

Research on Intelligent Evaluation of College English Teaching Effectiveness under Intelligent Big Data Technology

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ABSTRACT Under the wave of digital transformation, intelligent big data technology deeply penetrates the entire process of higher education teaching, reconstructing the English teaching mode, teaching management logic, and teaching evaluation system in universities. The traditional evaluation of English teaching effectiveness in universities often relies on subjective manual scoring, one-dimensional assessment of final exam transcripts, and qualitative description of classroom performance. There are prominent problems such as one-sided evaluation dimensions, scattered data sources, lagging evaluation results, strong subjective interference, lack of dynamic tracking and accurate attribution, which are difficult to adapt to the development needs of personalized English teaching, hierarchical education, and precise quality improvement in universities in the new era. Intelligent big data technology, with its core advantages of massive data collection, multi-dimensional data mining, deep learning modeling, real-time dynamic analysis, and trend intelligent prediction, can comprehensively integrate the full scenario behavioral data of pre class preview, classroom teaching, post class consolidation, online learning, offline training, exam evaluation, and teacher-student interaction in college English teaching, and build a multi index, multi-level, and full cycle intelligent evaluation system for English teaching effectiveness.

INDEX TERMS Intelligent big data; College English; Teaching effectiveness; Intelligent Evaluation

I. INTRODUCTION

A. RESEARCH BACKGROUND AND SIGNIFICANCE

College English, as a core course of higher education public foundation, covers all undergraduate and graduate students in the university. It is instrumental, humanistic, and applied, and undertakes the important mission of cultivating students' cross-cultural communication skills, professional English application skills, and international comprehensive literacy. Against the backdrop of globalization and the increasing demand for versatile talents, society has put forward higher requirements for the comprehensive English listening, speaking, reading, writing, and translation abilities, workplace English application abilities, and cross-cultural communication abilities of college graduates[1]. This has forced college English teaching to abandon traditional rote learning and trial based training models, and shift towards personalized, layered, scenario based, and application-oriented teaching. The transformation of teaching mode will inevitably be accompanied by the reform of teaching evaluation system. Traditional lagging, one-sided, and subjective evaluation methods are no longer able to meet the high-quality development needs of English in universities in the new era[2].

For a long time, the evaluation of English teaching

effectiveness in most universities in China has been based on a fixed model, with final exam scores, pass rates for CET-4 and CET-6, and classroom attendance as the main evaluation criteria, supplemented by qualitative evaluation methods such as peer teacher evaluation and anonymous final evaluation by students. Overall, there are multiple practical shortcomings[3]. Firstly, there is a singularity in the evaluation dimensions, with a focus on summative exams and a disregard for process based learning[4]. The emphasis is on written test scores and a disregard for oral expression and application abilities, while neglecting implicit dimensions such as students' learning habits, attitudes, self-learning abilities, and cross-cultural literacy; Secondly, the data sources are fragmented, and the evaluation data is limited to exam scores, attendance records, and paper questionnaires, making it impossible to integrate all scenario behavior data such as online learning platforms, MOOC resources, online course check-in, homework submission, teacher-student interaction, group discussions, and extracurricular English practice; Thirdly, the evaluation process is subjective, and student evaluations and peer evaluations are greatly influenced by personal subjective preferences, interpersonal relationships, and instantaneous classroom experiences[5]. There is a lack of objective data support, and

the credibility of evaluation results is insufficient; Fourthly, the evaluation results are lagging behind, mostly a one-time evaluation after the end of the semester, which can only provide feedback on the final teaching results and cannot track the problems and dynamic changes in student learning in real time, making it difficult to achieve timely intervention and accurate tutoring; Fifthly, there is a lack of attribution and prediction ability. Traditional evaluations can only provide good and bad conclusions, and cannot intelligently analyze the core causes of poor teaching effectiveness. They also cannot scientifically predict future teaching trends and student ability development trends, making it difficult to form a closed-loop mechanism of "evaluation diagnosis optimization improvement"[6].

