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Research on the Construction of Interdisciplinary Foreign Language Curriculum System and Talent Training Mode under AI Empowerment

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SUMMARY: *In recent years, artificial intelligence technology has continued to enter the field of foreign language education, and gradually promoted the reconstruction of curriculum design, resource management and talent training methods. Aiming at the problems of scattered discipline boundaries, low resource utilization efficiency, and insufficient connection of ability training chain in traditional foreign language courses, this paper constructs an AI-enabled interdisciplinary foreign language curriculum system and talent training model. The research was carried out from three levels of course knowledge representation, intelligent scheme design and comprehensive resource management platform, and knowledge graph, learning portrait, task generation and resource recommendation were integrated into the unified computing framework. The experimental results show that the mean value of the overall evaluation of the constructed curriculum system reaches 4.66, the coverage rate of the curriculum target increases to 92.8%, and the accuracy rate of resource matching reaches 93.4%. The comprehensive score of the experimental group was improved to 85.12, which was significantly better than 76.94 of the control group. The research shows that this model can enhance the systematization of curriculum organization and the dynamic adaptation ability of training process, and provide an operational realization path for the digital transformation of foreign language education in colleges and universities.*

KEYWORDS: *Artificial intelligence; Interdisciplinary foreign language course; Knowledge graph; Talent training mode*

1 Introduction

For a long time, although foreign language teaching in colleges and universities continues to absorb multimedia platforms, online courses and digital resources, the course organization, ability training path and evaluation basis are still mainly based on teacher experience and subject segmentation, and there is no stable connection between language knowledge, professional knowledge and technical ability. With the continuous development of generative artificial intelligence, natural language processing and educational data analysis technology, artificial intelligence has begun to deeply enter the scene of foreign language teaching, and shows strong adaptability in language training, teaching support and learning feedback [1]. Related studies have shown that the application scope of artificial intelligence in the field of second language teaching and applied linguistics is continuously expanding, and its influence has gradually extended from the use of a single tool to curriculum reform and teaching mode update [2]. In terms of oral training, the practice environment based on dialogue system and chatbot can provide learners with higher frequency of expression opportunities, and alleviate

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the problem of insufficient oral interaction in traditional classroom to some extent [3]. In terms of emotional support and learning engagement, the use of AI tools was also believed to help improve learners' sense of participation, self-efficacy and willingness to continue learning.

In college foreign language teaching, the entry of generative artificial intelligence has especially changed the original teaching support structure. It has been pointed out that ChatGPT and other tools can participate in text generation, language polishing, task demonstration and classroom assistance in college foreign language teaching, so as to improve the efficiency of teachers' lesson preparation and students' practice [4]. The case study also showed that the introduction of generative AI in college general English course was no longer limited to simple question answering, but began to affect the arrangement of classroom tasks, the organization of learning activities, and the adjustment of evaluation methods. For teachers, whether they have the corresponding technology readiness and teaching integration ability is becoming a key factor whether AI can truly enter the curriculum level. At the same time, existing review studies also emphasize that the value of conversational AI in language education does not lie in completely replacing teachers, but in forming a collaborative relationship with teachers to jointly complete exercise support, feedback generation and learning process adjustment [5].

However, the role of AI in foreign language education should not be understood only as the supplement of several tools to classroom teaching. After generative AI enters writing teaching, although it can provide draft modification, structural suggestions and sentence optimization suggestions, its real value lies in promoting instructional design from "result evaluation" to "process tracking" [6]. Relevant studies have proposed that when artificial intelligence is applied to language education, the evaluation framework and usage norms should be established simultaneously, so as to avoid the technical convenience masking the curriculum objectives themselves [7]. From the perspective of the longer development process of educational technology, language education has always been in the evolution process of "technology intervention - teacher adjustment - human-computer collaboration", and artificial intelligence only pushes this process to a new stage [8]. In writing training, automatic writing evaluation systems have been proved to have a positive impact on the improvement of second language writing skills. Relevant studies further show that the effectiveness of such systems in the classroom is closely related to the quality of feedback, task design and teacher involvement. At the same time, the attitudes of students and teachers towards generative AI participating in the writing process are not completely consistent, which also suggests that the course construction should not only emphasize the tool function, but also consider learning ethics, judgment ability and academic norms [9].

In this context, the core problem faced by foreign language curriculum reform is not only "whether to use AI", but "how to reconstruct the interdisciplinary curriculum system and talent training mode with AI". Some studies have proposed that artificial intelligence literacy should enter the overall curriculum system, rather than only be attached to individual teaching links as a scattered ability [10]. The interdisciplinary AI literacy framework in the field of education also shows that curriculum design needs to simultaneously cover multiple dimensions such as technical understanding, critical judgment, collaborative application and sense of responsibility [16]. The teacher survey around curriculum design further showed that the integration of AI literacy into the curriculum was not a simple addition of technical modules, but required the original training program to establish a new mapping relationship between objectives, content and evaluation [11]. Although the application of artificial intelligence in higher education has become an important trend at present, in the field of foreign language education, the existing research focuses more on the use of a single tool, teachers' willingness to accept or local classroom reform [12], and the systematic research on the complete chain of "curriculum knowledge representation, intelligent design of programs, resource platform support and training effect feedback" is still insufficient. Based on this, this paper focuses on the research on the construction of interdisciplinary foreign language curriculum system and talent training mode under AI-enabled, tries to put forward an integrated scheme from three levels of knowledge modeling, curriculum design and platform implementation, and analyzes its implementation effect combined with application experiments, expecting to provide more operational reference for the digital transformation of foreign language education in colleges and universities.

2 Related Research

In recent years, the path of artificial intelligence entering foreign language education has gradually expanded from a single tool assistance to deeper levels such as teaching organization, learning support and curriculum reform, and related research has roughly formed three relatively clear lines. First, it focuses on the intelligent support of language skills training, focusing on how AI can intervene in speaking, writing and feedback evaluation. Secondly, focusing on curriculum reform and AI literacy cultivation, how to embed artificial intelligence into the university curriculum system was discussed. Thirdly, the landing conditions of AI in education scenarios were analyzed around teacher adoption, platform implementation and teaching governance. The existing research results lay the foundation for this paper. However, there are still obvious gaps in the existing research from the perspective of the overall issue of "interdisciplinary foreign language curriculum system construction and talent training mode".

In terms of language skill training, Law[13] systematically reviewed the application of generative artificial intelligence in language teaching, and pointed out that AI has been widely used in writing support, oral practice, classroom feedback and learning guidance, indicating that foreign language teaching is shifting from experience judgment to data support. Du and Daniel[14] further summarized the role of AI chatbot in oral English practice, arguing that it can enhance the frequency of practice and immediateness of interaction, and provide a continuous data source for the recording of learning process. Wei et al. [15] verified the promotion effect of automatic writing evaluation system on Chinese EFL learners' writing ability through randomized controlled experiments, indicating that natural language processing technology has been able to enter the core link of language ability evaluation. The above studies show that artificial intelligence has strong application value in specific teaching tasks such as listening, speaking, reading and writing, but the research focus is mostly focused on single ability optimization, and there is little involved in how to linkage between curriculum modules and how to map ability goals hierarchically.

In terms of Curriculum reform and interdisciplinary training, Southworth et al. [16] proposed the "A I Across the Curriculum" model, emphasizing that artificial intelligence should not be attached to the classroom as an isolated tool, but should enter the whole higher education curriculum system to promote the reorganization of training logic. Allen and Kendeou[17] constructed an interdisciplinary AI literacy framework in the field of education, and argued that curriculum design should simultaneously cover the dimensions of technical understanding, critical judgment, collaborative application and sense of responsibility, which provided a theoretical pivot for the collaborative modeling of foreign language curriculum, digital competence and professional competence. Salhab[18] discussed the integration of AI literacy into curriculum design from the perspective of university teachers, and pointed out that the real curriculum reform is not simply to add technical content, but to reconstruct the corresponding relationship between curriculum objectives, teaching activities and evaluation criteria. That is to say, existing research has realized that artificial intelligence will change the course structure itself, but there is still a lack of direct implementation plans for how foreign language majors can complete the construction of interdisciplinary system with the help of knowledge map, ability portrait, course recommendation and resource management platform.

