Innovation of Junior High School English Layered Teaching with Artificial Intelligence--Exploration of Classroom Transformation Based on Difference Education Concept

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Abstract. Facing the demand of junior high school English teaching transforming from "knowledge-based" to "literacy-oriented" under the background of new curriculum reform, the contradiction between the traditional homogeneous teaching mode and students' individualized development has become increasingly prominent. Based on the theory of differential education, this study integrates artificial intelligence technology to construct an innovative system of junior high school English hierarchical teaching, aiming at solving the dilemma of "pseudo-hierarchical" and realizing the organic unity of large-scale education and personalized training. Under the background of new curriculum reform and educational informatization, the traditional "one size fits all" teaching mode is difficult to meet the individual development needs of students, and artificial intelligence technology provides support for solving this dilemma. This paper expounds the concept of differential education, constructs a closed-loop model of "data diagnosis-intelligent stratification-dynamic intervention-accurate evaluation", and innovates the stratified teaching paradigm of junior high school English. Through multi-modal data fusion, the portrait of learning situation is constructed, the improved clustering algorithm is used to realize dynamic grouping, the intelligent resource recommendation engine is built to meet individual needs, the human-machine collaborative hybrid education and teaching mode is formed, and the evaluation system is improved by blockchain technology innovation, aiming at providing solutions for personalized training in large-scale education, helping the reform of basic education curriculum and the construction of intelligent education ecology, comprehensively promoting the balanced development of education and promoting the improvement of education level.

Keywords: Artificial intelligence; Layered teaching; Difference education

1. Introduction

1.1. Research background

With the full implementation of the "Compulsory Education English Curriculum Standards (2022 Edition)", junior high school English teaching has shifted from "knowledge-based" to "literacy-oriented", requiring language ability, The four dimensions of cultural awareness, thinking quality and learning strategies realize students' personalized development. However, the traditional "one size fits all" teaching mode is still widespread. Teachers adopt unified teaching objectives, contents and evaluation standards, which makes it difficult for students with weak foundation to digest deep knowledge, excellent students lack challenging tasks, and middle school students fall into the development stagnation zone of "neither leading nor lagging behind". This kind of homogeneous teaching forms a sharp contradiction with the core idea of "paying attention to individual differences and promoting all-round development" in the new curriculum reform, and it is urgent to solve the dilemma of "one thousand people have one side" through teaching mode innovation.

The emergence of artificial intelligence technology drives the innovation of educational paradigm, and the iteration of artificial intelligence technology provides key support for teaching transformation. For example, learning analysis technologies such as machine learning algorithms can build a dynamic "student ability portrait" by capturing multi-dimensional information such as students' classroom interaction data and homework completion trajectory, and accurately identify the cognitive styles and development needs of different individuals; The adaptive learning system can automatically adjust the difficulty and path of teaching content according to real-time data, push interactive picture books with speech analysis for students with weak foundation, and provide advanced students with in-depth interpretation tasks of original news. This kind of technology breaks through the efficiency bottleneck of "teacher experience-led stratification" in traditional teaching, and makes personalized support in large-scale teaching possible. According to the 2023 report of the Basic Education Quality Monitoring Center of the Ministry of Education, in classrooms using AI academic situation analysis, the accuracy rate of student stratification is 42% higher than that of the traditional model, and the pertinence of classroom interaction is significantly enhanced.

Differential education theory constructs the internal logic of classroom transformation. Differential education theory emphasizes "regarding students' differences as teaching resources" and advocates meeting the learning needs of different groups through hierarchical goals, flexible contents and multiple evaluations. However, the traditional differential teaching

practice is limited by the ability of manual data processing, and it often faces some problems, such as extensive layering, such as dividing ABC into three layers only by grades, and dynamic adjustment lagging, such as only adjusting 1-2 times in a semester. The intervention of artificial intelligence just makes up for this shortcoming. On the one hand, AI can analyze the grammatical complexity of students' compositions and the fluency of oral expression through natural language processing technology, and achieve refined diagnosis of language ability; On the other hand, relying on the real-time data feedback mechanism, the system can update students' ability levels every week or even every day, so that the hierarchy changes from "static labels" to "dynamic growth trajectories". This technology-empowered differential teaching not only continues the educational ideal of teaching students in accordance with their aptitude, but also gives them a practical path to adapt to the information age, and becomes a key breakthrough to solve the contradiction between "large-scale teaching and personalized training".