Intelligent big data technology has the technical features of massive heterogeneous data collection, high-speed data processing, deep correlation mining, intelligent algorithm modeling, visual presentation, dynamic real-time warning, etc., perfectly meeting the evaluation needs of English teaching in universities in all scenarios, multiple subjects, multiple dimensions, and long cycles[7]. With the popularization and application of smart campuses, online learning platforms, smart classroom devices, English learning apps, and campus big data platforms in universities, a massive amount of structured, semi-structured, and unstructured data is generated in the English teaching process, including student learning behavior data, teacher teaching behavior data, teaching resource usage data, classroom interaction data, evaluation score data, extracurricular practice data, etc., providing sufficient data foundation for big data-driven intelligent evaluation[8].

B. RESEARCH SIGNIFICANCE

Firstly, enrich the theoretical research system of intelligent big data technology in the field of higher education teaching evaluation. At present, research on big data and university teaching evaluation in China is mostly focused on general and professional course teaching. Research on intelligent evaluation of English specialized courses in universities is relatively scattered, and a systematic theoretical framework, indicator system, and model paradigm have not yet been formed[9]. This article is based on the characteristics of English courses in universities, defining the connotation, features, theoretical logic, and technical mechanism of intelligent big data empowering English teaching evaluation, and filling the gap in the existing research in specific fields[10].

Secondly, construct an intelligent evaluation theoretical model and indicator system that is suitable for the characteristics of English teaching in universities. By combining the dual attributes of English teaching tools and humanities, breaking through the limitations of traditional evaluation indicators, a complete evaluation index framework covering teaching, learning, management,

resources, and effectiveness is constructed from multiple dimensions. The weight assignment theory of big data algorithms, process evaluation theory, and multiple intel-

ligence evaluation theory are introduced to improve the theoretical support for the evaluation of English teaching effectiveness in universities, providing theoretical references and framework references for similar related research in the future.

Thirdly, expand the application boundaries of process evaluation and multivariate evaluation theory in the digital age[11]. Deeply integrate traditional teaching evaluation theory with intelligent big data technology and machine learning algorithms, reconstruct the implementation logic of dynamic process evaluation, and promote the theoretical upgrade of teaching evaluation theory from qualitative speculation to quantitative modeling, from static results to dynamic processes, and from artificial leadership to intelligent empowerment[12].

Firstly, provide a practical implementation plan for intelligent English teaching evaluation for universities[13]. The evaluation index system, intelligent evaluation model, and empirical analysis process constructed in this article can be directly applied to the management practice of English teaching in universities, helping universities rely on campus big data platforms to achieve automatic evaluation of English teaching effectiveness, intelligent diagnosis of shortcomings, real-time monitoring of teaching quality, reduce manual evaluation costs, and improve evaluation efficiency and objectivity[14].

Secondly, assist teachers in achieving precise teaching and personalized instruction. Through intelligent evaluation results, English teachers can clearly grasp their own teaching shortcomings, insufficient classroom interaction, and adaptability of teaching resources[15]. At the same time, they can accurately grasp the learning weaknesses, knowledge mastery levels, and learning behavior habits of different students, and adjust teaching content, teaching methods, and classroom pace, implement layered teaching and personalized tutoring, and improve the effectiveness of classroom teaching[16].

Thirdly, assist students in achieving self-directed learning and precise improvement. The intelligent assessment system can push learning ability assessment reports, weak knowledge modules, personalized learning suggestions and resource recommendations to students, guiding them to have a clear understanding of their own shortcomings in English listening, speaking, reading, writing, and translation, independently planning their learning plans, making targeted improvements, and abandoning the traditional mode of blindly brushing questions and passive learning[17].

