school's evaluation system and documents, and 8 teachers say they do not understand the school's evaluation system and documents. Among the 10 teachers interviewed in School B, 3 say they understand the school's evaluation system and documents, and 7 say they do not understand the school's evaluation system and documents. Among the 10 teachers interviewed in School C, only one says he understands the school's evaluation system and documents, and nine say they do not understand the school's evaluation system and documents.

Other views of teachers on problems in teaching evaluation are described in Table 1.

Table 1. Other views of teachers on the problems in teaching evaluation

	School A	School B	School C
Qualification of supervisors	2	/	3
Evaluation technology lags behind	/	3	1
Lack of reward and punishment measures	3	/	/
The feedback system is not perfect	4	4	3
Lack of evaluation of graduates	1	3	3

The main problems reported by teachers from the three schools are: irregularities in the qualifications of the assessment bodies and the selection of supervisors (Schools A and C), insufficient reward and punishment measures (School A), outdated assessment technology (Schools B and C), imperfect feedback mechanisms (all three schools), and a lack of follow-up evaluations of graduates (all three schools). Among these, poor feedback and the lack of graduate evaluations are common problems.

3.2 Survey of students

Students' knowledge of the indicators for evaluating the quality of English teaching is illustrated in Figure 3.

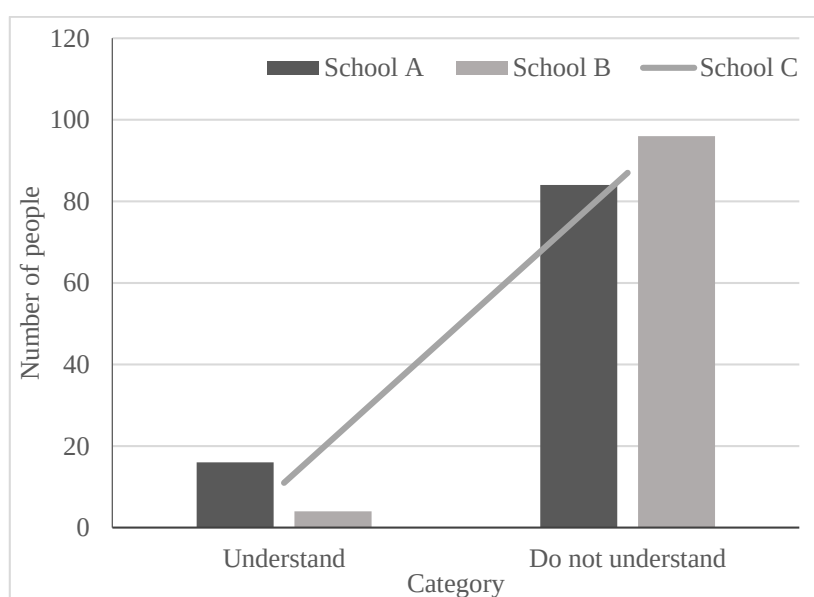


Figure 3. Students' Understanding of English Teaching Quality Evaluation Indicators

As illustrated in Figure 3, among the 100 students of School A, 16 students know about the quality evaluation indicators, and 84 students say they do not know about the quality evaluation indicators. Among the 100 students in School B, only 4 students know about the quality evaluation indicators, and 96 students say they do not know about the quality evaluation indicators. Of the 98 students in School C, 11 students understand the quality evaluation indicators, and 87 students say they do not understand the quality evaluation indicators. According to the total data of the three schools, 267 students think that they do not know the quality evaluation indicators, accounting for 89.6%.

In addition to not knowing the quality evaluation indicators and not participating in the quality evaluation, students think that the problems in the assessment of English teaching quality are presented in Figure 4.