In terms of application conditions and teaching implementation, Kong et al. [19] investigated teachers' behavioral intention to use generative artificial intelligence tools based on the extended technology acceptance model, and found that perceived usefulness, ease of use and external support would directly affect teachers' adoption depth. Lee et al. [20] analyzed the impact of generative AI on higher education teaching from the perspective of educators, and pointed out that although teachers generally recognized its efficiency value, they also worried about evaluation distortion, academic dependence and weakening of teaching boundaries. Cabero-Almenara et al. [21] discussed teachers' acceptance of educational artificial intelligence and its relationship with teaching beliefs, indicating that technology integration is not only a problem of platform access, but also involves teachers' cognitive structure and adjustment of teaching concepts. An et al. [22] modeled and analyzed the behavioral intention of English teachers to use artificial intelligence, and further proved that the institutional environment, training support and technical confidence would jointly affect the continuous application of AI in the classroom. This kind of research reveals the realistic premise of AI-enabled teaching reform, but it still mainly stays at the level of teachers 'adoption and attitude, and has not yet formed a complete closed loop on how the resource platform supports the course operation and how the training program is continuously optimized through data feedback.

Table 1: Main contents and shortcomings of existing studies

Reference No.	Research Content	Technology or Object	Main Conclusion	Limitation
[13]	Review of generative AI applications in language teaching	GenAI, language teaching	AI has been widely introduced into writing, speaking, and feedback scenarios	Focuses on application summary, lacking course-system-level design
[14]	AI chatbots and speaking training	Dialogue systems, speaking instruction	Improves interaction frequency and immediate feedback capability	Mainly focuses on single-skill training
[15]	Experimental study on automated writing assessment	NLP, writing assessment	Has a positive effect on second-language writing improvement	Insufficient discussion of curriculum linkage and training models
[16]	AI integration into overall curriculum models	Higher education curriculum reform	Emphasizes that AI should be incorporated into the overall curriculum structure	Does not specify implementation pathways for foreign language majors
[17]	AI literacy framework in education	Interdisciplinary curriculum design	Proposes multidimensional goals such as technology, judgment, and responsibility	More theoretical, lacking platform support solutions
[19]	Teachers' willingness to use generative AI	Extended TAM model	Teacher adoption is influenced by perceived usefulness and the support environment	Lacks long-term validation of training effectiveness
[20]	Educators' views on the impact of GenAI	Higher education teaching applications	Acknowledges efficiency improvement while pointing out potential risks	Focuses on perception analysis, lacking curriculum reconstruction models
[21]	Research on teachers' acceptance of educational AI	Teaching beliefs and AI acceptance	Teaching beliefs affect the depth of technology integration	Lacks discussion of resource management and implementation mechanisms
[22]	Modeling English teachers' behavioral intention toward AI	English teaching scenarios	Institutional environment and technological confidence have significant effects	Does not extend to curriculum systems and talent cultivation

In general, the existing research has achieved solid results in the aspects of language training, intelligent feedback, AI literacy education and teacher adoption, which also provides a methodological basis and empirical support for the entry of AI into foreign language education. However, most of these studies stay at the tool application level, attitude cognitive level or principle framework level, and pay insufficient attention to the internal knowledge organization mode, the mapping relationship between ability goals, the intelligent generation mechanism of curriculum plans, and the collaborative relationship between resource platform and talent training mode in interdisciplinary foreign language courses. In other words, the existing research has answered the question "what links can AI be used in foreign language teaching", but has not fully answered the question "how can AI connect foreign language curriculum, professional ability and training mechanism into an overall system that can be calculated, implemented, and optimized by feedback". Based on this, this paper will further study from three aspects of curriculum knowledge representation, intelligent scheme design and resource integrated management platform on the basis of previous research, in order to make up for the shortcomings of the existing results in the systematic construction and application of closed-loop.

3 Construction Scheme of interdisciplinary foreign language curriculum system and talent training mode under AI empowerment

3.1 Knowledge Representation and Competency Goal Modeling of Interdisciplinary Foreign Language Courses

The construction of interdisciplinary foreign language curriculum system is not a simple concatenation of language courses and several professional courses, but to organize language competence, subject understanding, digital literacy and international communication ability into a computable, traceable and updatable curriculum structure under a unified training goal. Traditional training programs are mainly organized by course name and credit hour allocation, and the priority relationship between courses, knowledge intersection position and ability generation path often rely on artificial experience judgment, which is difficult to adapt to the rapidly changing teaching needs under the background of AI empowerment. Especially when foreign language learning is oriented to international communication, academic writing, data retrieval, cross-cultural collaboration and intelligent tool application at the same time, the original curriculum expression method divided by subject boundaries is no longer sufficient to support the cultivation of compound talents. Based on this, the interdisciplinary foreign language curriculum system is represented as a multi-layer heterogeneous network composed of "knowledge unit -- task scenario -- ability goal -- evaluation evidence", and on this basis, the ability goal modeling mechanism is established, whose overall structure is shown in Figure 1.

Figure 1: Framework of knowledge representation in interdisciplinary foreign language courses

In the knowledge representation layer, this paper no longer treats the course as an isolated text, but splits the course content into several reusable knowledge nodes, and constructs the course knowledge graph:

$$G = (V, E, R) \tag{1}$$

where, V represents the set of knowledge nodes, E represents the connecting edges between nodes, and R represents the set of relation types. The nodes here include not only linguistic content such as vocabulary strategy, discourse structure and cross-cultural expression, but also interdisciplinary topics such as international business communication, scientific and technological text interpretation, data presentation and academic demonstration. Through this representation, the content which was originally scattered in different courses can be reorganized into a unified semantic space.

To improve the stability of course knowledge extraction, the system jointly encodes the syllabus, case text, task description and evaluation criteria, and represents each knowledge unit as:

$$h_i = W_t t_i + W_p p_i + W_s s_i \tag{2}$$

where t_i is the semantic vector of the text, p_i is the feature vector of the professional topic, s_i is the feature vector of the teaching scene, W_t, W_p, W_s are the corresponding weight matrix. The function of this formula is to incorporate the three kinds of information "what is language knowledge", "what professional subject is it serving" and "what task situation is it appearing in" into the representation process at the same time, so as to avoid the clustering of course content only according to word similarity and ignoring the differences in teaching purposes.

Knowledge units are not tiled and parallel, but there are significant antecedent, support, transfer and coordination relationships between them. In order to characterize the association strength between different knowledge nodes, this paper introduces an attention-based relationship calculation method:

$$\alpha_{ij} = \frac{\exp(q_i^{\top} k_j)}{\sum_{j \in \mathcal{N}(i)} \exp(q_i^{\top} k_j)} \tag{3}$$

where, α_{ij} represents the association weight between node i and node j, q_i and k_j are the query vector and key vector respectively, and $\mathcal{N}(i)$ is the adjacency set of node i. If a writing skill node maintains a high correlation weight with "data chart interpretation" and "academic summary generation", the system will regard it as a key bridging unit in the interdisciplinary course, rather than a common language point.

In the ability target level, this paper divides the training requirements into four dimensions: language application ability, professional integration ability, technical collaboration ability and international communication ability, and establishes the target vector for each dimension:

$$c_k = \sum_{i=1}^{n} \beta_{ki} h_i \tag{4}$$

Here, c_k denotes the KTH type of capability target vector, and β_{ki} denotes the contribution coefficient of knowledge unit i to capability target k. In this way, the ability goal is no longer in the concept description of the training program, but can be supported by specific knowledge units, task types and evaluation indicators. According to this, course designers can judge to what extent a course serves "cross-cultural expression" or "professional discourse construction", so as to reduce the phenomenon of disconnection between goal setting and actual teaching content.