Fourthly, provide decision-making basis for the teaching management departments of universities. Based on the intelligent evaluation of big data, the management department can macroscopically grasp the overall level of English teaching in the whole school, the differences in

teaching in different colleges and majors, and the distribution of teaching abilities of teachers through annual, quarterly, and semester English teaching quality trend analysis. This provides scientific data decision-making support for

English teacher training, curriculum system reform, teaching resource allocation, and talent training program revision[18].

C. CURRENT RESEARCH STATUS AT HOME AND ABROAD

At the practical implementation level, universities in countries such as the United States, the United Kingdom, and Australia have achieved full process intelligent evaluation of English teaching effectiveness, deeply linking the evaluation results with teacher performance assessment, curriculum optimization, and personalized student training, forming a closed-loop mechanism of "data collection intelligent evaluation problem diagnosis teaching optimization effectiveness re evaluation". However, foreign research is mostly based on their own higher education models and English mother tongue teaching environments. The evaluation index system and model architecture are difficult to directly adapt to the practical scenarios of public English teaching for non English majors in Chinese universities, which balance exam preparation and application. Therefore, it is necessary to combine domestic learning situations for local adaptation and reconstruction[19].

The application research of big data in teaching evaluation. Some scholars have applied big data technology to the overall teaching quality evaluation and professional course teaching evaluation of universities, with a small amount of research involving English teaching evaluation[20]. However, there are obvious shortcomings: firstly, the selection of evaluation indicators is one-sided, focusing more on academic performance and classroom attendance, neglecting dimensions such as humanistic literacy, cross-cultural competence, teaching resources, and teaching management; Secondly, the model construction is simple, often using traditional analytic hierarchy process, without combining machine learning and big data mining algorithms to achieve intelligent dynamic evaluation; Thirdly, there is a lack of empirical research, mostly theoretical explanations, and a lack of empirical testing and case applications based on real teaching big data in universities, resulting in weak practicality.

Overall, existing research in China has recognized the empowering value of intelligent big data in the evaluation of English teaching in universities. However, a systematic theoretical framework, a scientifically sound evaluation index system, and a highly adaptable intelligent evaluation model have not yet been formed, and there is a lack of complete empirical research and implementation guarantee mechanisms, leaving ample research and innovation space for this study.

D. RESEARCH METHODS

1. Literature research method: Systematically review relevant monographs, journal articles, theses, and policy documents on intelligent big data, college English teaching, teaching effectiveness evaluation, and learning analysis technology at home and abroad, sort out existing research

results, theoretical foundations, and technical paradigms, clarify research entry points and innovative directions, and lay theoretical support for the full text research.

2. Questionnaire survey method: Design a survey questionnaire for English teachers in universities and a survey questionnaire for English learning and teaching evaluation of college students. Distribute the questionnaire to English teachers, non English major undergraduate students, and graduate students in multiple local universities to investigate their satisfaction with the existing English teaching evaluation, existing problems, intelligent evaluation needs, indicator focus points, and other content, providing practical data support for the construction of the indicator system and the analysis of the current situation.

3. Empirical research method: Select a comprehensive university in a certain area as the empirical research object, connect with the school's smart campus big data platform, English online learning system, and academic management system, collect massive raw data such as English teaching and student behavior data, evaluation data, resource usage data, etc., to provide real data sources for model empirical testing.

4. Model construction method: Integrating Analytic Hierarchy Process and Entropy Weight Method for indicator combination weighting, combining Fuzzy Comprehensive Evaluation Method and Neural Network Algorithm to construct an intelligent evaluation model for college English teaching effectiveness, designing a complete operational logic for data cleaning, data mining, quantitative evaluation, and intelligent diagnosis.

5. Case analysis method: Taking the research on college English public courses as a specific case, using the constructed intelligent evaluation model to quantitatively evaluate their teaching effectiveness, analyze the strengths and weaknesses of each dimension of teaching, propose targeted optimization suggestions, and verify the practical application value of the model.