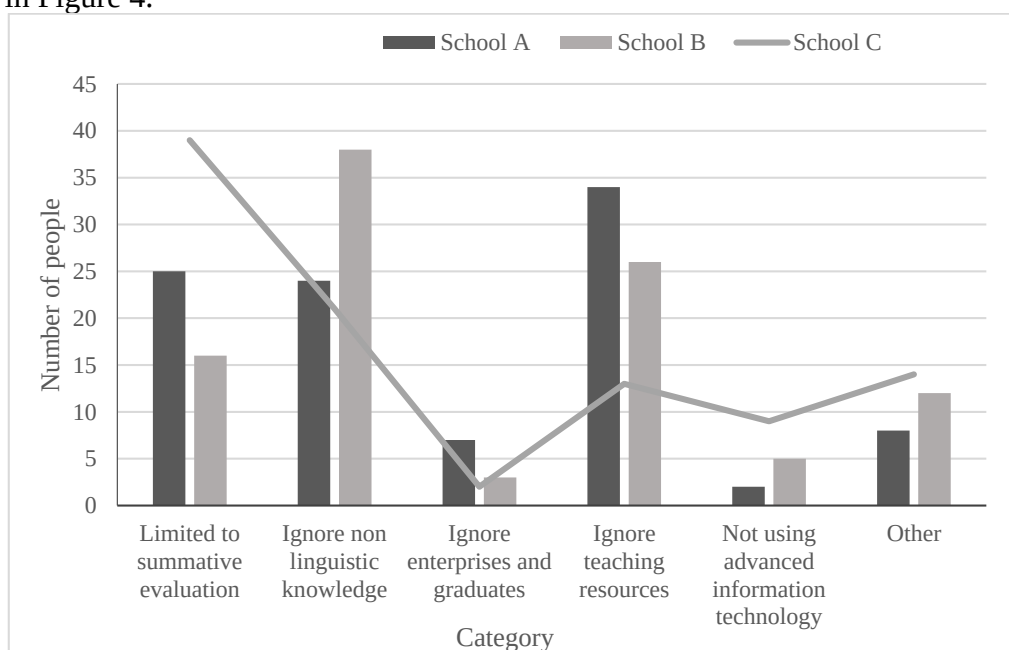


Figure 4. The Problems That Students Think Exist in the Evaluation of English Teaching Quality

As presented in Figure 4, 25 students in School A believe that the quality evaluation work is limited to summative evaluation. There are 24 students who think that there is a problem of ignoring the evaluation of non linguistic knowledge in quality evaluation. Seven students think that the quality evaluation work has the problem of ignoring the evaluation of enterprises and graduates. 34 students think that there is a problem of ignoring the evaluation of teaching resources in quality evaluation. Two students believe that there is a problem of not using advanced information technology for quality evaluation. Among the students of School B, 16 students believe that the quality evaluation work is limited to summative evaluation. There are 38 students who think that there is a problem of ignoring the evaluation of nonverbal knowledge in quality evaluation. Three students think that the quality evaluation work has the problem of ignoring the evaluation of enterprises and graduates. 26 students think that there is a problem of ignoring the evaluation of teaching resources in quality evaluation. Five students believe that there is a problem of not using advanced information technology for quality evaluation. Among the students of School C, 39 students believe that the quality evaluation work is limited to summative evaluation. There are 21 students who think that there is a problem of ignoring the evaluation of non linguistic knowledge in quality evaluation. Two students think that the quality evaluation work has the problem of ignoring the evaluation of enterprises and graduates. There are 13 students who think that there is a problem of ignoring the evaluation of teaching resources in quality evaluation. There are 9 students who think that there is a problem of not using advanced information technology to evaluate the quality evaluation.

From the interview of teachers and the survey of students, it can be concluded that the assessment of English teaching quality has some shortcomings, such as lack of students' in-depth participation in the teaching evaluation process, limited subject and object of teaching evaluation, lack of communication between supervisors and teachers, neglect of graduate evaluation, and backward teaching evaluation technology, as shown in Figure 5.

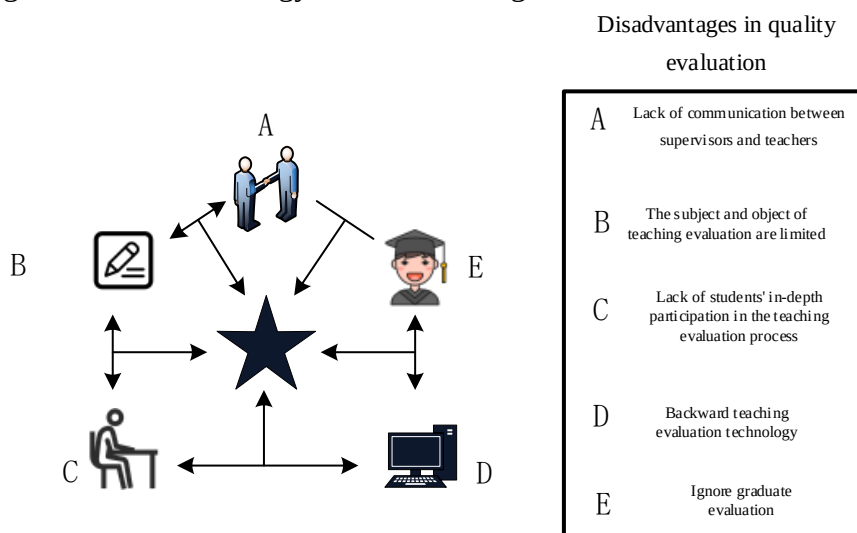


Figure 5. A Summary of the Shortcomings of English Teaching Quality Evaluation

Students lack meaningful participation in teaching quality evaluation, as administrators undervalue their voice. Evaluation subjects are overly restricted to supervisory oversight, neglecting teacher, student, and social perspectives; evaluation objects prioritize summative assessment while underusing formative methods. Supervisors rarely communicate with teachers after evaluations due to limited time for reflection and feedback. Graduate follow-up on English pragmatic competence is often omitted. Moreover, advanced technologies like AI for classroom behavior monitoring and big data for quality analysis remain unused. These issues collectively hinder effective improvement of

English teaching.