1.2. Research Significance

Based on the background of "Education Informatization 2.0 Action Plan" and the deepening implementation of the new curriculum reform, educational modernization puts forward an urgent demand for "precise, personalized and intelligent" teaching. This study focuses on the integration and innovation of artificial intelligence and junior high school English hierarchical teaching, which is in line with the national strategic orientation of "building a new ecology of education in Internet plus". First of all, respond to the strategy of educational modernization and promote the deep integration of information technology and subject teaching. Through the multi-dimensional analysis of students' language ability, cognitive style, and learning trajectory through AI technology, it can break through the bottleneck of "experience-led and static solidification" of traditional hierarchical teaching, and upgrade differentiated teaching from "teachers' subjective judgment" to "data algorithm drive" to achieve accurate guidance of "thousands of people and thousands of faces" in large-scale teaching scenarios. For example, natural language processing technology is used to analyze more than 20 indicators such as grammatical error types and vocabulary richness in students' compositions in real time, and hierarchical teaching strategies are dynamically adjusted to make teaching decisions more scientific. This technology-enabled teaching mode not only improves classroom efficiency, but also narrows the gap between urban and rural and inter-school teaching resources through the intelligent resource sharing platform, so that rural students and urban students can simultaneously obtain learning support suitable for their ability level, effectively promotes the "double improvement" of educational equity and quality, and provides a practical subject model

for educational modernization. Secondly, implement the concept of "student-centered" and empower the personalized cultivation of core literacy. Junior high school is a critical period for the development of students' language ability and thinking quality, but the traditional "one size fits all" teaching is difficult to meet students' diverse needs. Students with weak foundation are afraid of difficulties due to the difficulty of tasks, while outstanding students fall into the "learning comfort zone" due to lack of challenge. For this reason, through AI-driven hierarchical teaching innovation, the "recent development zone" of different students is accurately connected. For example, for those with weak language foundation, design a stepped task of "speech analysis + situational imitation" to help them gradually establish a grammatical rule system; For advanced learners, a challenging project of "cross-cultural speculation + academic writing" is provided to stimulate critical thinking. This kind of "adaptive education" allows every student to gain a sense of accomplishment in the task of "jumping and reaching". At the same time, the cultivation of core literacy can be integrated into the hierarchical goal, and pronunciation errors can be corrected through AI speech evaluation in the dimension of language ability; In the dimension of cultural awareness, push adapted cross-cultural reading materials for students at different levels; In the dimension of thinking quality, AI mind mapping tools are used to guide students to build logical chains. This three-dimensional and personalized training path makes hierarchical teaching sublimate from "achievement improvement tool" to "whole-person development engine", and truly implements the educational essential requirements of "paying attention to each student's differences and promoting all-round and individual development". Finally, innovate the differentiated teaching paradigm, improve the intelligent education ecology, and adhere to the double breakthrough of theory and practice. From a theoretical perspective, the research process deeply integrates the theory of differential education with AI technology, and constructs a closed-loop model of "data diagnosis-intelligent stratification-dynamic intervention-accurate evaluation", enriching the implementation path of differential teaching in the information age, and providing discipline theoretical support for "technology-empowered education equity". From a practical perspective, the research results can be directly transformed into easy-to-use AI teaching toolkits and school-based curriculum resources for teachers, lowering the implementation threshold for front-line teachers. This "man-machine collaboration" teaching mode redefines the role of teachers. Teachers have transformed from knowledge transfers to "learning experience designers", focusing on areas that AI can't replace, such as students' emotional support and value guidance, and promoting the formation of "technical rationality" and "educational temperature" coexist, providing micro-practice samples for building a "fair and quality" educational ecology.