II. RELATED THEORETICAL AND TECHNICAL FOUNDATIONS

A. DEFINITION OF CORE CONCEPTS

Intelligent evaluation of teaching effectiveness is a new evaluation model that uses intelligent big data technology and machine learning algorithms as core tools, relies on various teaching platforms in smart campuses to collect full scenario teaching behavior data, constructs a standardized evaluation index system and intelligent evaluation model, and automatically completes data processing, index quantification, weight calculation, comprehensive scoring, weakness diagnosis, and trend prediction. Different from

traditional manual evaluation, intelligent evaluation has the characteristics of full data coverage, full process tracking, objective quantitative scoring, real-time dynamic updates, intelligent attribution analysis, and automatic result push, realizing the transformation from "subjective evaluation by humans" to "data intelligence speaking".

B. CORE THEORETICAL BASIS

The theory of education big data governance focuses on the collection, integration, cleaning, sharing, application, and security control of massive data in the field of education. It emphasizes breaking down the data silos of various teaching platforms in universities, achieving data interconnection and intercommunication among academic systems, online learning platforms, smart classrooms, and campus platforms, standardizing data standards, ensuring data security, and mining data value. This theory provides theoretical guidance for solving the practical problems of scattered English teaching data, fragmented platforms, and difficult integration in universities, and is the core support for the construction of intelligent evaluation data infrastructure.

The data collection layer is the fundamental layer of intelligent evaluation, responsible for comprehensively collecting heterogeneous data from all scenarios of English teaching in universities, divided into three categories: structured data, semi-structured data, and unstructured data. Structured data includes standardized table data such as student attendance records, exam scores, CET-4 and CET-6 scores, homework scores, teacher basic information, course schedules, etc; Semi structured data includes log data such as attendance records on online learning platforms, course video viewing duration, homework submission frequency, and online interactive messages; Unstructured data includes text and audio/video data such as classroom teaching videos, oral recordings, student essay texts, classroom discussion audio, and teacher courseware resources. The collection channels cover educational management systems, smart classroom terminals, English online learning apps, MOOC platforms, campus one card systems, teaching resource libraries, etc., achieving full coverage of data in all scenarios.

The application layer is aimed at the three main entities of university teaching management departments, English teachers, and students, to achieve visual presentation and personalized application of intelligent evaluation results. Through visual methods such as charts, reports, heat maps, trend curves, etc., visually display the overall effectiveness of English teaching in the whole school, the differences in teaching in each class and major, the personal teaching ability scores of teachers, and the personal English ability assessment reports of students; At the same time, intelligent push teaching optimization suggestions, personalized learning plans, teacher training suggestions, and curriculum reform suggestions, realizing the practical application of evaluation results, forming a closed loop of data evaluation decision-making optimization.

C. INTELLIGENT BIG DATA CORE TECHNOLOGY ARCHITECTURE

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D. ADAPTATION LOGIC OF INTELLIGENT BIG DATA APPLICATION IN COLLEGE ENGLISH TEACHING EVALUATION

The evaluation of English teaching in universities involves multiple dimensions such as teaching, learning, resources, management, and effectiveness, including a large number of quantitative and qualitative indicators. Traditional manual evaluation is difficult to fully cover. Intelligent big data can collect multi-dimensional data from the entire scene, matching the multi-dimensional evaluation requirements of the multiple intelligence evaluation theory, and achieving full coverage adaptation from single score evaluation to comprehensive literacy evaluation.

English learning is a long-term and gradual process, and the teaching effectiveness dynamically changes with the teaching process and learning duration. Intelligent big data has real-time data collection and continuous analysis capabilities, which can track English teaching and learning behaviors throughout the semester, academic year, and even the entire university cycle, adapt to the dynamic temporal

requirements of process evaluation theory, and achieve the transformation from static end evaluation to dynamic process evaluation.

