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Design of Intelligent Assistant System for English Teaching Based on Artificial Intelligence

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Driven by the wave of globalization, the importance of English as a facilitator of international communication is becoming more and more pronounced. Traditional English teaching is facing challenges such as the lack of teachers and uneven distribution of resources. Hence, there is an urgent need for innovative solutions. In this study, we develop an English teaching aid system based on artificial intelligence, with the aim of improving the quality of teaching and learners' motivation. This study was carried out using a multi-dimensional approach comprising a literature review, requirement analysis, system design and prototype testing. First, the literature review revealed the core challenges of English teaching and the current status of AI application in education. Then, the requirement analysis clarified the key requirements for system design. On this basis, we constructed a system architecture and developed a prototype system. In particular, in terms of teaching assistance, this system uses natural language processing technology and machine learning algorithms to achieve intelligent adaptation and personalized recommendation of course content to adapt to the needs of different learners. The results of the study show that the assistance system significantly improves the efficiency of English teaching and the learning outcomes of learners. The system dynamically adjusts teaching strategies and optimizes learning paths according to learners' progress and feedback. Meanwhile, the system provides teachers with learning data analysis, which enhances their understanding and responsiveness to learners' needs.

Keywords: artificial intelligence, English language teaching, intelligent assistance system

1. INTRODUCTION

In the context of globalization, the teaching of the English language has become increasingly important. With the strengthening of global interconnection, English has become more than a mere language tool; it is now a key element of international communication, academic research, and business cooperation, as well as an important means of acquiring and disseminating of information. In the current globalized environment, English proficiency is not only an important way to enhance personal competitiveness; it also a strategic means whereby the country can cultivate talents with international vision and the ability to engage in intercultural communication. However, traditional English teaching methods have many shortcomings such as over-reliance on teachers' explanations, and neglecting students' individual characteristics and personal development. Excessive attention is paid to grammatical structures and vocabulary memorization, while practical language application and listening skills are neglected. Also, the uneven distribution of educational resources makes it difficult to meet the needs of all learners and give them access to quality education [1–3]. Moreover, the traditional test-oriented teaching and evaluation system also restricts the development of students' overall language ability.

Against this background, the application of artificial intelligence technology in the field of education shows great potential and is becoming a matter of necessity. Artificial intelligence is gradually subverting the traditional teaching mode by virtue of its powerful data processing capability, accurate user profile construction and personalized learning path design [4]. For example, the intelligent teaching system

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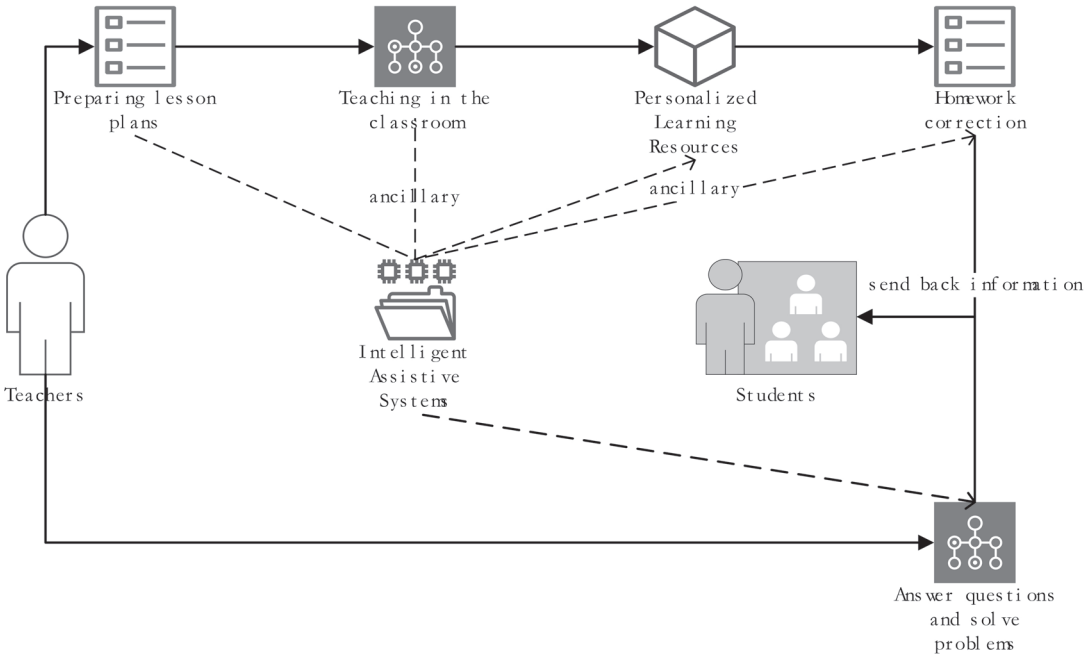

Figure 1 Working principle of Intelligent Assist System.

can achieve personalized teaching delivery based on big data analysis, using speech recognition, natural language processing and other technologies to simulate real conversation scenarios to enhance students' language practice ability, and provide real-time feedback on students' learning outcomes through intelligent assessment, assisting teachers to refine and better manage their teaching practices. In addition, AI technology can overcome the limitations imposed by time and space, so that high-quality educational resources can be popularized and shared, effectively alleviating the problem of uneven distribution of educational resources.