Based on the above representation results, the system further calculates the matching degree between the course module and the ability goal:

$$S_{mk} = \frac{z_m^{\top} c_k}{||z_m|| ||c_k||} \tag{5}$$

where, S_{mk} is the matching score between the course module m and the competence goal k, and z_m is the course module vector. If a module has a high score in language expression, but a significantly low matching degree in professional context and technical collaboration, the system will suggest that it is more suitable as a basic support course rather than a core integration course. This process makes the construction of curriculum system change from experience arrangement to quantitative diagnosis.

At the student level, capability goal modeling also needs to form a correspondence with the learner state. In this paper, we construct student profiles based on learning records, homework performance, task completion and platform interaction data, and estimate their goal attainment level in the following way:

$$\hat{y}_{uk} = \sigma(x_u^{\top} c_k + b_k) \tag{6}$$

Here, $\hat{y}_{uk}$ represents the achievement probability of student u on the KTH ability goal, x_u is the student profile vector, b_k is the bias term, and $\sigma(\cdot)$ is the activation function. This formula means that the curriculum system is not a static planning, but can constantly revise the course intensity, task difficulty and resource allocation direction according to the actual performance of the student group.

In order to avoid the imbalance of the training structure caused by the excessive concentration of the curriculum system on a certain kind of ability, this paper sets up the curriculum balance constraint item:

$$L_{bal} = \sum_{k=1}^{K} \left(\frac{1}{M} \sum_{m=1}^{M} S_{mk} - \rho_k \right)^2 \tag{7}$$

Here, ρ_k is the target proportion of the KTH ability in the training program, and M is the total number of course modules. This formula is used to measure the deviation between the actual course supply and the target ability structure. When a semester of courses excessively emphasizes language skills practice and ignores technical collaboration and professional integration, the system can send a structural correction signal through this formula. Its capability mapping process is shown in Figure 2.

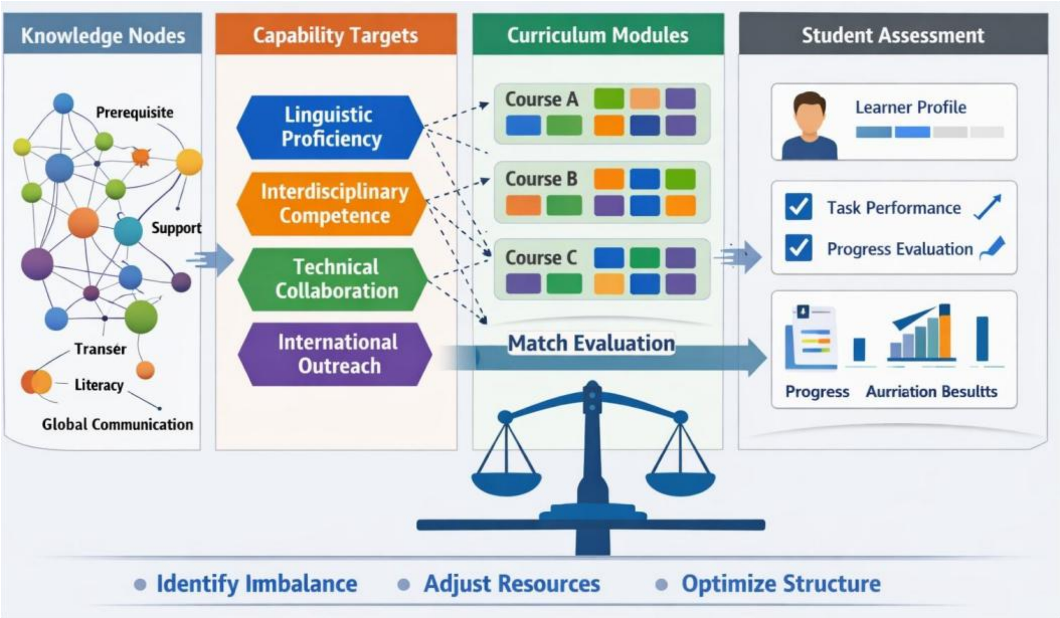

Figure 2: Capability goal modeling and curriculum mapping mechanism

3.2 Intelligent design of interdisciplinary Foreign language course program

The formation of interdisciplinary foreign language course scheme should not stop at the level of manual course arrangement, experience splicing or simple addition of technical modules, but should be based on the collaborative analysis of course objectives, learner characteristics, task scenarios and platform resources. The course design under AI empowerment is essentially a continuous calculation process composed of requirements identification, goal decomposition, content combination, task generation, resource allocation and feedback correction. It should not only respond to the basic requirements of language training in foreign language education, but also take into account the access of interdisciplinary knowledge, the application of intelligent tools and the dynamic adjustment of talent training direction. Based on the course knowledge representation and ability goal model established in the previous section, this paper further constructs the intelligent design process of interdisciplinary foreign language course plan. The process is learner-centered, task organization driven, and data feedback as a regulation mechanism. It contains six core links and several execution nodes, and its overall structure is shown in Figure 3.

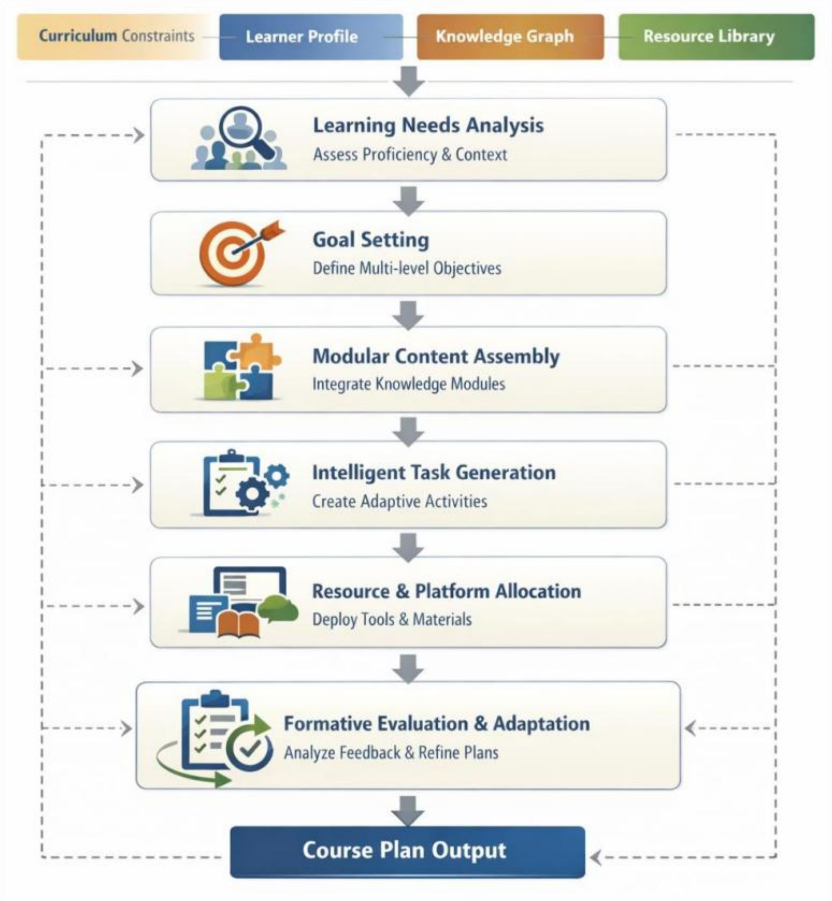

Figure 3: Intelligent design process of interdisciplinary foreign language course scheme

As can be seen from Figure 3, the intelligent design of the interdisciplinary foreign language course scheme mainly includes the following parts.