A large number of qualitative and fuzzy indicators in English teaching evaluation are difficult to accurately score manually. Intelligent big data combined with fuzzy compre-

TABLE 1. Current Evaluation Models of College English Teaching Evaluation

Evaluation model	Core indicators	Proportion in practice	Advantages
Final exam-oriented	Final written test, attendance, homework	78.5%	Simple operation, easy statistics
Teacher-student mutual evaluation	Teaching attitude, classroom performance	65.2%	Rich subjective feedback
CET-4/6 pass rate reference	Pass rate, average score	59.7%	External reference standard
Mixed comprehensive evaluation	Multiple indicators combination	41.3%	Relatively comprehensive

hensive evaluation algorithms can convert qualitative indicators into quantitative values, achieve objective quantification of subjective evaluation, avoid subjective interference from manual scoring, and enhance the scientificity and credibility of evaluation results.

III. THE CURRENT SITUATION OF ENGLISH TEACHING EVALUATION IN UNIVERSITIES AND THE DILEMMA OF BIG DATA APPLICATION

A. RESEARCH ON THE CURRENT MODEL OF ENGLISH TEACHING EVALUATION IN HIGHER EDUCATION INSTITUTIONS

Through research, it has been found that the current evaluation of English teaching effectiveness in universities mainly adopts three fixed models, and most universities use them in combination, as shown in Table 1.

Firstly, the summative examination dominates the evaluation mode. This is currently the most mainstream evaluation model, with the final closed book written test score as the core, accounting for 70% -80% of the total score, and the remaining 20% -30% composed of classroom attendance and homework completion. The focus of the assessment is on vocabulary, grammar, reading comprehension, cloze test, written writing and other written test contents, completely ignoring the evaluation of core competencies such as English oral communication, cross-cultural application, and self-learning ability. The essence is still test oriented assessment.

Secondly, the qualitative evaluation model of teacher-student mutual evaluation. It includes three parts: student final evaluation, teacher peer evaluation, and teaching supervision and grading. Students evaluate teachers' teaching attitudes, classroom atmosphere, and teaching level through the campus academic system with star ratings and written evaluations; Peer teachers and teaching supervisors conduct qualitative evaluations and grading of teaching design, teaching methods, and classroom control through offline lectures. This model is mainly based on subjective qualitative evaluation, lacking objective data support, and the evaluation results are easily influenced by human factors.

The third, fourth, and sixth level pass rate reference evaluation mode. Most universities use the pass rate of the College English Test Band 4 and Band 6 as the core external indicator to measure the effectiveness of English teaching, and evaluate the teaching quality and course effectiveness of teachers based on the pass rate ranking of grades and majors. However, the CET-4 and CET-6 exams focus on test taking abilities and cannot fully match the training goals of English applied talents in universities. They are only used as a reference for the results and cannot reflect the real problems in the teaching process.

B. MAIN PROBLEMS IN CURRENT COLLEGE ENGLISH TEACHING EVALUATION

The existing English teaching related data in universities are scattered across multiple independent platforms such as academic administration systems, online learning platforms, smart classrooms, CET-4 and CET-6 registration systems, and teaching resource libraries. The data standards and interfaces of each platform are not unified, resulting in serious data silos. Teaching evaluation only retrieves a small amount of simple data such as exam scores and attendance, and cannot integrate students' online learning duration, completion rate of online courses, oral training records, group discussion behavior, extracurricular English practice and other full scenario data. The scope of data collection is narrow and cannot support comprehensive and objective teaching evaluation.

The current evaluations are all one-time static evaluations after the end of the semester, which belong to typical summative post evaluation. Unable to monitor classroom teaching status in real time, students' weekly learning behavior changes, and knowledge mastery dynamics, unable to timely detect problems such as teachers' teaching rhythm discomfort, students' knowledge gaps, and learning slackness during the teaching process, only able to provide results after the end of the semester, unable to achieve process intervention, real-time warning, and dynamic adjustment, and the diagnostic and guiding value of evaluation is difficult to play.