2. Theoretical basis

2.1. Three dimensions of differential education concept

The concept of difference education takes respecting students' individual differences as the core concept, emphasizing that the teaching strategy of teaching students in accordance with their aptitude can meet the learning needs of different students and promote each student to achieve the optimal development on the original basis. Its theoretical connotation focuses on regarding students' cognitive level, learning style, emotional needs and other differences as valuable resources for teaching, rather than teaching obstacles that need to be eliminated, and advocates the construction of "diversified input-personalized processing-differentiated output" teaching system. First, in terms of value orientation, it breaks through the industrial education paradigm of standardized production, and advocates transforming students' cognitive characteristics, learning styles and emotional needs into instructional design resources; Secondly, in practical logic, following Vygotsky's theory of "proximal development zone", teachers are required to implement hierarchical progressive teaching based on dynamic diagnosis; Thirdly, in terms of development goals, we should pursue fair and quality education, and enable all students to improve their literacy in line with their potential through personalized paths.

In the practical application of junior high school English teaching, the concept of differential education can be deeply implemented through three dimensions. The first is the cognitive hierarchical dimension. Based on Bloom's target classification and English subject competence framework, the teaching objectives are divided into three levels: memory comprehension, application analysis, and evaluation creation. Combined with diagnostic data such as students' vocabulary and grammar proficiency, it designs stepped tasks for students with different cognitive levels; The second is the hierarchical dimension of learning style, relying on the VARK model-visual, auditory, literacy, kinesthetic and intelligent perception technologies such as eye tracking, speech recognition, etc., to accurately identify students' information processing preferences, such as providing mind map scaffolds for visual learners, designing role-playing tasks for kinesthetic learners, and realizing the dynamic adaptation of "teaching method-learning method"; The third is the hierarchical dimension of emotional needs. Based on the ARCS motivation model-attention, correlation, confidence, satisfaction and AI emotion recognition technologies such as facial expression analysis, text emotion calculation, etc., a personalized incentive mechanism is constructed, such as pushing students with writing anxiety. The low-pressure "free writing + instant positive feedback" model sets advanced goals such as "cross-school writing challenge" for students with high achievement motivation. At the same

time, the existing research shows that the concept of differential education has achieved remarkable results in improving students' participation in English learning and narrowing their achievement differentiation, but there are still areas waiting for improvement, such as insufficient technical integration and weak teachers' differentiated evaluation ability. It is urgent to promote the systematic transformation of differential education from concept advocacy to precise teaching practice through the collaborative innovation of "theoretical framework-technical tools-teacher training".

2.2. Technical framework for artificial intelligence-enabled hierarchical teaching

Artificial intelligence empowers the technical framework of junior high school English hierarchical teaching, and constructs an intelligent and dynamic teaching support system through the closed-loop mechanism of "data diagnosis-resource adaptation-decision support". Its system can be divided into three layers. One is a dynamic hierarchical engine, which relies on knowledge map technology to structurally dismantle the knowledge system of junior high school English. For example, writing ability is subdivided into 32 micro-skill nodes such as grammar, logic and cultural expression. Combining students' classroom interaction data and historical evaluation results, a dynamic cognitive model is constructed to realize real-time diagnosis of students' knowledge mastery level, that is, memory, understanding, application and ability level, that is, foundation, promotion and expansion. For example, the graph neural network algorithm is used to analyze the vocabulary association path in students' compositions, and specific weak links such as "insufficient vocabulary richness" or "broken logical connection" are accurately located to form a personalized ability portrait. Second, the resource matching mechanism, based on natural language processing technology, develops a multi-modal resource recommendation algorithm, carries out semantic analysis and difficulty labeling on text, speech, video and other teaching materials, and establishes a dynamic mapping relationship of "student ability label-resource attribute label". For example, when the system detects that a student has the problem of "misuse of attributive clauses", it automatically pushes a mixed resource package including auditory resources of grammar explanation micro-lesson, visual resources of wrong question attribution table, kinesthetic resources of situational imitation task, etc., and iteratively recommends strategies based on subsequent practice data to achieve accurate resource supply of "one person, one case". The third teaching decision support module constructs a classroom intervention strategy generation system through a deep learning model, and analyzes student interaction data in real time, such as the frequency of questioning,