At the same time, the research and development and application of intelligent assistive systems for English language teaching are increasing significantly. These systems integrate cutting-edge achievements in artificial intelligence and bring unprecedented transformative power to English teaching. They can provide customized learning resources according to students' learning styles, progress and difficulties, greatly improving teaching efficiency and learning effectiveness. However, despite this, the development of intelligent assistive systems for English language teaching is still in its infancy, with many challenges such as technological maturity, user experience, and educational fairness, which urgently require further research and exploration. The working principle underpinning the intelligent assistive system is shown in Figure 1 [5, 6].

This research was motivated by the concern regarding the problems of English teaching in the context of globalization and the need to explore the potential and impact of educational innovation driven by artificial intelligence technology. The purpose of the research was explore the specific application value of AI technology in English teaching, analyze the current development status of the existing intelligent assistive system for English teaching and its problems, and on this basis, propose innovative solutions and future development directions.

The innovative contributions of this study are: (1) A complete architecture of intelligent assistive system for English teaching is constructed, which can effectively integrate and apply natural language processing (NLP) technology and machine learning algorithms to realize the leap from theory to practice. (2) In the design of system functions, it innovatively realizes the intelligent adaptation of teaching content. Through the use of advanced NLP technology, the system understands, parses and structures all kinds of teaching resources so that it can accurately match the needs of learners at different levels and with different points of interest. (3) Introducing a personalized recommendation mechanism, using machine learning algorithms to deeply mine and learn user behavioral data, the system is able to dynamically generate personalized learning paths and resource push strategies to ensure that each learner's English learning experience is both targeted and interactive.

2. LITERATURE REVIEW

2.1 Core Issues in English Language Teaching

Although English language teaching plays an important role in the context of globalization, it faces many core problems in practice [7]. The balanced development of language skills is one of the first challenges. Traditional classroom environments tend to emphasize the development of reading and writing skills, while listening and speaking skills may be neglected due to insufficient opportunities for practice, leading to the prevalence of "mute English". In addition, due to the uneven distribution of educational resources [8], there are significant disparities in the quality of English language teaching between different regions and schools, which hinders the overall development of students. The need for

personalized teaching is another pressing issue. Each student has a different learning style, interests and learning speed, but with the traditional teaching model, it is difficult to take individual differences into account, which may lead to students becoming frustrated or losing interest in standardized courses [9]. At the same time, how to effectively implement differentiated teaching strategies to meet the needs of various types of learners has long been the focus of educators [10]. The evaluation of teaching effectiveness and exploration of feedback mechanisms are also key issues. The traditional test and evaluation system relies mainly on standardized test scores, ignoring the comprehensive examination of students' practical application ability and comprehensive literacy [11].

2.2 Status of Artificial Intelligence Applications in Education

With the ever-changing pace of scientific and technological progress, the powerful tool of Artificial Intelligence (AI) is penetrating the field of education with unprecedented breadth and depth, triggering a major change in education and modes of teaching, showing great potential to improve teaching quality, personalized learning experiences and teaching efficiency. First of all, with the support of big data technology, AI systems are able to conduct in-depth mining and detailed analysis of massive student behavioral data, academic performance, and interest preferences, and through the integration and analysis of these complex data sets, build an accurate user profile. This user profile not only includes students' knowledge structure and ability level, but also covers their learning style, emotional state and even potential subject interests, providing educators with a comprehensive and three-dimensional cognitive framework of students [12].

Based on this accurate user profile, the education platform can intelligently match and promote teaching resources that are highly compatible with students' current abilities and needs, ranging from course content, and difficulty of exercises to extended reading materials, all indicative of customization. At the same time, AI technology can dynamically plan a personalized learning path based on each student's learning progress and level of understanding, ensuring the efficient use of educational resources and respect for individual differences, thus promoting the all-round development of each student [13]. Moreover, the application of AI in practical teaching scenarios has become increasingly rich and diverse. The application of intelligent speech recognition technology in the field of education has significantly improved the interactivity and effectiveness of language teaching, especially in the English listening and speaking training sessions, which plays a key role in improving students' academic outcomes. This technology can capture and accurately recognize elements of students' pronunciation in real time, comprehensively assess students' fluency, accuracy, intonation, rhythm and other dimensions of their oral expression, and give them targeted corrective suggestions, which greatly improves the practicality and effectiveness of language learning. In addition, Natural Language Processing (NLP) technology also plays an important role in the educational evaluation system. By means of complex algorithmic models, NLP technology can automatically assess the quality of students' essays, including paragraph structure, vocabulary use, grammatical norms and expression of ideas, thus replacing part of the manual marking tasks and improving the objectivity and fairness of the evaluation. Furthermore, AI can also provide students with instant feedback on detailed evaluation results and suggestions for improvement, helping them adjust their writing strategies in a timely manner and continuously optimize their written expression skills. On the visual and sensory level, Virtual Reality (VR) and Augmented Reality (AR) technologies have created a new immersive teaching environment. They break the time and space constraints of the traditional classroom, enabling students to experience historical events, explore scientific mysteries, simulate experiments, and even go on field trips across geographic barriers in a virtual space [14]. This intuitive, vivid and creative way of learning greatly stimulates students' interest and participation, and also strengthens their in-depth understanding and practical innovation ability. Finally, the AI-driven adaptive learning platform, as the core carrier of future education, makes full use of machine learning algorithms to continuously optimize teaching strategies. It tracks and analyzes students' learning trajectories on the platform, the speed and quality of completing tasks, the mastery of knowledge points, and other data indicators in real time, and then dynamically adjusts the teaching content, pace, and mode accordingly, forming a closed-loop mechanism of "tailored to the needs of the students". This approach not only effectively solves the problem of traditional teaching, which makes it difficult to take into account individual differences, but also helps to improve the overall efficacy of teaching and students' commitment to learning, and thus promotes the fairness and quality of education.