Most English teaching evaluations in universities only focus on superficial applications such as scoring, ranking, and archiving. After the evaluation is completed, there is a lack of in-depth analysis of the results, problem attribution, and tracking of rectification. The teaching management department only focuses on the overall pass rate and ranking, and teachers are unable to accurately identify their own

teaching shortcomings. Students are unable to clearly recognize their weak points in English proficiency, and there is a serious disconnect between evaluation and teaching optimization, teacher training, personalized tutoring, and curriculum reform. A closed-loop education mechanism of "evaluation diagnosis rectification optimization re evaluation" has not been formed.

C. THE PRACTICAL DILEMMA OF APPLYING INTELLIGENT BIG DATA TECHNOLOGY TO THE EVALUATION OF ENGLISH TEACHING IN UNIVERSITIES

Some university management have insufficient understanding of the digitization of education and the empowerment of big data in teaching evaluation, and still adhere to traditional manual evaluation thinking, believing that English teaching evaluation only needs to rely on exams and manual scoring, lacking top-level design, policy support, and funding for building an English teaching big data evaluation system. At the same time, some English teachers are accustomed to traditional teaching and evaluation models, with low awareness and acceptance of intelligent big data evaluation, and are unwilling to actively adapt to the reform of intelligent evaluation. The lagging concept has become the primary obstacle to the implementation of technology.

On the one hand, the construction of smart campuses in some universities is not perfect, English teaching lacks a unified online learning platform, and the coverage of smart classroom equipment is low, which cannot generate sufficient process behavior big data; On the other hand, there are already multiple platforms with inconsistent data standards and incompatible interfaces, lacking a unified integration and governance of campus big data middleware. Data cleaning and data fusion are difficult, and a large amount of valuable teaching behavior data is idle and wasted, which cannot provide complete data support for intelligent evaluation, as shown in Table 2 below.

At present, there is no unified and recognized big data intelligent evaluation index system for English teaching in universities in China. Each university sets its own indicators, which have problems such as high arbitrariness, incomplete dimensions, difficult quantification of qualitative indicators, and unscientific weight setting. At the same time, there is a lack of professional education evaluation talents and big data technology talent combination teams. Compound talents who understand both the laws of English teaching and big data modeling are scarce, making it difficult to construct intelligent evaluation indicators and models with strong adaptability and scientific standards.

Most university teaching management personnel and English teachers lack professional technical abilities in big data mining, intelligent algorithms, and model analysis. They can only use basic data statistical functions and cannot use machine learning and neural network algorithms for deep data modeling and intelligent evaluation. At the same time, there is a scarcity of intelligent evaluation systems suitable for college English majors on the market. General teaching evaluation systems cannot fit the professional characteristics of English teaching listening, speaking, reading, writing, and translation, resulting in intelligent big data technology mostly staying at the theoretical research level and difficult to apply to daily English teaching evaluation.

The operation of the intelligent big data English teaching evaluation system requires supporting institutional guarantees, operation and maintenance guarantees, assessment

guarantees, and funding guarantees. Currently, most universities have not introduced teaching big data management measures, implementation rules for intelligent evaluation, and management systems for the application of evaluation results. They lack dedicated big data operation and maintenance teams and funding investment, and lack long-term support for system maintenance, data updates, and model optimization, making it difficult to ensure the long-term stable operation of the intelligent evaluation system.

IV. CONSTRUCTION OF EVALUATION INDEX SYSTEM FOR COLLEGE ENGLISH TEACHING EFFECTIVENESS UNDER INTELLIGENT BIG DATA

A. CONSTRUCTION PRINCIPLES OF EVALUATION INDEX SYSTEM

To ensure the construction of a scientific, comprehensive, adaptable, quantifiable, and implementable intelligent evaluation index system for college English teaching effectiveness, this article strictly follows the six construction principles.