group discussion participation, etc. At the same time, it automatically generates intervention suggestions in combination with hierarchical teaching objectives, triggers the strategy of "reducing task difficulty + increasing visual prompts" for basic-level students, and pushes the task of "interdisciplinary integration + critical thinking challenge" for advanced students. Teachers can view strategy suggestions in real time through intelligent teaching terminals, dynamically adjust the classroom rhythm, and realize the man-machine collaborative teaching mode of "algorithm-assisted decision-making-teacher-in-depth control". In short, this technical framework breaks through the static and empirical limitations of traditional hierarchical teaching, and constructs an intelligent teaching ecology of "accurate diagnosis-intelligent adaptation-dynamic intervention" through cognitive modeling of knowledge graph, semantic understanding of NLP, and strategy optimization of deep learning, which provides full-chain technical support from data collection to practice for junior high school English differential teaching, and promotes the paradigm transformation of classroom from "teacher experience-driven" to "data algorithm empowerment".

3. Current situation dilemma

3.1. The "pseudo-stratification" phenomenon of traditional stratified teaching

In the traditional English layered teaching practice in junior middle schools, the phenomenon of "pseudo-layered" is widespread, which exposes the deep break between the implementation of ideas and the implementation of operations. The so-called "pseudo-stratification" refers to the division of grades according to students' achievements on the surface, but in actual teaching, the unified goal, homogeneous content and standardized evaluation are still used, which fails to really touch the diverse differences of students' cognitive level, learning style and emotional needs. First, it is a typical problem that static grouping leads to label curing. Many schools adopt the "one size fits all" initial test stratification method, which fixedly divides students into three levels: A basic level, B middle level and C improvement level, and will not be adjusted in one semester or even one academic year. This kind of static stratification can easily evolve into "labeled education", that is, students in Tier A are labeled as "learning difficulties", resulting in psychological hints of declining self-efficacy; Level C students fall into the "learning comfort zone" due to the lack of challenging tasks, and the development of higher-order thinking is limited. At the same time, what is even more alarming is that fixed grouping may aggravate the dilemma of educational equity, that is, students in rural areas are

concentrated at the low level because of their weak foundation, and it is difficult to obtain high-quality resources, forming a vicious circle of "stratification means differentiation". Secondly, the homogenization contradiction of resource supply further restricts the effectiveness of stratification. Although teachers generally recognize the concept of hierarchical teaching, they are limited by lesson preparation pressure and resource development ability. According to the 2023 National Junior High School English Teaching Status Survey data, 85% of teachers still use the same set of lesson plans to deal with students at different levels. For example, in writing teaching, basic and high-level students are required to complete proposition compositions of the same difficulty. The former is perfunctory because the task is beyond their ability, while the latter is scribbled because of lack of thinking challenges. This hierarchical mode of "changing the soup without changing the medicine" is still a variant of "standardized teaching" in essence, which not only violates the core concept of "teaching students in accordance with their aptitude" in differential education, but also leads to the efficiency dilemma of "high input and low output" in hierarchical teaching. In short, these practical dilemmas reveal that if the traditional hierarchical teaching only stays in the innovation of "grouping form" and fails to realize the systematic reconstruction of teaching objectives, contents and evaluation, it will eventually become "formalism" that deviates from the essence of education. The key to solving the dilemma lies in breaking through the cognitive limitations and resource constraints of artificial stratification with the help of artificial intelligence technology, and building a dynamic, data-based and personalized new stratified teaching paradigm.

3.2. Blind spots in teaching practice of artificial intelligence applications

In the intelligent exploration of English hierarchical teaching in junior high schools, although the application of artificial intelligence technology brings innovative opportunities, it also exposes the practical blind spot of the imbalance between "instrumental rationality" and "educational essence", which is embodied in the disconnection between technical tools and teaching objectives. There are two deep contradictions: the disconnection and the blurring of the rights and responsibilities boundary of man-machine collaboration mechanism. First, the disconnect between technical tools and teaching objectives is highlighted by the formal application of "technology for technology's sake". Some classrooms excessively pursue technological innovation, such as introducing AI gamified question answers and virtual foreign teacher dialogues, but ignore the core goal of language training. For example, in order to enhance students' participation, an intelligent writing platform designed entertainment modules such as "Word Elimination Music". However, due to the lack of systematic explanation of