2.3 Analysis of Existing English Teaching Aid Systems

A series of English teaching assistance systems based on AI technology have been put into use in the current market. For example, Li [15] uses AI algorithms to customize personalized learning plans, and mobile apps such as Li [16] use gamified learning to enhance users' learning enjoyment and persistence. However, these systems are not perfect, and studies have found that while they have improved teaching and learning to a certain extent, there is still room for improvement in terms of the realism of contextual dialog simulations, the quality of interactive feedback, and the support of complex thinking processes [17]. At the same time, some scholars point out that although intelligent aids are rapidly gaining popularity, teachers may face problems such as difficulty in operating the system and insufficient technical support in this regard. Also, over-reliance on technology may affect emotional communication and humanistic aspects of care that teachers should provide to students [18].

3. NEEDS ANALYSIS

In this section, we take a university as a specific research case to explore in depth all the requirements of an intelligent auxiliary system for English teaching, the design of which

is based on AI technology. We also consider the unique attributes and needs of the target user group, and provide a comprehensive analysis of the current teaching environment and resource situation.

3.1 Key Requirements for System Design

In order to ensure that the system can effectively improve the quality of English teaching and meet the needs of students in various practical teaching scenarios, we have identified and refined the following key design requirements:

Adaptability: The system should have excellent adaptability and be able to seamlessly be integrated with all kinds of teaching situations, including traditional face-to-face lectures, blended teaching modes combining online and offline, and pure online distance learning modes. The design should fully consider the learning habits of students and the pedagogical strategies used by teachers in different environments, and achieve flexible and seamless transition and integration [19].

Personalization: The system uses advanced algorithms and technical means to dynamically generate personalized learning paths and content recommendations based on the individual differences of each student. This includes, but is not limited to, identifying the student's learning progress, language skill level, and knowledge mastery, and then providing precisely customized learning materials and services.

Interactivity: The system builds an effective two-way interaction mechanism that supports real-time communication and feedback between students and teachers, and also encourages collaborative learning and knowledge co-construction among students. To this end, the system needs to be equipped with functional modules such as online Q&A, discussion forums, and collaboration tools to enhance the communication and cooperation experience in the learning process [20].

Scalability: At the system architecture level, from the outset, the design focuses on the future development potential to ensure that the system has a good modular structure and open interfaces, so that new functional modules can be added and external educational resources can be integrated at a later stage, so that the system is always dynamic in keeping with emerging trends.

3.2 Characteristics and Needs of Target User Groups

The target user group consisted of university English language learners, who exhibit diverse characteristics and complex and multifaceted needs. First of all, the student body comprises a wide range of learning backgrounds, including different academic majors, cultural backgrounds, and prior language learning experiences. In addition, their learning styles vary, with some favoring independent exploration and others preferring teamwork. They also have different learning goals, ranging from overall improvement of language skills to specialized training for specific areas or exams. Although students are generally exposed to a variety of electronic devices and online platforms, their proficiency in using educational technology tools varies significantly. Therefore, the system interface must be designed to be intuitive and easy to use, with detailed tutorials to ensure that all users are able to get started quickly. The system should have built-in incentives to stimulate students' initiative and continuity, such as the establishment of an achievement system, virtual badge rewards, points ranking, etc., so as to mobilize students' motivation to learn and promote the formation of independent learning habits. In the face of modern fast-paced learning environment, students often need to flexibly arrange their study schedule without time and space constraints. The system must support 24/7 access, allowing students to study anytime, anywhere, using fragmented time, accessing the required resources and completing various learning tasks [21].

3.3 Survey of the Current State of the Teaching Environment and Resources

After conducting a comprehensive examination of the university's current teaching environment and resources, we observed the following: the university has a series of rich physical and digital teaching resources, such as a modern library collection, multimedia classroom facilities, and a perfect online learning platform, which provides a huge amount of learning materials and course content. The school's network infrastructure is relatively modern, ensuring high-speed and stable network connections, and there is an adequate configuration of various types of multifunctional electronic equipment, creating hardware conditions for the deployment of intelligent teaching systems Most teachers have a positive and innovative attitude and are willing to try out new teaching methods and technological tools, suggesting potential strong support for the introduction of AI-based teaching assistance systems. Feedback from students indicates a strong desire for richer and more varied interactive learning experiences, as well as more targeted and personalized teaching services. This call further confirms the necessity and urgency of developing intelligent teaching assistance systems [22].

4. INTELLIGENT ADAPTATION MODEL FOR TEACHING CONTENT

The core objective of this section is to construct a more sophisticated and complex framework for intelligent adaptation of teaching content. The proposed AICIAM model framework is shown in Figure 2.