The indicator system should cover five core dimensions of English teaching in universities: teaching by teachers, student learning, teaching resources, teaching management, and teaching effectiveness. It should cover all scenarios before, during, after, online, offline, in class, and outside of class, taking into account both explicit quantitative indicators and implicit qualitative indicators. The indicators at each level are independent and interrelated, forming a complete and systematic evaluation framework without missing dimensions or indicators.

The selection of indicators relies on basic theories such as multiple intelligence evaluation and process evaluation, combined with the laws of English teaching in universities and the characteristics of big data collection, to avoid subjective and arbitrary setting of indicators. Quantitative indicators can be directly collected and quantified through big data, while qualitative indicators can be standardized and quantified through fuzzy algorithms. The weights of indicators are a combination of objective and subjective weighting to ensure the scientific objectivity of the system.

All selected indicators must be compatible with intelligent big data collection capabilities, able to obtain raw data from various teaching platforms on campus, and avoid setting vague indicators that cannot be collected or quantified. Quantitative indicators are directly presented in numerical values, frequency, duration, and proportion, while qualitative indicators can be indirectly quantified through behavioral data or fuzzy scoring quantification, adapting to the data computation needs of intelligent evaluation models.

Adopting a three-level hierarchical structure of "target layer criterion layer indicator layer", the target layer is the comprehensive evaluation of the effectiveness of English teaching in universities; The criterion layer is divided into five core dimensions; The indicator layer consists of specific sub indicators for each dimension, with clear hierarchy

TABLE 2. Problems and Obstacles of Big Data Application in English Teaching Evaluation

Obstacle dimension	Specific performance	Impact degree	Obstacle dimension
Concept and top-level design	Backward evaluation awareness, lack of planning	High	Concept and top-level design
Data foundation and platform	Data silos, inconsistent standards, incomplete collection	High	Data foundation and platform
Indicator system construction	Unprofessional, incomplete, difficult to quantify	Medium	Indicator system construction
Technical and talent support	Lack of big data talents, weak algorithm application	High	Technical and talent support
System and guarantee mechanism	No management system, insufficient maintenance funds	Medium	System and guarantee mechanism

and logic, making it easy for big data classification and collection, hierarchical modeling, and sub item evaluation.

The indicator system reserves dynamic adjustment space, which can increase or decrease sub indicators and adjust indicator weights according to the direction of English teaching reform in universities, the upgrading of big data technology, and changes in talent training needs; Simultaneously adapting to the differences in English teaching among students from different types of universities and majors, with good adaptability and adjustability.

The indicator system is not only used for evaluating and scoring teaching effectiveness, but also has the guiding function of teaching diagnosis and optimization guidance. The indicator setting focuses on the core shortcomings of English teaching and the core competency needs of talent cultivation. At the same time, it conforms to the actual construction level of smart campuses in universities, with concise and clear indicators, easy data collection, and easy model construction, and has strong practical application value.

B. HIERARCHICAL STRUCTURE OF EVALUATION INDEX SYSTEM

This article constructs a three-level evaluation index system: Level 1: Target layer, comprehensive evaluation of English teaching effectiveness in universities under intelligent big data technology;

The second level: the criterion level, which includes five dimensions: teacher teaching dimension, student learning dimension, teaching resource dimension, teaching management dimension, and teaching effectiveness dimension;

The third level: indicator level, subdivided into 32 specific evaluation indicators under the five criteria levels, covering both quantitative and qualitative indicators, forming a complete and quantifiable indicator system, as shown in Table 3 below.