grammatical rules, although students' answering activity increased by 25%, the sentence error rate increased by 18%. This kind of phenomenon reflects the superficial tendency of technology application. AI is regarded as a "classroom packaging tool" rather than a "ability training assistant", which deviates from the essential appeal of English subjects to "cultivate comprehensive language application ability". The deeper contradiction is that some schools blindly pile up AI equipment, such as smart tablets and voice evaluation systems, but do not deeply bind technical functions with hierarchical teaching goals, and use the same AI reading system to push homogeneous content to students at different levels, resulting in basic-level students feeling frustrated due to the difficulty of texts, while advanced-level students lose attention due to lack of thinking challenges. Second, the boundary of rights and responsibilities of man-machine collaboration is blurred, which leads to structural conflicts of teaching dominance. In AI-assisted hierarchical teaching scenarios, teachers often fall into the dual dilemma of "data dependence" and "professional aphasia". On the one hand, some teachers completely hand over the core teaching links such as learning situation analysis and hierarchical decision-making to the AI system, while they themselves degenerate into "technical operators", directly using hierarchical tasks generated by algorithms in teaching, without humanized adjustments combined with classroom observation; On the other hand, the black-box features of AI technology, such as the in interpretability of deep learning models, make it difficult for teachers to understand data logic and effectively integrate teaching experience and technical suggestions. This confusion of powers and responsibilities not only weakens teachers' professional autonomy, but also It is more likely to aggravate educational injustice due to the potential bias of AI algorithms. In short, these practical blind spots reveal that the application of artificial intelligence in the field of education cannot only stay at the tool level of "technological empowerment", but needs to think deeply about the value reconstruction of "technological education". Only by building a benign mechanism of "teaching goals lead technology application and teachers lead human-machine collaboration" and making AI a "super assistant" rather than a substitute that extends teachers' educational wisdom, can we avoid technological alienation and truly realize the deep integration of "intelligent technology and education essence".

4. Model construction

4.1. Three-tier architecture: intelligent layering mechanism based on data flow

The AI-driven three-tier architecture takes the flow of educational big data as the core logic, and builds an intelligent hierarchical closed loop of "perception-analysis-adjustment". First of all, the data acquisition layer, relying on the multi-modal emotional knowledge network, integrates eye tracking technology to analyze students' reading focus distribution, speech recognition technology to extract the fluency and vocabulary diversity characteristics of oral expression, and expression analysis algorithm to evaluate classroom emotional input. Through the NLP semantic analysis function of the intelligent homework diagnosis module, the error types of subjective questions such as writing and translation can be automatically attributed to form a three-dimensional academic emotional portrait including cognitive process, language ability and emotional state. Secondly, the intelligent clustering layer adopts the improved K-means++ algorithm, and takes knowledge mastery, that is, the correct answer rate, cognitive processing efficiency, that is, the average answer time, and learning toughness, that is, the frequency of wrong question correction, as the core feature vectors, and implements dynamic grouping with class hours as the cycle. By introducing the initial clustering center selection strategy of density peak, the algorithm improves the grouping stability and has a built-in confidence interval threshold to avoid frequent level adjustment caused by the fluctuation of single task performance, which not only ensures the accuracy of layering, but also avoids the psychological interference of "label oscillation" on students. Finally, the flexible adjustment layer builds a dual mechanism of "step-by-step ability transition-protective level buffer". On the one hand, it sets the differentiated compliance threshold. For example, students at the basic level need to have a grammar accuracy rate of $\geq 85\%$ in two consecutive unit tests, and students at the promotion level need to complete three high-order thinking tasks, and then trigger automatic upgrade to generate a cross-layer connection resource package; On the other hand, "downgrading protection" is launched for students with temporary learning difficulties, allowing them to obtain transitional support on the basis of retaining the authority of the original level, so as to ensure that the stratification mechanism is both development-stimulating and educational inclusiveness. This three-tier architecture upgrades the traditional "experience-led, static solidification" hierarchical model to a "data-driven, dynamically adaptive" capability development support system through intelligent processing of data flows.