(1)Learning needs identification and teaching situation analysis.

Before the course design begins, it is necessary to jointly analyze the learning object, training direction and teaching situation. This part not only focuses on the current foreign language level of students, but also identifies their professional background, digital tool use ability, intercultural communication experience and future position orientation. To this end, the student demand vector is represented in this paper as

$$n_u = W_a a_u + W_d d_u + W_g g_u \tag{8}$$

Among them, a_u represents the language basis characteristics of students, d_u represents the interdisciplinary digital literacy characteristics, g_u represents the career development goal characteristics, and W_a, W_d, W_g are mapping matrices. In this way, demand analysis is no longer limited to a single judgment of "English strength", but can more accurately reflect students' real support needs in the course. At the same time, the system also needs to evaluate the implementation environment of the course by considering the class size, the proportion of online and offline mixing, the types of resources that can be called, and the interaction conditions of the platform, so as to ensure that the subsequent design does not stay on the ideal structure.

(2)Hierarchical setting of course objectives.

After completing the needs identification, the system sets the course objectives according to the training program and professional direction. Different from the traditional practice, the goal here no longer exists only as a literal description, but is transformed into computable constraints through hierarchical modeling. In this paper, the curriculum objectives are divided into three categories: knowledge mastery objectives, ability training objectives and comprehensive output objectives, and the overall goal intensity of the curriculum is defined as

$$O = \lambda_1 O_k + \lambda_2 O_c + \lambda_3 O_p \tag{9}$$

where O_k is the knowledge goal score, O_c is the ability goal score, O_p is the achievement output goal score, and $\lambda_1, \lambda_2, \lambda_3$ are the weight coefficients. For interdisciplinary foreign language courses, the goal setting should not only emphasize the coverage of language knowledge, but also incorporate the requirements of information retrieval, professional discourse understanding, data representation, and collaborative writing with intelligent tools into the same goal set. Only in this way will the course scheme not degenerate in implementation into a technologically outsourced version of a traditional language class.

(3)Modular course content combination.

After the course objectives are established, suitable teaching contents need to be selected from the course knowledge map and resource library, and executable course modules need to be formed. Since the interdisciplinary foreign language course involves many kinds of content such as language learning, professional topic introduction and practical task organization, the system must judge whether a certain knowledge module is suitable for entering a specific course unit. In this paper, the course content matching function is used to represent the degree of adaptation between the candidate content and the target:

$$M_{ij} = \mu \cdot \mathrm{sim}(c_i, o_j) + (1 - \mu) \cdot \mathrm{cov}_{ij} \tag{10}$$

Here, M_{ij} represents the matching value between course content unit i and target item j, $\mathrm{sim}(c_i, o_j)$ is the semantic similarity, cov_{ij} is the target coverage rate, μ is the balance parameter. If a content unit can support language expression training and professional context understanding at the same time, its matching value will be significantly improved, and it is more suitable for entering the core module. In this way, the selection of course content no longer depends on the personal experience of the writer, but turns to the combination optimization based on data.

(4)Intelligent generation of teaching tasks.

The key to whether the course plan can really be implemented is whether the teaching tasks are consistent with the course objectives and the characteristics of students. The task design in interdisciplinary foreign language courses should not only stay at the level of vocabulary practice or text paraphrasing, but should be as close as possible to real communication, professional collaboration and information processing situations. For example, the English for Science and Technology course could set the task of "reading research abstracts in English and generating bilingual infographics", and the international communication course could set the task of "writing short video scripts in English based on public data". In order to control the task difficulty, this paper constructs the task complexity estimation formula:

$$D_t = \alpha l_t + \beta s_t + \gamma r_t + \delta h_t \tag{11}$$

where D_t is the complexity of task t, l_t is the language load, s_t is the depth of expertise, r_t is the difficulty of resource scheduling, h_t is the degree of human-machine collaboration, and $\alpha, \beta, \gamma, \delta$ are the corresponding coefficients. This equation can be used to determine whether the task is beyond the range of the target group, so as to make the generative task challenging without disrupting the rhythm of the course.

(5) Resource and platform configuration.

After the formation of the course plan, it is necessary to complete the joint configuration of teaching resources, intelligent tools and platform functions. Simply having rich resources does not mean that the quality of the course is improved. The key is whether the resources are effectively matched with the course modules, task types and student status. To this end, the system uses the resource recommendation score function to complete the optimal selection:

$$R_{ur} = \frac{p_u^T q_r}{\|p_u\| \|q_r\|} + \eta f_r \tag{12}$$

Here, R_{ur} represents the adaptation score of student group u to resource r, p_u is the learning group portrait vector, q_r is the resource feature vector, f_r is the resource interaction feedback strength, η is the adjustment coefficient. At the platform level, multi-modal content integration such as text, audio, video, prompt word templates, automatic evaluation and collaborative recording should be supported. Only when the resource supply and the platform function form a stable cooperation, the task chain and the ability chain in the course plan can be truly connected.

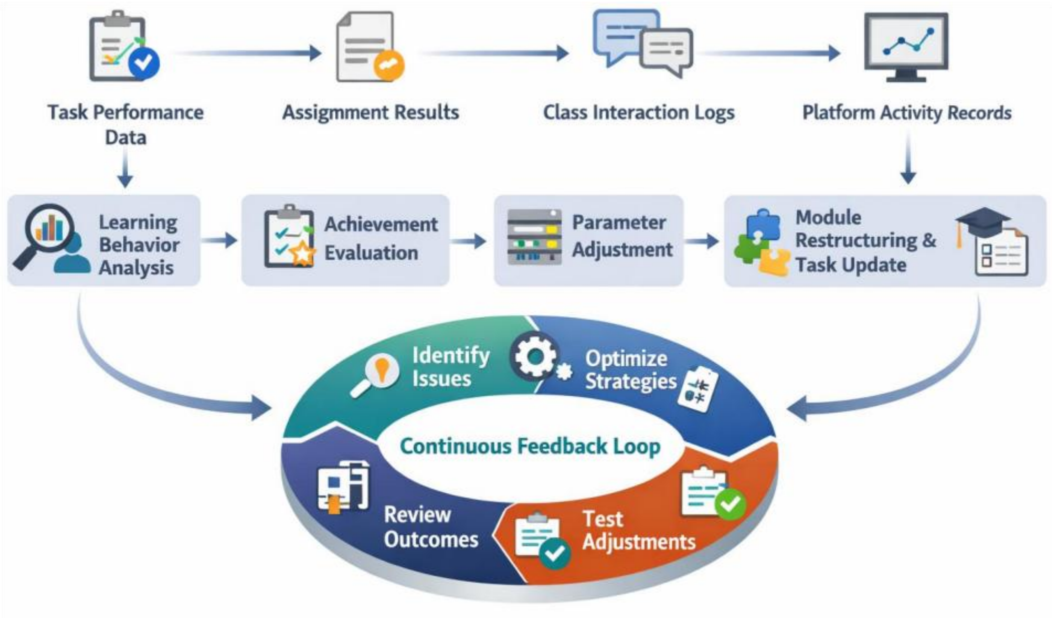

Figure 4: The iterative optimization mechanism of curriculum scheme based on learning feedback

(6)Formative assessment and curriculum iteration.

The intelligent design does not end with the initial output of the course plan, and the evaluation mechanism runs through the whole process of the course implementation. The system continuously analyzes the course effect based on classroom interaction logs, assignment submission results, spoken language recognition data, writing revision trajectories and platform access records. In this paper, the actual effect of the course program is expressed by the goal achievement gain:

$$\Delta_u = \frac{P_u^{post} - P_u^{pre}}{P^{max} - P^{min}} \tag{13}$$

Here, Δ_u represents the standardized learning gain of student population u, P_u^{post} and P_u^{pre} are the post-test and pre-test performance after the course implementation, respectively. If a course module does not bring obvious gains after investing higher resources, the system will re-examine the rationality of content arrangement and task design.