4.1 Overview of the Model

The core concept of the Instructional Content Intelligent Adaptation Model (AICIAM) takes into account the multi-dimensional attribute characteristics of learners and the diversified intrinsic characteristics of teaching materials, so as to achieve the precise positioning and highly adaptive delivery of personalized teaching content. The purpose of this model is to break away from the traditional "personalized teaching"

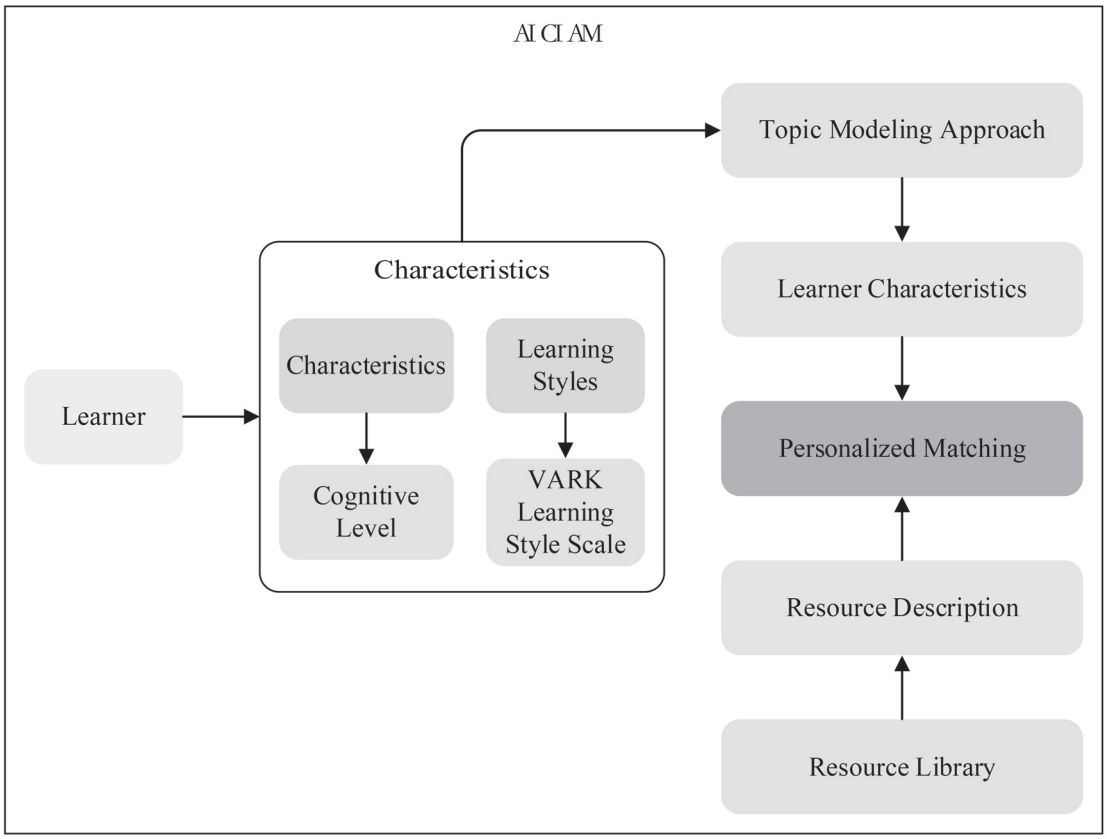

Figure 2 AICIAM modeling framework.

model. This model departs from the traditional "one-size-fits-all" teaching model, and strives to carefully select the learning materials that best meet the current needs and ability levels of each learner in the vast teaching resource database, so as to effectively improve the teaching effectiveness and learning experience [23].

4.2 In-Depth Analysis of Learner Characteristics

First, at the cognitive level, we use advanced Cognitive Diagnostic Models (cdms) to systematically analyze learners' knowledge structure and depth of understanding, and accurately assess their mastery of each knowledge point and potential ability gaps. We accurately identify individualized learning styles, combining traditional questionnaire tools such as the VARK Learning Style Scale with online behavioral tracking data to scientifically reveal each learner's unique learning style preferences and interaction habits. Through the innovative application of Association Rule Mining (ARM) and Topic Modeling (e.g. Latent Dirichlet Allocation (LDA), we can explore and extract learners' intrinsic focuses of interest and their evolution paths, which provides valuable data support for personalized teaching content matching. Data support for personalized teaching and learning content matching [24].

In the AICIAM model, we first need to determine the learner's cognitive. This can be done with Cognitive Diagnostic Models (cdms), whose basic formula is (1):

$$C = Q \cdot \theta \tag{1}$$

Where C is the learner's cognitive state vector, Q is a binary matrix representing the relationship between topics and skills, and θ is the learner's skill mastery vector. With this model, we can diagnose the learner's mastery in a particular skill.

The identification of learning styles can be quantified by the scores of the VARK questionnaire, and the score of each learning style can be calculated with this formula (2):

$$S_{style} = \sum_{i=1}^{n} w_i \cdot x_i \tag{2}$$

Where S_{style} represents the score of a particular learning style, w_i is the weighting coefficients, x_i is the score of the corresponding question in the questionnaire, and n is the number of questions. The mining of interest points can be realized by Latent Dirichlet Allocation (LDA) model with the basic formula:

$$p(\beta, \theta, z, w|\alpha, \eta) = \prod_{k=1}^{K} p(\beta_k|\eta) \prod_{d=1}^{D} p(\theta_d|\alpha) \times p\left(\prod_{n=1}^{N} (z_{d,n}|\theta_d)\, p(w_{d,n}|\beta_{z_{d,n}})\right)$$

[25]. Where β is the distribution of subject words, θ is the distribution of document topics, z is the subject assignment of words in the document, w is the words in the document, and α and η are hyperparameters. This model allows us to discover topics in a collection of documents and associate learners' points of interest with these topics.