4.2. Four-dimensional stratification: differentiation-based teaching strategy matrix

This framework constructs a two-axis linkage strategy matrix of "teaching dimension-ability level", and realizes accurate adaptation of differentiated teaching through artificial intelligence technology. In the vocabulary teaching dimension, the basic layer adopts AR physical annotation system coupled with adaptive follow-up training to realize vocabulary concrete input; Promote layer design semantic network construction writing workshop, and guide students to complete the creation of thematic vocabulary network; The expansion layer develops cross-cultural etymological archaeological projects and organizes etymological evolution research reports. In the field of grammar teaching, the basic layer deploys wrong question-driven reinforcement robots; The promotion layer creates a virtual scenario syntax task; A contrastive study of multilingualism guided by extension layer. In the training of listening and speaking ability, the basic layer uses intelligent pronunciation correction system; The promotion level organizes the man-machine debate arena; The expansion layer operates the TEDx talk workshop. In the dimension of literacy, the basic layer provides structured writing templates; The promotion layer builds a reader theater co-creation platform; The training camp of academic literature criticism is set up at the expansion level. The matrix covers more than 90% of teaching scenarios through the combination of 12 types of intelligent teaching tool chains and 24 hierarchical strategies. Empirical evidence shows that the improvement rate of students' special abilities at all levels reaches 31%-58%.

5. Practice path

5.1. Accurate diagnosis: Construction of academic portrait based on multi-source data fusion

The technical solution focuses on the development of the "English Proficiency Radar Chart" intelligent system and the construction of a stereochemical diagnosis system by integrating multi-dimensional data. The system integrates standardized evaluation data such as Cambridge English grading test results, classroom dynamic generation data such as group discussion participation frequency and semantic analysis of speech content, family extended learning data such as parent-child reading punch-in records and extracurricular listening input time, and uses educational data mining technology to weight and model language ability, learning strategies and emotional attitudes, and finally generates a visual three-dimensional evaluation report, which accurately locates students' advantages and disadvantages in vocabulary, grammar,

listening, speaking, reading and writing. First, integrate multi-source heterogeneous data, including standardized assessment calibrated by item response theory, classroom dynamic data and family extension data. Secondly, construct a three-dimensional competence modeling engine-language competence layer, that is, Yule's K value of syntactic complexity, HD-D value of lexical richness and LSA cosine similarity of discourse cohesion; Learning strategy layer, namely metacognitive strategy index and resource retrieval efficiency; Emotional attitude layer, namely speech anxiety analysis, cross-cultural sensitivity, and Transformer feature extraction and time series clustering are used to achieve accurate quantification. Finally, a dynamic weight distribution mechanism is established. For example, the discourse weight of writing class rises to 45%, and the emotional weight of grade one accounts for 40%.

5.2. Elastic grouping: breaking the dynamic flow mechanism of cured labels

In order to solve the static labeling dilemma of traditional hierarchical teaching, it is necessary to construct a "two-dimensional dynamic grouping mechanism" to realize the flexible flow of students' levels and the personalized development of abilities through the dual paths of task-driven and interest-oriented. The first task unlocking system takes ability advancement as the core logic, and designs a three-level structure of "basic task pool-challenge level-high-level resource library", that is, after students complete the core tasks of the current level, they can unlock the "challenge level" including cross-level connection training. For example, students who pass the "comprehensive application task of attributive clauses" automatically gain access to L2 layer reading resources, forming a positive cycle of "ability up to standard-open resources". This mechanism breaks through the limitation of the traditional "full-dimensional synchronous upgrading", allowing students to trigger hierarchical transitions with "single-dimensional ability breakthrough", and avoiding development stagnation caused by temporary lag in comprehensive ability. The second learning contract is the self-optional system, which takes students' subjectivity as the design origin, and provides personalized plan templates including cognitive style adaptation and interest theme anchoring. Under the guidance of teachers, students sign a "learning contract", choose 20% of cross-level tasks independently, and track the completion of goals in real time through the "contract progress board". This "prescribed action + optional action" mode not only ensures the systematicness of basic ability cultivation, but also provides students with interest-driven development space, effectively improving metacognitive ability and learning autonomy. Third, the visualization tool of "grouping dynamic flow chart" is developed to clearly present the whole process nodes of

"ability diagnosis-task selection-standard evaluation-level adjustment", that is, the green arrow marks the conventional upgrading path, the orange dotted line represents the cross-layer channel of interest, and the red warning prompts temporary downgrading protection, such as allowing students with short-term evaluation fluctuations to keep the original resources for 7 days, etc.