In order to continuously optimize the curriculum plan in multiple iterations, this paper further constructs the overall loss function:

$$L = \theta_1 L_o + \theta_2 L_d + \theta_3 L_r + \theta_4 L_e \tag{14}$$

Here, L_o represents the goal bias loss, L_d represents the task difficulty imbalance loss, Lr represents the resource allocation redundancy loss, L_e represents the learning effect bias loss, and $\theta_1, \theta_2, \theta_3, \theta_4$ are the weight parameters. By minimizing the function, the system makes rolling corrections to the sequence of course modules, task parameters and resource allocation proportion. The course plan formed in this way is not a static document finalized once, but a dynamic design result that can continuously evolve according to real teaching feedback.

3.3 Design of comprehensive management Platform for Foreign Language Teaching Resources and talent training mode

In order to ensure that the interdisciplinary foreign language curriculum system can continue to operate in real teaching scenarios, it is necessary to establish a matching resource comprehensive management platform in addition to curriculum design. The function of the platform is not only to centralize the storage of courseware, cases, corpus and assignment templates, but to form a stable connection between resource organization, authority control, learning process record, ability diagnosis and training feedback, so that the curriculum system, teaching implementation and talent training mode can fall into the same data framework. Based on this, this paper constructs a comprehensive management platform for AI-enabled foreign language teaching, which integrates resource storage, curriculum services, learning analysis, authority governance and training evaluation into a unified framework. The overall structure is shown in Figure 5.

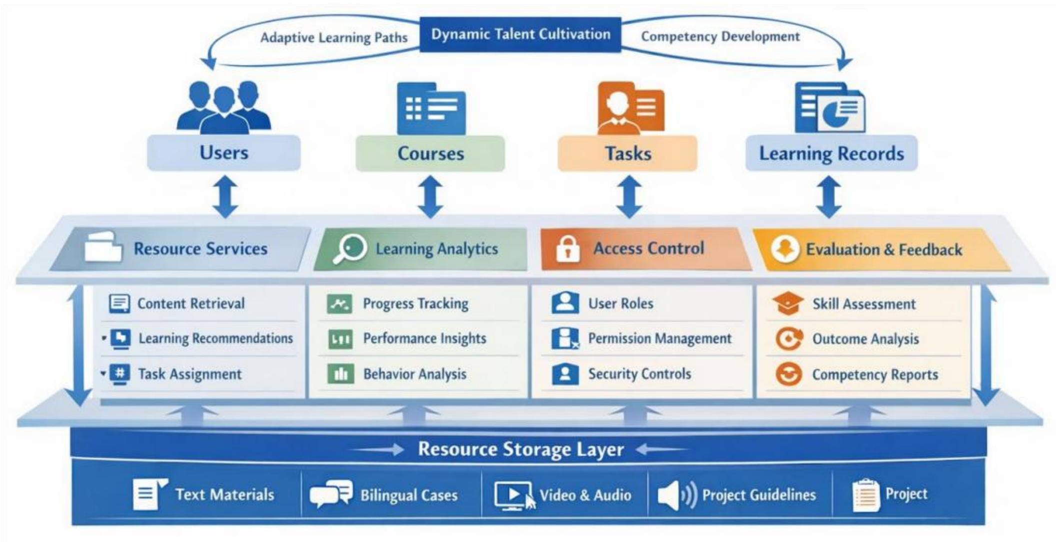

Figure 5: Collaborative architecture of comprehensive management Platform of Foreign Language Teaching Resources and talent training mode

In the resource storage layer, the platform converts teaching texts, bilingual cases, professional glossary, spoken audio, video explanation and project task description into searchable objects. Considering the large difference of resource types, this paper constructs a fusion representation for each resource unit:

$$r_i = W_m[t_i; a_i; v_i; g_i] + b_m \tag{15}$$

where t_i, a_i, v_i and g_i represent text, audio, video and teaching label features respectively, W_m is the mapping matrix, and b_m is the bias term. After unified coding, the platform can complete the association matching of "course objects-learning task-resource objects" in the same retrieval space, so as to avoid the problem that although there are many resources, it is difficult to be accurately invoked.

In order to ensure the security of the resource sharing process and the stability of the teaching order, the platform introduces a hierarchical authorization mechanism in the stage of user login and resource access. The system calculates access permission based on user role, course affiliation, task stage and data sensitivity level:

$$P(u, j) = \sigma(w^\top x_{u,j} + b) \tag{16}$$

Here, $P(u, j)$ represents the access probability of user u to resource j, $x_{u,j}$ contains features such as role category, course relationship, historical behavior and resource level, and $\sigma(\cdot)$ is the activation function. When $P(u, j) \geq \tau$, the system grants the access permission. When it is below a threshold τ, only restricted browsing is kept or access is denied. This not only ensures the flexibility of sharing curriculum resources across subjects, but also avoids the indiscriminate use of item bank, evaluation data and individual portrait.

The core of the platform database does not lie in simple archiving, but in supporting the whole process linkage of course operation and training evaluation. After business analysis, this paper summarizes the key entities in the platform into seven categories: users, courses, resources, tasks, learning records, evaluation results and ability portraits, which together form the logical basis of the resource platform. Table 2 presents the main entities and their functional descriptions.

Table 2: Description of main entities and functions of integrated management platform

Entity Name	Main Content	Platform Function
User Entity	Students, teachers, administrators, enterprise mentors	Identity recognition, permission allocation, behavior recording
Course Entity	Course modules, credits, objectives, prerequisite relationships	Course organization and training pathway management
Resource Entity	Texts, audio, videos, cases, corpora	Resource storage, retrieval, and recommendation
Task Entity	Discussion tasks, writing tasks, project tasks	Teaching activity publishing and process tracking
Learning Record Entity	Login, access, submission, interaction logs	Learning analytics and behavior mining
Evaluation Result Entity	Test scores, process evaluation, project performance	Achievement analysis and quality feedback
Competency Profile Entity	Language proficiency, interdisciplinary integration ability, technical application ability	Talent cultivation diagnosis and scheme optimization

In the resource invocation stage, the platform makes personalized recommendations based on course objectives and student portraits. If a group of students has a weak foundation in academic expression, but has accumulated a certain amount of professional knowledge understanding, the system will give priority to term comparison, academic sentence pattern template and data expression tasks, rather than repeating basic vocabulary materials. Its recommendation score can be expressed as follows.

$$S_{ui} = \frac{p_u^T r_i}{\|p_u\|\|r_i\|} + \lambda c_i \tag{17}$$

where p_u is the learner profile vector, r_i is the resource vector, c_i is the coverage coefficient between the resource and the current course goal, and λ is the adjustment parameter. Therefore, the resource platform not only assumes the storage function, but also assumes the responsibility of content scheduling in the training path.

The design of talent training mode is based on the continuous feedback of platform data. This paper divides the training effectiveness into four dimensions: language use, interdisciplinary integration, digital collaboration and practical output, and constructs a comprehensive achievement function:

$$A_u = \sum_{k=1}^{4} \omega_k y_{uk} \tag{18}$$

where, A_u represents the comprehensive training achievement degree of student u, y_{uk} represents the evaluation result of its ability in the KTH dimension, and ω_k is the weight coefficient. According to the stage achievement results, the platform dynamically adjusted the course learning sequence, project task arrangement and practice support mode. The talent training mode formed in this way is no longer a fixed linear program, but a closed-loop operation mechanism with the resource platform as the center, the learning data as the basis, and the ability generation effect as the goal.