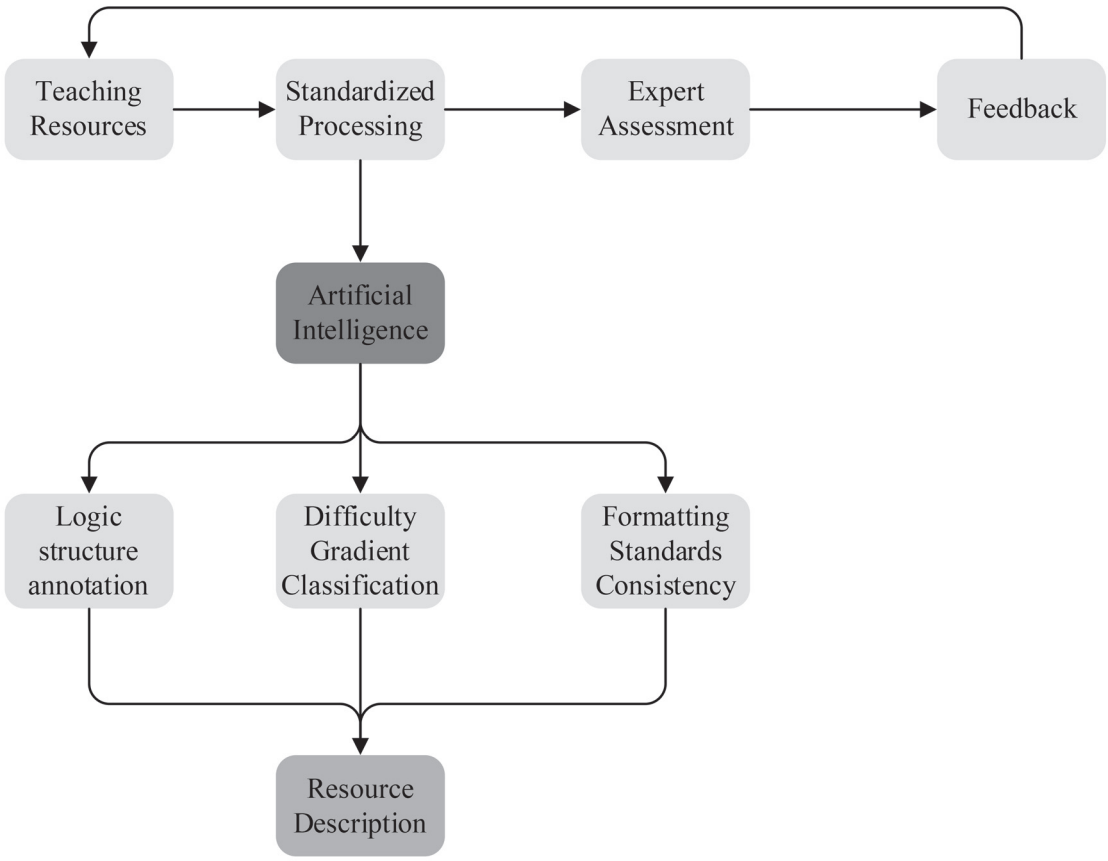

Figure 3 Resource structuring framework.

4.3 All-Encompassing and Multi-Dimensional Structuring Strategy for Teaching Resources

The resource architecture framework is shown in Figure 3. We use advanced deep learning models to perform deep semantic parsing and encoding of teaching content to ensure the accuracy and effectiveness of information delivery. We combine the professional evaluation system of education experts and real-time learner usage feedback data to achieve fine and dynamic labeling of the difficulty level of teaching resources to meet the needs of learners at different levels. In order to facilitate efficient recognition and processing by the AI system, all teaching resources must undergo a rigorous format standardization process to ensure that they comply with the preset specifications, thus achieving consistency and convenience in resource utilization.

4.4 Design and Implementation of Matching Algorithm

In the designed matching algorithm, we need to calculate the similarity between the learner feature vector and the teaching resource feature vector. This can be achieved by the cosine similarity, which is given by (3):

$$\cos(\vec{a}, \vec{b}) = \frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \|\vec{b}\|} \tag{3}$$

Where $\vec{a}$ and $\vec{b}$ are the learner feature vectors and the teaching resource feature vectors, respectively, the dot product denotes the inner product of the vectors, and $|\vec{a}|$ and $|\vec{b}|$ are the Euclidean norms of the vectors [26]. To balance the different matching objectives, we can use genetic algorithm whose fitness function can be expressed as: $F(x) = \omega_1 \cdot Sim(x) + \omega_2 \cdot Div(x) - \omega_3 \cdot C(x)F(x)$ is the fitness score [27].