V. CONSTRUCTION OF INTELLIGENT EVALUATION MODEL FOR COLLEGE ENGLISH TEACHING EFFECTIVENESS

A. COMPARATIVE ANALYSIS OF MAINSTREAM INTELLIGENT EVALUATION ALGORITHMS

To select the most suitable algorithm model for evaluating the effectiveness of English teaching in universities, this article compares commonly used algorithms in the current field of educational evaluation:

TABLE 3. Indicator System of College English Teaching Effect Evaluation

Criterion layer (First-level index)	Number of secondary indicators	Representative measurable indicators	Data collection method
Teacher teaching	7	Teaching design, key explanation, interaction	Platform + expert scoring
Student learning	8	Preview rate, concentration, homework quality	Behavior data statistics
Teaching resources	6	Resource richness, usability, update frequency	Platform log
Teaching management	5	Curriculum arrangement, supervision, feedback	Management system
Teaching effectiveness	6	Score improvement, ability growth, satisfaction	Test + questionnaire

TABLE 4. Performance Comparison of Common Intelligent Evaluation Algorithms

Algorithm	Big data adaptability	Nonlinear fitting	Quantification ability	Stability
AHP	Weak	Low	Medium	High
Fuzzy comprehensive evaluation	Medium	Medium	Strong	Medium
BP neural network	Strong	Strong	Medium	High
Grey relation analysis	Weak	Low	Medium	Medium

Advantages: Clear logic and clear hierarchy, suitable for multi indicator hierarchical evaluation, and can be combined with expert experience to set weights

Disadvantages: Strong subjective dependence, poor dynamic adaptability, inability to handle massive amounts of big data and non-linear

correlations, and difficulty in achieving intelligent prediction and short board diagnosis, as shown in Table 4.

Advantages: Proficient in handling qualitative and quantitative fuzzy indicators, adaptable to a large number of fuzzy evaluation dimensions in English teaching

Disadvantage: Mainly relying on static evaluation, weak self-learning ability, unable to explore potential correlations and development trends in data.

Advantages: With strong self-learning, non-linear fitting, and massive data processing capabilities, it can automatically mine indicator correlation relationships, dynamically optimize weights, and achieve teaching effectiveness pre-

diction and intelligent diagnosis of shortcomings

Disadvantage: Requires sufficient sample data support and high model training complexity.

Advantages: Suitable for evaluation scenarios with small samples and incomplete data

Disadvantages: Weak big data processing capabilities, low level of intelligence, and inability to adapt to the mining needs of massive teaching data in all scenarios.

Through comparison, this article determines to use the fuzzy comprehensive evaluation method+BP neural network algorithm as the core, integrate big data mining technology, and construct an intelligent evaluation model for college English teaching effectiveness, taking into account multiple advantages such as fuzzy index quantification, massive data processing, self-learning modeling, and dynamic prediction and diagnosis.

B. OVERALL ARCHITECTURE OF INTELLIGENT EVALUATION MODEL

The model is divided into six core modules: data input module, data preprocessing module, indicator weight module, intelligent evaluation operation module, result output and intelligent diagnosis module, and visualization application module. These modules work together to achieve intelligent processing of the entire process from raw teaching big data to evaluation results, problem diagnosis, and optimization suggestions.

VI. RESEARCH CONCLUSION

This article focuses on the core theme of intelligent evaluation of college English teaching effectiveness under intelligent big data technology. Through theoretical analysis, current situation research, indicator construction, model building, and empirical analysis, the following core research conclusions are formed:

Firstly, the traditional evaluation of English teaching in universities has six prominent problems: one-dimensional indicators, serious data silos, lagging static evaluations, strong subjective interference, shallow application of results, and lack of hierarchical evaluations. These problems are no longer suitable for the digital transformation of higher education and the cultivation of English application-oriented talents; At the same time, the application of intelligent big data technology in English teaching evaluation still faces practical challenges such as outdated concepts, weak data foundation, lack of professional talents, difficulties in model implementation, data security risks, and incomplete guarantee mechanisms.

Secondly, following the principles of comprehensiveness, scientificity, quantifiability, and hierarchy, an intelligent evaluation index system for high school English teaching effectiveness has been constructed, which includes a three-level structure of target layer, criterion layer, and indicator layer, covering five major criterion layers of teacher teaching, student learning, teaching resources, teaching management, and teaching effectiveness, and 32 sub indicators.

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