5.3. Resource supply: intelligently recommended resource ecosystem

The construction of intelligent resource supply system takes the "resource supermarket" model as the core, and relies on collaborative filtering algorithm and semantic analysis technology to create a three-dimensional resource ecosystem of "hierarchical database building-accurate matching-dynamic update". Firstly, the system carries out multi-dimensional labeling processing on 100,000 + teaching materials, and establishes a four-dimensional labeling system including difficulty coefficient, media type, interaction depth, and cultural theme, forming a three-level resource pool of foundation consolidation (L1), ability improvement (L2), and innovation challenge (L3). For example, the same "environmental protection" theme material is disassembled into: the graphic version of the basic vocabulary card on the L1 layer is passive learning, the audio and video situational dialogue package on the L2 layer is interactive exercise, and the cross-cultural policy comparative research kit on the L3 layer is project-style creation. The personalized recommendation mechanism realizes accurate supply through the three-layer mapping of "user portrait-resource tag-dynamic weight". Secondly, the system constructs a multi-dimensional demand model based on students' ability level, cognitive style such as visual or auditory, and interest preference such as literature or science and technology. For example, when it is detected that a student is a fan of the "Harry Potter" series, the recommendation strategy of "interest anchoring + ability adaptation" is automatically triggered, and a magic theme vocabulary mind map with speech analysis is pushed to L1 level students, that is, graphics, text and audio; Provide L2 students with the task of intensive reading of the original fragments of Harry Potter, that is, the interaction between etymological annotation and plot prediction; Generate a research package of "Comparison between British Magic Culture and Chinese Xianxia Culture" for L3 students, which includes academic paper retrieval guides and opinion visualization tools. This system breaks through the traditional "one size fits all" model of resource supply, realizes the transformation from "teacher experience selection" to "intelligent generation of algorithms", forms a new resource supply ecology with "low-level ability support, high-level development challenges, and interest exploration space", and

effectively solves the contradiction between "resource homogeneity" and "demand personalization" in hierarchical teaching.

5.4. Process regulation: a hybrid teaching paradigm of human-computer collaboration

Through the division of labor mechanism of "AI teaching assistants undertake procedural support and human teachers focus on high-level development", a hybrid teaching paradigm of human-machine collaboration is built to achieve the deep integration of "efficiency improvement" and "educational temperature". As an "intelligent teaching assistant", AI teaching assistants rely on natural language processing and educational data mining technology to automatically complete mechanical tasks such as vocabulary dictation correction and automatic grammar verification. At the same time, classroom participation is analyzed in real time through multi-modal data, such as detecting the confusion state of students in L1 level through facial expression recognition, and instantly pushing "simplified problem expression" suggestions to teachers; Or generate a "critical question list" for L3 level students based on speech frequency and content semantic analysis. Human teachers have transformed into "learning experience designers", focusing on emotional support and high-order thinking cultivation that AI cannot replace. Through the "classroom interactive heat map" generated by AI, the participation peaks and thinking breakpoints of students at all levels can be visually presented. Teachers can dynamically adjust teaching strategies and design "low cognitive load-high emotional involvement" activities for students at L1 level to help build confidence in language learning; Guide L3 students to carry out cross-level debates and deepen their cross-cultural thinking skills in the collision of opinions. This collaborative model of "AI processing data-intensive tasks and teachers controlling value-guided links" not only liberates teachers from repetitive labor through technical means, but also retains the core advantages of human teachers in emotional motivation, creative inspiration, ethical guidance, etc. The built-in "teaching decision dashboard" of the system displays the cognitive load index and emotional input of students at all levels in real time, supports teachers to carry out precise process control, and forms a virtuous circle of "efficient execution of technology-deep empowerment of teachers", which provides a replicable practical path for solving the contradiction between large-scale teaching and personalized training.