4.5 Personalized Learning Paths and Resource Push Strategies

When designing the personalized learning path and resource pushing strategy, the core logic of the model is to achieve a high degree of fit between resources and students' needs through the matching function (f(L, R)) based on the learner feature vector (L), teaching resource feature vector (R) and learning goal vector (G). The specific steps are as follows:

Learner Characteristic Vector L Construction: learner characteristic vectors cover information about students' individual differences, such as cognitive developmental stage, language proficiency level, learning style (e.g., visual, auditory, or hands-on), interest preferences (e.g., specific topics or themes), and prior knowledge background. These characteristics are usually obtained by systematically collecting learning data, user behavior analysis, and possibly self-assessment questionnaires, and are converted into numerical values for quantitative representation.

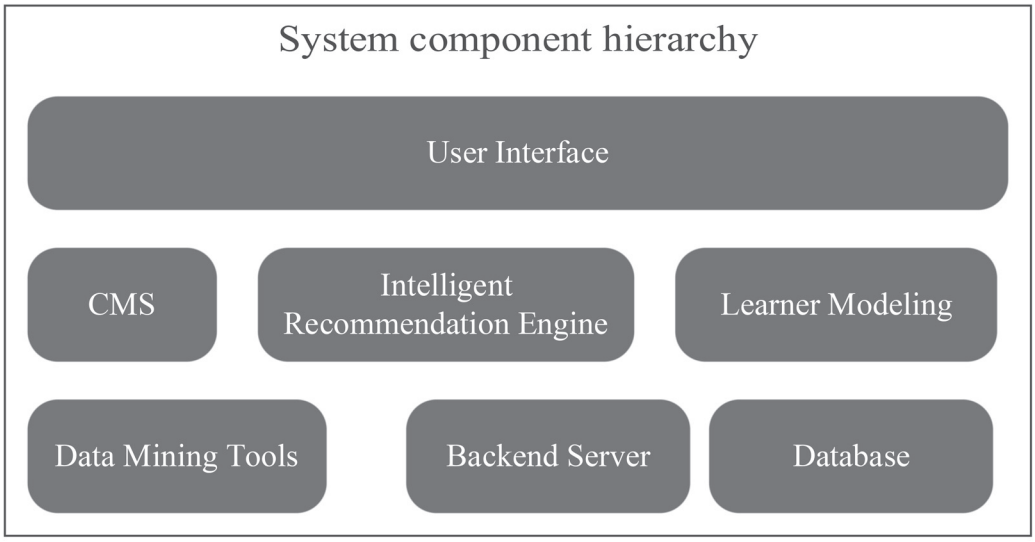

Figure 4 System Component Groups.

R-construction of teaching resource feature vectors: teaching resource feature vectors describe the characteristics of each educational resource, including, but not limited to, the difficulty level (suitable for students of different levels), content type (reading materials, listening exercises, video lessons, interactive games, etc.), the coverage of the knowledge points, and the direction of the educational objectives (e.g., whether it targets a certain grammar point, vocabulary category, or one of the four skills of listening, reading, writing, etc.). The resources are labeled according to the content information uploaded by teachers, and transformed into computable feature vectors.

Definition of Learning Goal Vector G: The Learning Goal Vector expresses the specific academic achievement or competency enhancement that the learner expects to achieve, e.g., a short-term goal may be to improve vocabulary mastery in a particular unit, while a long-term goal may be to become fluent in daily conversations or writing English reports. Learning goals can be set by the students themselves or in conjunction with a personalized growth path recommended by the system to ensure that the goals are clear and measurable.

Matching Function $f(L, R)$ Design and Application: The matching function is an algorithm that maps a vector of learner characteristics to a vector of teaching resource characteristics onto a similarity score, which we can implement using the cosine similarity formula: $f(L, R) = \frac{L \cdot R}{\|L\|\|R\|}$, where $L \cdot R$ denotes the dot product of the vectors and $|L|, |R|$ denotes the modulus of the vectors respectively. This function is designed to measure the fit between learner characteristics and resource characteristics, when the higher the similarity score, the more the resource matches the current needs and goals of that learner [28].

Learning Objective Adaptation Function $g(G, R)$: This function evaluates whether the instructional resource meets the learner's learning objective. For example, if the learning objective is to improve speaking, resources related to speaking practice will be rated higher.

Personalized Learning Path Recommendation Function $P(L, R, G)$: The final recommendation function combines a matching function and a learning goal adaptation function to recommend the most appropriate learning path for the learner: $P(L, R, G) = f(L, R) * g(G, R)$. This function will generate a list of instructional resources for each learner, sorted by recommendation score, and the highest scoring resources will be pushed to the learner.

In this way, the system is able to dynamically customize personalized learning paths for each learner, taking into account not only their individual characteristics but also their specific learning goals. This strategy can significantly improve the learning efficiency and the quality of the learning experience [29].

5. REALIZATION AND TESTING

5.1 Development Process of the Prototype System

The prototype framework structure of the AI-based intelligent assistive system for English teaching contains several key components, each of which plays an indispensable role. The specific technical details of this framework are shown in Figure 4.

The user interface is designed using modern human-computer interaction design principles and user experience (UX) best practices to ensure that the interface is intuitive, simple, and easy to navigate, with a responsive design that adapts to different devices and screen sizes to provide a consistent experience across platforms. The responsive design adapts to different devices and screen sizes to provide a consistent cross-platform experience. The UI includes functional modules such as login/registration module, course list, personalized recommended content display area, learning progress tracking panel, and interactive communication area, which are convenient for teachers to manage and students to learn independently [30].