In addition, the platform design also needs to take into account the user experience of teachers and students. The interface layer adopts modular navigation and simple interaction logic to support multi-terminal access, and provides adaptation for voice playback, subtitle display, text amplification and high contrast mode to improve the accessibility in different use scenarios. It can be seen that the integrated management platform is not an auxiliary system outside the curriculum system, but a key infrastructure connecting resource allocation, course operation and talent training mode optimization. Through this platform, the construction of interdisciplinary foreign language courses empowered by AI obtained sustainable data support, and also provided stable conditions for subsequent training effect verification and application analysis.

4 Result analysis and discussion

4.1 Effect analysis of interdisciplinary Foreign language curriculum system construction

In order to test the actual performance of the AI-enabled interdisciplinary foreign language curriculum system constructed in this paper in terms of structural rationality, target coverage ability and implementation support effect, this paper selected English related courses in Beibu

Gulf University as the pilot objects, and carried out teaching implementation and platform tracking for 16 consecutive weeks. The experimental sample consisted of 186 students, 12 foreign language teachers, 4 educational technology teachers, and 3 corporate practice tutors. The course operation data came from the teaching platform log, task submission record, resource call record and stage evaluation results. A total of 19 valid questionnaires were collected from 12 foreign language teachers, 4 educational technology teachers and 3 corporate practice tutors. In order to reduce subjective bias, all scoring results are taken as the average of two rounds of statistics, and the node coverage in the course knowledge graph is combined with the task link data for cross-checking.

Table 3 presents the questionnaire evaluation results of the course system construction effect. From the perspective of overall performance, the total mean of the scale reached 4.66, and the standard deviation was 0.48, indicating that the curriculum system constructed in this paper had high recognition in terms of structure clarity and implementation operability. It is particularly noteworthy that the scores of "curriculum system contributes to the improvement of interdisciplinary ability" and "formative evaluation feedback is timely and effective" reached 4.79 and 4.74 respectively, indicating that curriculum design does not just stay at the level of content reorganization, but establishes a relatively stable linkage relationship between learning tasks, resource allocation and evaluation mechanism. In contrast, the mean value of "course difficulty gradient setting is reasonable" is slightly lower, which is 4.47, indicating that when language tasks are deeply coupled with professional tasks, some students still feel a certain load, which also provides a basis for subsequent course stratification and task fine adjustment.

Table 3: Evaluation results of the construction effect of interdisciplinary foreign language curriculum system

Evaluation Item	Mean	Standard Deviation
Clear course objectives and training orientation	4.68	0.46
Reasonable alignment between language modules and professional modules	4.59	0.51
Appropriate integration of AI tools into course tasks	4.72	0.45
Convenient access to teaching resources with high relevance	4.64	0.50
Reasonable progression of course difficulty	4.47	0.60
Timely and effective formative assessment feedback	4.74	0.44
The curriculum system helps improve interdisciplinary competence	4.79	0.41
Strong overall operability and promotion value	4.63	0.49
Overall	4.66	0.48

In order to further verify the improvement effect of the curriculum system on key teaching indicators, this paper compares and analyzes the traditional curriculum scheme with the scheme in this paper, and statistics the five indicators of curriculum target coverage rate, interdisciplinary knowledge association rate, resource matching accuracy rate, task completion rate and feedback timely rate, and the results are shown in Figure 6. The data in the figure show that the proposed scheme is significantly better than the traditional scheme in five dimensions: The course target coverage rate increased from 76.4% to 92.8%, the interdisciplinary knowledge association rate increased from 58.7% to 88.1%, the resource matching accuracy rate increased from 78.9% to 93.4%, the task completion rate increased from 82.1% to 94.6%, and the feedback timely rate increased from 65.7% to 89.2%. This result shows that the curriculum system based on knowledge graph and learning portrait can more effectively integrate language training, professional content and intelligent resources into an executable teaching chain, and the curriculum implementation no longer depends on the temporary supplement of teachers 'individual experience, and presents a stronger systematization.

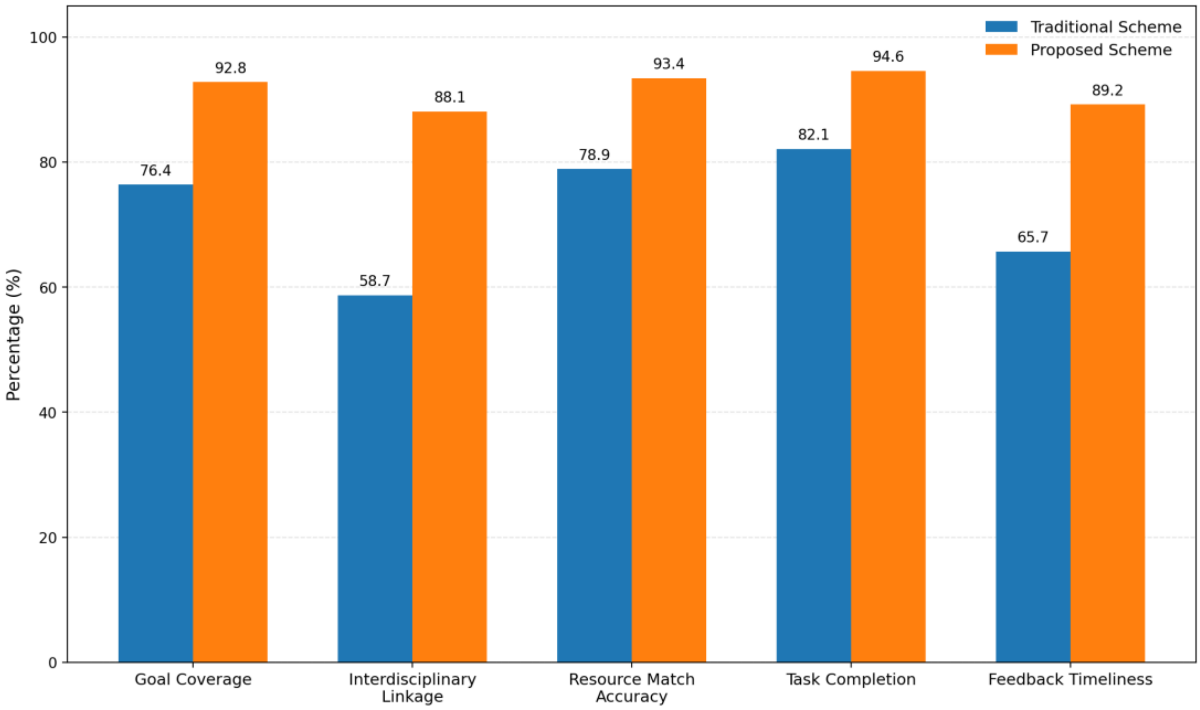

Figure 6: Comparison of key indicators between the traditional curriculum scheme and the proposed curriculum scheme

In addition to the horizontal comparison, this paper also tracks the dynamic changes of the curriculum system during multiple rounds of optimization. Relying on the course knowledge graph and platform log feedback, the system performs six rounds of iterative optimization on course nodes, task relationships and resource mapping, and the results are shown in Figure 7. With the increase of the number of iterations, the target coverage rate of the course continued to increase from 76.4% to 92.8%, while the content redundancy rate decreased from 21.8% to 7.8%. The improvement of coverage rate means that the knowledge units that were not effectively included in the training chain gradually enter the curriculum structure. The reduction of redundancy rate indicates that the problems of repeated teaching between courses, task homogeneity and repeated allocation of resources have been significantly alleviated. The two curves tend to be stable after the fourth round, indicating that the curriculum system proposed in this paper has better convergence and stability after the completion of the core structure optimization, rather than relying on unlimited expansion of curriculum content in exchange for superficial coverage improvement.