4. Principles of English teaching quality evaluation

4.1 Principle of giving full play to students' subjective position in evaluation

As the direct receiver of teaching activities, students have a direct experience of teachers' classroom behavior. Students should occupy the main position in the evaluation of teaching quality. The school should attach importance to the evaluation of students' pre class preparation, class attitude, teaching methods, etc. To evaluate teaching effectiveness, students' classroom behavior should be observed to see whether their enthusiasm is effectively stimulated, and to assess their learning attitude and ability.

4.2 Principle of promoting diversification of evaluation subjects

In addition to giving play to the role of students in teaching evaluation, other evaluation subjects should also participate in the assessment of teaching quality. For example, teachers' self-assessment enables them to evaluate and reflect on their attitudes and behaviors in teaching activities. For example, peer evaluation of teachers is conducted to evaluate the classroom behavior of target teachers from the perspective of other teachers.

4.3 Paying attention to formative evaluation principle

The evaluation of traditional teaching effectiveness attaches too much importance to final examination results. However, in the new era, people also require that the assessment of English teaching quality should give consideration to formative assessment to focus on students' attitudes in the learning process, their learning time, their learning methods and their cooperative learning ability.

4.4 Adhering to the people-oriented principle

In terms of the effect assessment of teaching quality, that is, when evaluating students' classroom behavior, the evaluation subject should take into account the differences in students' individual English proficiency humanely, and whether students' various indicators have made progress in the learning process in the assessment process. When evaluating teachers, the specific teaching background and situation faced by teachers should be fully considered, and teachers' teaching ability cannot be simply evaluated.

4.5 Focusing on feedback principle

School administrators should not only emphasize the quality assessment of English teaching, but also focus on the feedback after the assessment. Only by ensuring the smooth flow of the feedback link of teaching evaluation, can school administrators reasonably and effectively carry out teaching management and reform activities to clarify the direction of their teaching innovation and constantly improve their decision-making level in this process. For teachers, ensuring that the feedback channel is not hindered is conducive to identifying and addressing gaps in their teaching. Their own shortcomings are continuously improved in a targeted way to effectively improve their own capabilities.

5. English teaching quality evaluation system under IoT and AI

The English teaching quality evaluation system studied in this article is based on IoT and AI. At this stage, the campus makes full use of IoT, AI, big data and other technologies as well as multimedia for teaching activities. The teaching quality evaluation system of IoT, AI and other modern information technologies is utilized to assess activities, making English teaching more information-based.

5.1 Teaching quality evaluation system combining IoT and AI

The system collects students' facial features and behavioral characteristics data through IoT cameras, and identifies and tracks students' classroom behavior through AI and big data. The system enables face detection and recognition and various expression recognition. It can analyze students' positive classroom behaviors and negative classroom behaviors, such as standing up to answer questions, raising hands to answer questions, listening attentively, not using cell phones for the purpose of classroom learning, and lying on the table, so as to judge whether students' behavioral performance meets classroom requirements and provide a real and scientific basis for the quality evaluation activities of evaluation subjects.

5.2 AI-based method for monitoring and evaluating students' classroom behavior

The IoT camera in the classroom is used to obtain students' English classroom behavior data for image preprocessing. Image preprocessing includes You Only Look Once target detection, data preprocessing and data enhancement. The grid vector in target detection is:

$$\eta_v = [I_k, c_a, c_b, c_x, c_y, d_1, d_i] (1)$$

Among them, I_k indicates whether the target object exists. (c_a, c_b) represents the center point of the target. c_x is the height of the segmented image frame. c_y is the width of the segmented image frame.

The formula of coordinate transformation in data enhancement is expressed as:

$$(a, b) = S\{(o, \xi)\} (2)$$

Among them, (o, ξ) is the coordinates of the unchanged pixel and (a, b) is the coordinates of the changed pixel.

ResNet50 is used for migration learning, and then the RectifiedLinearUnit activation function is set, then:

$$e(m) = \max(0, m) (3)$$

$$e'(m) = \begin{cases} 1, & m > 0 \\ 0, & m \leq 0 \end{cases} (4)$$

Among them, $e(m)$ is the RectifiedLinearUnit activation function.