The CMS allows teachers to upload teaching materials in various formats (e.g. MP4 videos, PDF documents, Word documents or online test questions), and supports metadata

Table 1 Test results.

Functional module	Test content	Test results	Note
Learner profiling	Accuracy analysis of cognitive levels, learning styles, and points of interest	Pass (a bill or inspection etc.)	Multi-scenario testing was performed using real datasets
Teaching Resources Difficulty Level Labeling	Match between resource difficulty and learner level	Pass (a bill or inspection etc.)	Difficulty level matches expert assessment
Personalized recommendations for teaching content	Accuracy and adaptability of recommender systems	Pass (a bill or inspection etc.)	Recommended content is highly aligned with learner characteristics

tagging for content categorization and retrieval. Teachers can edit, delete, manage permissions and version control of the uploaded content, realizing flexible and efficient educational resource management [31].

The intelligent recommendation engine utilizes advanced Natural Language Processing (NLP) technologies, such as BERT or GPT family of models, to understand the subject matter, difficulty level, and semantic relationships of the textual content in order to accurately match the students' language proficiency level. The engine also combines machine learning algorithms (e.g., collaborative filtering, deep learning recommendation algorithms, etc.) to analyze students' learning behavior data (e.g., browsing records, question-answer scores, study time, etc.) and to generate a personalized list of learning resource recommendations based on students' real-time learning status.

The learner model is a student portrait-building system based on big data, which continuously collects and updates each student's learning journey data, including information on what has been learned, learning speed, interest preferences, interactive feedback, etc. The learner model is used to dynamically adjust students' individual learning paths and provide teachers with recommendations for optimizing their own recommendation strategies. This data is used to dynamically adjust students' individual learning paths and provide targeted teaching guidance suggestions for teachers, as well as providing a basis for the system to optimize its own recommendation strategies.

Using data mining technology and visualization tools, the system is able to analyze massive learning data in depth and extract valuable information, such as students' learning efficiency, knowledge point mastery, and overall class performance trends. The system automatically generates detailed learning analysis reports to help teachers understand the learning status of individuals and groups of students, adjust teaching plans and methods accordingly, and achieve effective teaching.

The back-end server is responsible for processing all requests sent by the front-end and for executing business logic, such as content publishing, user authentication, resource recommendation and other operations. The server uses a highly efficient service architecture to ensure fast response under high concurrent access, and at the same time adopts secure communication protocols (e.g. HTTPS, SSL/TLS) to protect the security of data transmission. Read and write operations on the database are optimized to reduce latency and improve the efficiency of data query and update.

The database serves as the data storage center of the whole system, using relational databases (e.g., mysql, postgresql) or non-relational databases (e.g., mongodb) to store user account information, teaching content, user behavior logs, and other application-related data. The database design follows the principle of standardization to ensure data consistency and integrity, and takes encryption, backup and other measures to guarantee the safe storage of data. At the same time, a caching mechanism could also be set up to accelerate the speed with which commonly-used data can be accessed according to demand.

5.2 Functional and User Experience Testing

After the AICIAM prototype system was fully developed, we conducted comprehensive and in-depth functional testing and user experience evaluation, the results of which are shown in Table 1. First, in the functional validation phase, we launched a meticulous examination of the key performance indicators of the system modules and overall functionality. Specifically, the learner characterization module was rigorously tested, involving the accuracy analysis of cognitive levels, learning styles and interests. A large amount of real data was used to simulate a variety of actual teaching scenarios, which ensured that the module was able to maintain stable accuracy in different environments and pass the test. Meanwhile, the module for the difficulty level of teaching resources was also rigorously tested to determine the effectiveness of the system in matching the difficulty level of educational resources with the learners' abilities. The results are consistent with the assessment of educational experts, which lends support for the reliability of this function. In addition, the recommendation module for the personalization of course content also performed well, with the recommended content strongly matching the learners' characteristics, showing good accuracy and adaptability. In terms of user experience, we invited several teachers and students to participate in the trial and provide valuable feedback, shown in Table 2.

In order to have a more detailed understanding of users' satisfaction with the AICIAM prototype system and obtain suggestions for improvement, we also conducted a satisfaction survey, as shown in Table 3. The results show that most of the users gave high ratings to the ease of use and stability of the system, with average satisfaction ratings of 4.2/5 and 4.5/5, respectively, indicating that the system has been widely recognized for its basic usage features. However, in terms of

Table 2 Test results.

User group	Test content	Test results	User feedback
Principals	Interface aesthetics and ease of operation	Favorable	Operational processes can be further simplified
Schoolchildren	Learning efficiency improvement, system responsiveness	To be improved	Response speed needs to be improved in specific environments

Table 3 Results of Opinion Survey.

Investigative projects	Satisfaction rating	Number of feedbacks	Synthesized assessment
System Ease of Use	4.2/5	100	Most users expressed satisfaction
System Stability	4.5/5	100	Stable system operation
System Functionality	4.0/5	100	Functionality meets most needs

Table 4 Summary of inputs.