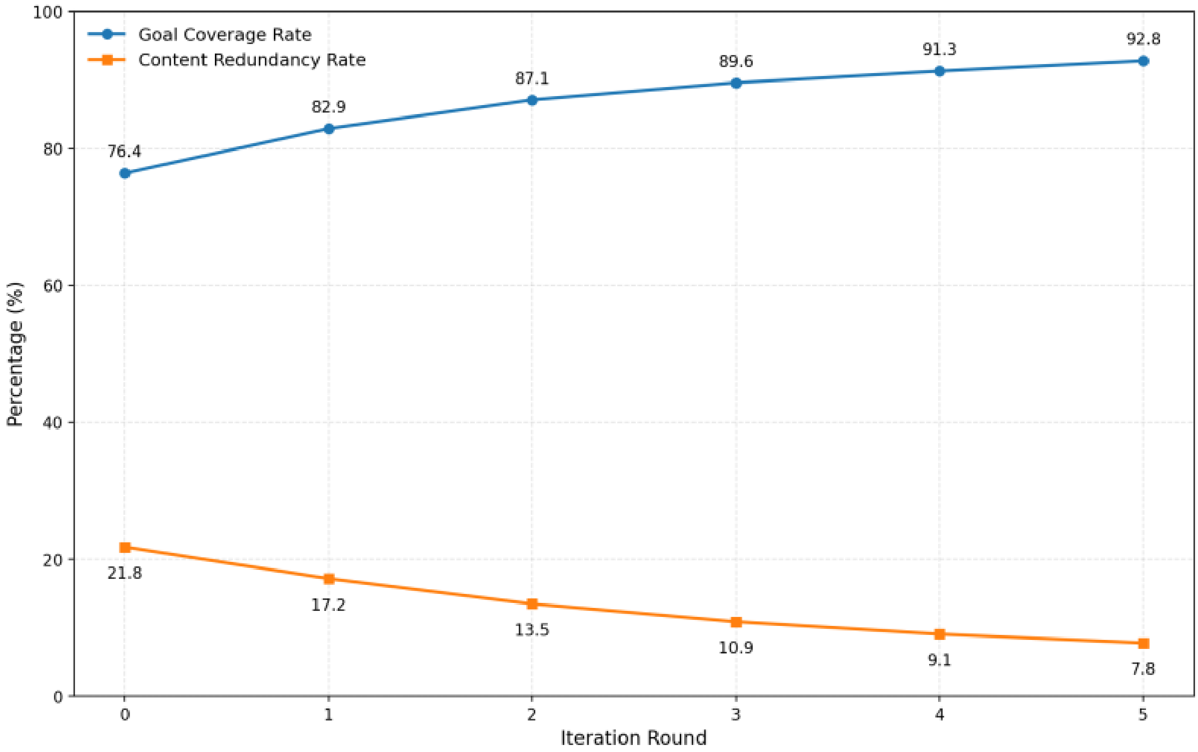

Figure 7: Changes of target coverage and content redundancy rate in the process of iterative optimization of the curriculum system

Combined with Table 3, Figure 6 and Figure 7, it can be seen that the interdisciplinary foreign language curriculum system constructed in this paper performs prominently in three aspects. On the one hand, there is a clear correspondence between course objectives, module organization and resource invocation, and the course structure is no longer in a state of loose splicing. On the other hand, the introduction of AI tools did not make the course deviate from the main line of foreign language teaching, but strengthened the efficiency of resource matching, task generation and feedback correction. At the same time, the system shows good stability in multiple iterations, indicating that the curriculum system has the basis for further promotion and expansion. Because of this, the experimental verification of the subsequent talent training mode has a more reliable prerequisite for the course carrying.

4.2 Experimental Verification and application Analysis of talent Training Mode under AI empowerment

In order to test the effectiveness of the AI empowering talent training mode proposed in this paper in the real teaching environment, this paper further carries out controlled experiments on the basis of the above curriculum system pilot. The experiment period was 16 weeks, the samples were from two parallel classes of the same grade, a total of 186 students, including 94 students in the experimental group, and the training mode of "curriculum knowledge map + intelligent task generation + resource comprehensive management platform + dynamic ability portrait" was adopted. In the control group, 92 students were treated with the original training method based on course teaching and stage assessment. The experimental platform is deployed in Ubuntu 22.04 environment, the server is configured with Intel Core i7-12700, 32 GB RAM, the back-end uses Python 3.11 and PostgreSQL 14, and the knowledge graph management uses Neo4j. The learning behavior analysis module is implemented based on BERT text encoding and LightGBM classifier. The training rounds are set to 80, and the initial learning rate is 0.001. In order to ensure the credibility of the results, the homogeneity test was carried out before the experiment, and the comprehensive evaluation was carried out from the four dimensions of language application ability, interdisciplinary integration ability, digital collaboration ability and international communication expression ability after the experiment.

Table 4 presents the results of the ability assessment of the two groups of students before and after the experiment. It can be seen that the mean values of the four ability indicators of students in the first two groups of the experiment are close, indicating that their initial levels are generally equivalent. After 16 weeks of implementation, the experimental group showed more significant improvement in all four dimensions. Among them, the language application ability increased from 72.84 to 84.97, the interdisciplinary integration ability increased from 69.13 to 85.21, the digital collaboration ability increased from 66.75 to 86.43, and the international communication expression ability increased from 70.46 to 83.88. The overall score increased from 69.80 to 85.12. In contrast, although the control group also increased, the increase was significantly smaller, and the overall score only increased from 70.11 to 76.94. This shows that the AI empowerment training mode is not limited to the local optimization of a certain language skill, but has a more stable promotion effect on the generation of composite ability.

Table 4: Comparison of pretest ability results between experimental group and control group

Evaluation Dimension	Experimental Group (Pre-test)	Experimental Group (Post-test)	Control Group (Pre-test)	Control Group (Post-test)
Language Application Ability	72.84 ± 6.91	84.97 ± 5.48	73.12 ± 7.04	79.26 ± 6.37
Interdisciplinary Integration Ability	69.13 ± 7.22	85.21 ± 5.63	69.48 ± 7.10	75.83 ± 6.45
Digital Collaboration Ability	66.75 ± 7.56	86.43 ± 5.21	67.09 ± 7.31	74.68 ± 6.72
International Communication and Expression Ability	70.46 ± 6.88	83.88 ± 5.74	70.75 ± 6.95	78.01 ± 6.18
Overall Score	69.80 ± 6.94	85.12 ± 5.12	70.11 ± 6.89	76.94 ± 6.03

In order to more clearly show the differences in the increase of comprehensive ability under different training modes, this paper plots the improvement of each dimension as Figure 8. It can be seen from the figure that the increase of the experimental group in the four abilities reached 12.13, 16.08, 19.68 and 13.42 points respectively, while the corresponding increase of the control group was only 6.14, 6.35, 7.59 and 7.26 points. Among them, the indicator with the largest gap is digital collaboration ability, which is directly related to the intelligent task chain, collaborative platform log feedback, and generative tool specification use mechanism in the training model of this paper. The improvement of interdisciplinary integration ability was also significant, indicating that after the collaboration of professional topics, language tasks and AI tools, students could more effectively transform foreign language expression into problem analysis and task output ability, rather than staying at the knowledge memory level.