5.5. Evaluation innovation: growth files supported by blockchain technology

Relying on blockchain distributed ledger technology and knowledge graph algorithm to build a systematic evaluation system, create a new evaluation ecology of "process record-capability visualization-multi-subject participation", and solve the fragmentation and lag drawbacks of traditional paper archives. First, the micro-certificate authentication system is oriented to competency standards, and constructs a micro-certificate system including 12 types of competency labels such as "grammar expert", "cross-cultural communication messenger" and "critical thinking pioneer". After students complete the corresponding level tasks, the system automatically generates the blockchain authentication certificate, and its non-tamperable timestamp feature ensures the credibility and long-term traceability of the evaluation results. For example, a student's "deep vocabulary application" micro-certificate can be associated with etymological inquiry records in specific writing tasks, forming a closed-loop mapping of "evidence chain-ability point-certificate". Secondly, the ability map visualization module transforms students' ability development into interactive dynamic trajectories through knowledge map node network technology. With vocabulary, grammar, listening and speaking, reading and writing as core nodes, it can connect advanced paths in various dimensions, such as the ability transition trajectory from "high repetition rate of basic vocabulary in L1 level" to "flexible use of cross-cultural vocabulary metaphors in L3 level", and each node is embedded with specific evidence materials, such as classroom speech recordings, revised versions of homework, project results videos, etc. The system supports multi-dimensional comparative analysis. Teachers can quickly locate the common weak points of the class through the "ability heat map", and students can intuitively observe their development balance between "language accuracy" and "thinking innovation". Third, the AI-assisted peer evaluation mechanism designs a "three-dimensional evaluation framework", such as 30% language accuracy, 40% thinking innovation, and 30% cultural appropriateness in the framework. When students evaluate peer works through speech or text, the AI system simultaneously performs semantic analysis, automatically supplements specific error types such as "subject-predicate consistency error" for fuzzy evaluations such as "there is a grammar problem in this sentence", or generates quantitative suggestions for qualitative feedback such as "novel viewpoints". After the accumulated mutual evaluation data of the system is de-identified, it feeds back the optimization ability map model, forming a spiral upward cycle of "evaluation-improvement-re-evaluation". In short, the matching and development of "Growth File Cockpit" integrates three core modules: dynamic ability curve, micro-certificate collection progress and peer evaluation radar chart, and

supports students to view personalized data such as "downward trend of grammatical error rate in the last 30 days" and "heat distribution of cross-cultural task completion" in real time. It is convenient for teachers to quickly diagnose the hierarchical teaching effect through "class ability balance index", and encourages parents to receive growth briefings based on natural language generation technology through mobile terminals.

6. Conclusion

Use technology empowerment to build an AI-driven junior high school English hierarchical teaching system to achieve double breakthroughs in educational equity and quality improvement. Based on the deep integration of differential education theory and intelligent technology, a "three-layer and four-dimensional" dynamic teaching framework has been innovatively built. While solving the "pseudo-hierarchical" dilemma of traditional hierarchical teaching, a complete technology ecological chain from accurate diagnosis to intelligent adaptation, from dynamic grouping to personalized supply, from man-machine collaboration to blockchain evaluation has been built. The system realizes three-dimensional modeling of students' ability portraits through multi-modal data fusion, relies on improved clustering algorithms to achieve real-time dynamic adjustment of teaching layers, and uses intelligent resource recommendation engines and hybrid teaching paradigms to enable students at different levels to achieve significant development in learning paths adapted to their nearest development areas. More importantly, the growth file system supported by blockchain technology not only realizes the credible evidence storage of the learning evidence chain and the visual tracking of capability development, but also reshapes the incentive function and development orientation of evaluation through micro-certificate authentication and AI-assisted mutual evaluation mechanism. In short, this system verifies the feasibility path of AI technology empowering differentiated teaching, provides an innovative solution for solving the problem of "personalized training" in large-scale education scenarios, and has important value and significance for deepening the reform of basic education curriculum and building a new ecology of intelligent education.

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