Directions for improvement	User recommendation	Projected implementation	Prioritization
User	Simplified operational processes	Next version	Your (honorific)
Responsiveness	Improve loading speed in specific environments	Toward	Center

functionality, although the user ratings were 4.0/5, this still indicates that although the system's functions can meet most of the users' needs, there is still room for optimization.

Based on the above test results and user feedback, we summarized the improvement suggestions as shown in Table 4, in which "user interface" is listed as a high priority for improvement, and we intend to simplify the operation process in the next version to improve user experience. Meanwhile, the team is working on the issue of "response speed", aiming to improve the loading speed of the system in specific environments, so that the AICIAM prototype system can meet the requirements of English language teaching in the context of globalization and, at the same time, provide users with a more seamless and efficient learning experience.

After exhaustive functional and user experience tests, we obtained a large amount of empirical data and feedback information. The test results show that the AICIAM prototype system exhibits good accuracy and effectiveness in recognizing learner characteristics and teaching resource matching, and is able to provide highly personalized teaching content recommendations based on learners' cognitive levels, learning styles, and points of interest. However, in terms of user experience, although most of the participants appreciated the intelligence of the system, they also suggested some areas for improvement. For instance, some of the functional operations could be simplified, and the response speed of the system in specific environments needs to be improved. Based on these feedbacks, we promptly adjusted and optimized the system design and intend to address these issues in subsequent releases. Overall, the realization of the AICIAM prototype system and its preliminary tests have confirmed the feasibility of our design concept and technical route, providing a solid foundation for the future implementation of our intelligent assistive system in English teaching. However, the continuous optimization and improvement of the system is essential, and we will continue to pay attention to user feedback in order to continuously adapt to and meet the emerging needs of the English teaching domain in the context of globalization.

5.3 Comparison of student learning effectiveness and satisfaction assessment

In order to scientifically verify the practical utility of AICIAM Teaching Intelligent Aid System in enhancing students' English learning outcomes, we selected 100 English majors from a university as our sample for experimental research. The experimental design was a pre-test-post-test control group experiment, in which the students were randomly divided into two groups: the experimental group (using the AICIAM system to assist learning) and the control group (adopting the traditional teaching mode), and quantitative assessment of the students' learning progress was carried out for the three core skill areas of speaking, writing and listening.

Table 5 enables us to visually compare and analyze the changes in the performance of the experimental group and the control group after a period of study to reveal the specific impact of the AICIAM system on the improvement of students' English proficiency. At the same time, in order to have a comprehensive understanding of the performance of the system in practical application, we also conducted a survey of students, teachers and administrators to evaluate their level of satisfaction and the system's ease of use.

Table 5 Before and after comparison of students' learning outcomes.

Skill areas	Mean score on pre-test for experimental group	Experimental group post-test mean scores	Mean pre-test scores for control group	Mean post-test scores for control group	Comparative progress
Speaking	70	85	71	73	Significant progress
Writing	65	80	66	68	Significant progress
Listening	68	83	69	70	Significant progress

Table 6 Evaluation of System Satisfaction and Ease of Application.

Assessment dimensions	**Average satisfaction score**	**Number of feedbacks**	**Synthesized assessment**
System Ease of Use	4.3/5	100	High degree of satisfaction
Learning Efficiency Improvement	4.5/5	100	High degree of satisfaction
System Stability	4.2/5	100	High degree of satisfaction

The data presented in Table 6 enables a comprehensive evaluation of the AICIAM Teaching Intelligent Aid System used by different groups, and its ability to effectively improve the quality of teaching and learning, enhance the students' learning experience, and the degree of convenience it provides to daily management and operation.

Combined with the above experimental results and satisfaction surveys, this study examined the impact of the AICIAM Teaching Intelligent Aid System on students' English learning outcomes, and its practicality and acceptance in educational practice, providing strong data support for further optimization and improvement of the system.

6. CONCLUSION

This study was conducted in the context of globalization to address the problems faced by traditional English language teaching, such as teacher shortage and unbalanced distribution of resources. Through the review and in-depth analysis of existing literature, we clarified the potential and value of the application of AI technology in addressing the challenges of English language teaching. In the course of our research, first, we refined the key design elements by conducting systematic demand analysis, and on this basis, we constructed AICIAM, an intelligent auxiliary system for English teaching based on artificial intelligence, which skillfully uses natural language processing technology and machine learning algorithms to realize intelligent adaptation of teaching content and personalized recommendation, so as to meet the learning needs of different levels and types of learners. The development and functional testing of the prototype system show that AICIAM has significant advantages in terms of improving the efficiency of English teaching and students' learning outcomes, dynamically adjusting teaching strategies and optimizing learning paths, as well as providing teachers with in-depth analysis of learning data to enhance their understanding of and responsiveness to students' needs. However, during the user experience testing phase, although most users recognized the high intelligence of AICIAM, they also found some room for improvement regarding the complexity of the operation process of some functions and the response speed in specific environments. Accordingly, we promptly adjusted and optimized the system and plan to further improve these issues in future versions. Overall, the AICIAM Teaching Intelligent Aid System designed and preliminarily validated in this research not only proves the feasibility of applying artificial intelligence technology in the field of English teaching, but also makes substantial breakthroughs in personalized recommendation of teaching content and optimization of learning paths. This research result is of great practical significance and innovative value for improving the current situation of English teaching, enhancing the quality of teaching, and meeting the growing demand for personalized learning in the era of globalization.

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