If the square loss function is set as the loss function of classroom behavior recognition method, there are:

$$R(\mu) = \min_{\mu} \frac{1}{2} \sum_{v=1}^p \left(h_{\mu} \left(m^{(v)} - n^{(v)} \right) \right)^2 (5)$$

$$\mu_v = \mu_v - \lambda \frac{\partial}{\partial \mu_v} R(\mu) \quad (6)$$

Among them, $R(\mu)$ represents the degree of fit between the model and training data.

5.3 Content of quality evaluation system

The evaluation system under the background of IoT and AI includes teacher evaluation, student evaluation and the third-party evaluation, as shown in Figure 6.

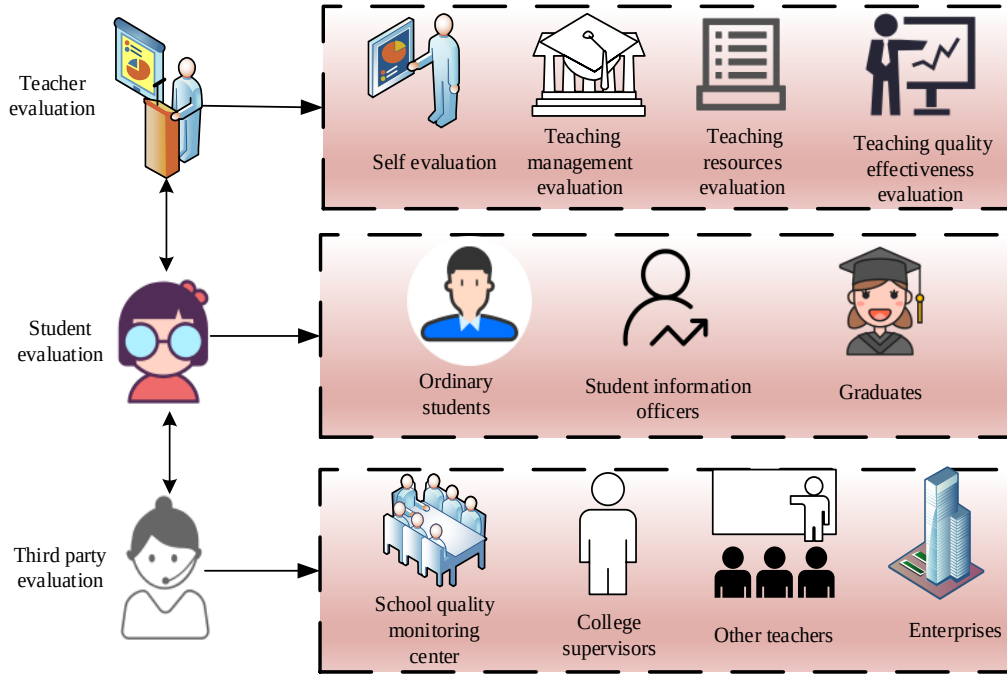


Figure 6. Content of quality evaluation system

Teacher evaluation encompasses self-assessment, teaching management, resources, and outcomes. Self-assessment focuses on lesson preparation, attitude, expression, key points and difficulties, and practical and technological applications. Outcome evaluation is based on student attitudes (electronic pre-learning), behavior (AI camera), and learning outcomes. Evaluation subjects include current students, graduates, supervisors, and companies. After data upload, it undergoes AI and big data analysis to generate formative assessments, which are then fed back to management and teachers to optimize teaching plans and strategies.

6. Conclusions

This article first introduced the significance and theoretical basis of English teaching quality evaluation. Secondly, this paper explored the shortcomings in the quality evaluation work, and drew the conclusion that there were some disadvantages in the quality evaluation work, such as lack of students' in-depth participation, limited evaluation subject and object, blocked communication between supervisors and teachers, ignored graduate evaluation, and backward teaching evaluation technology. Then, the paper put forward some principles of English teaching quality evaluation, such as giving full play to the students' subjective position in evaluation, promoting the diversification of assessment subjects, and paying attention to feedback. Finally, after briefly describing the teaching quality evaluation system and student behavior monitoring method

combined with IoT and AI, this paper proposed an English teaching quality evaluation system under the background of IoT and AI, which included teacher evaluation, student evaluation and the third-party evaluation. Although this paper has put forward some quality evaluation methods, there are also some deficiencies in this study. In this paper, the sample size was too small when investigating the shortcomings in the quality evaluation work. It is hoped that there is an opportunity to increase the number of samples in future studies to make the survey results more reliable and convincing.

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