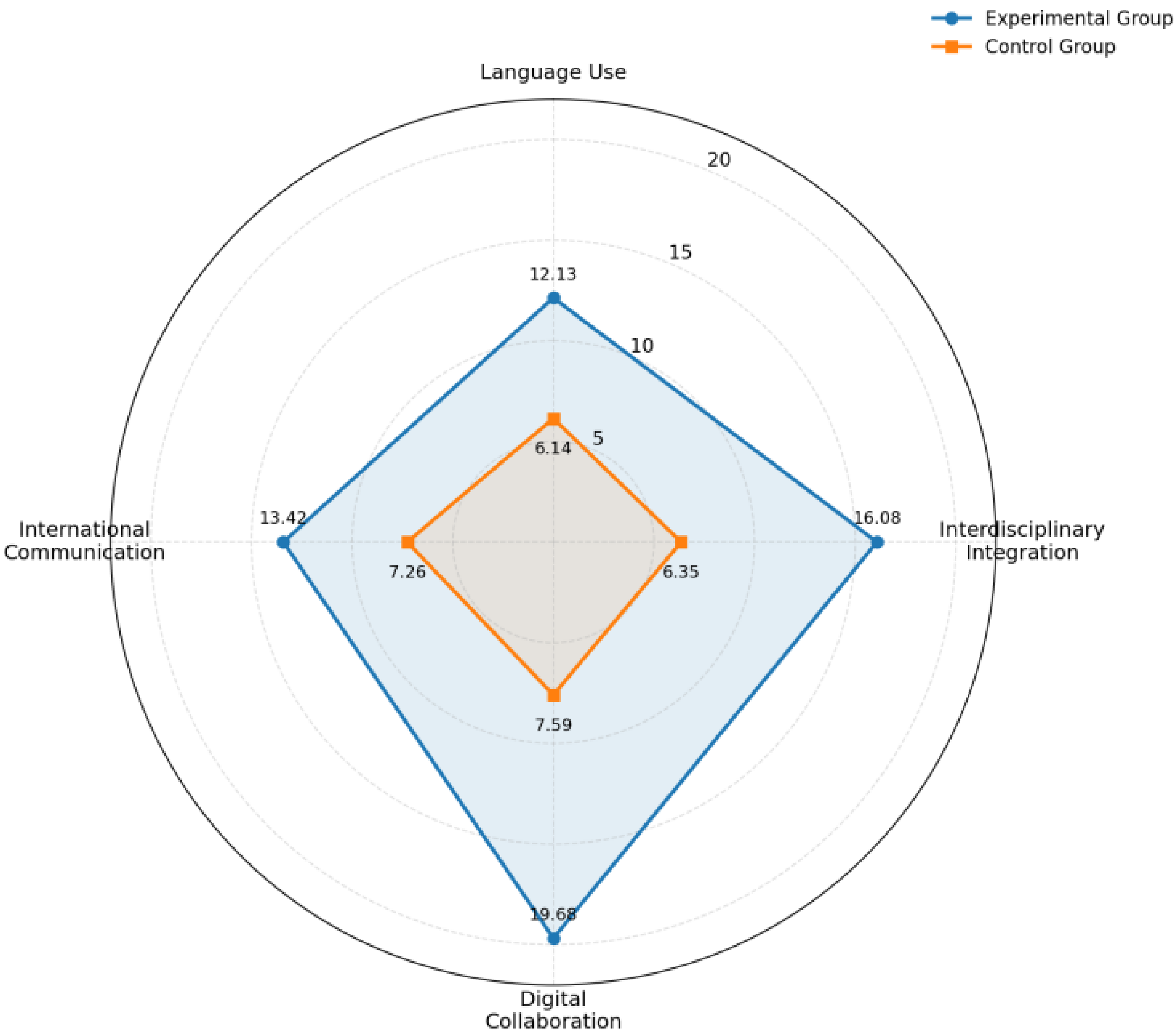

Figure 8: Comparison of the improvement range of each dimension ability between the two groups

In addition to ability evaluation, this paper also analyzes the effect of the model from the level of platform application and training process operation. Table 5 shows that the experimental group is significantly better than the control group in terms of the task submission rate on time, the project task completion rate, the success rate of cross-lingual information retrieval, the adoption rate of AI-assisted revision and the timeliness of teacher feedback. Among them, the task submission rate on time reached 93.6%, 11.8 percentage points higher than that of the control group; The completion rate of project tasks reached 91.5%, 14.7 percentage points higher than that of others. The success rate of cross-language information retrieval reached 88.9%, 17.2 percentage points higher. This shows that the platform-based training mode not only improves students 'outcome performance, but also strengthens their execution efficiency and collaboration quality in the learning process. The average feedback delay of teachers was reduced from 29.4 hours in the control group to 12.7 hours, which also showed that the learning analysis and intelligent recommendation mechanism effectively reduced the burden of repetitive processing, so that teachers could devote more time to high-level guidance.

Table 5: Application and operation results of AI empowering talent training mode

Indicator	Experimental Group	Control Group
On-Time Task Submission Rate / %	93.6	81.8
Project Task Completion Rate / %	91.5	76.8
Cross-Lingual Information Retrieval Success Rate / %	88.9	71.7
AI-Assisted Revision Adoption Rate / %	79.4	52.6
Group Collaboration Stability Score / 5 points	4.61	3.94
Average Teacher Feedback Latency / h	12.7	29.4
Overall Student Satisfaction / %	90.8	78.3

Based on Table 4, Table 5 and Figure 8, it can be seen that the AI empowering talent training mode proposed in this paper has strong application feasibility and promotion value. Its effect is not only reflected in the improvement of test scores, but also reflected in the quality of course task completion, the stability of learning process and the efficiency of teacher feedback. The reason is that this model connects curriculum structure, resource scheduling, task generation and ability diagnosis into a continuous link, so that students can complete learning and output in a more real and complex interdisciplinary pragmatic situation.

5 Discussion

This paper focuses on the design of the interdisciplinary foreign language curriculum system and talent training mode under AI empowerment, and its effects are verified through curriculum implementation, platform operation and controlled experiments. From the results, the course knowledge graph, learning portrait, task generation and resource recommendation are not isolated technical modules, but work together in the process of course organization and ability generation in a unified data structure. Compared with the previous researches that stay on single skill training or local tool embedding, the value of this paper lies in connecting foreign language curriculum, professional task, digital literacy and evaluation feedback into a sustainable iterative overall link, so that the curriculum reform does not rely on the temporary splicing of individual teachers' experience, but has strong structural and computable characteristics. From the quantitative results, the proposed scheme is superior to the traditional scheme in terms of the coverage rate of curriculum objectives, the correlation rate of interdisciplinary knowledge, the accuracy rate of resource matching and the task completion rate, indicating that the introduction of AI technology does not weaken the subject ontology of foreign language teaching, but improves the collaborative efficiency between curriculum elements. From the training effect, the experimental group had a more obvious improvement in interdisciplinary integration ability, digital collaboration ability and international communication expression ability, which indicated that the link of artificial intelligence really playing a role was not to replace learners to complete expression, but to reconstruct the learning path through intelligent analysis, process feedback and resource scheduling, so that students could form composite ability in a more real task environment. At the same time, the proposed scheme still has further optimization space. Some students showed high cognitive load in the high-intensity task chain, indicating that the course difficulty stratification and task granularity control still need to be refined. Future research can continue to introduce more stable adaptive recommendation mechanisms and multi-round interactive optimization methods to further improve the adaptability of curriculum programs to different learning groups, and promote the in-depth application of AI in the overall construction of foreign language education environment.

6 Conclusions

According to the comprehensive analysis of the construction effect of the curriculum system and the experimental results of talent training in this paper, it can be believed that the interdisciplinary foreign language curriculum system and talent training mode under the AI empowerment have good applicability and promotion value. This paper constructs an integrated implementation framework for foreign language education reform in colleges and universities, focusing on curriculum knowledge representation, program intelligent design, resource integrated management platform and training path optimization. The results show that under the joint effect of knowledge graph, learning portrait, intelligent task generation and resource recommendation mechanism, the coverage rate of course objectives, the efficiency of resource matching and the achievement degree of students 'comprehensive ability have been significantly improved, and foreign language teaching has changed from the static organization mode based on experience arrangement to the intelligent operation mode characterized by data-driven and dynamic feedback. At the same time, the application of artificial intelligence in interdisciplinary foreign language education is still limited by factors such as corpus quality, algorithm adaptation ability and platform interaction accuracy. For complex context understanding, individual difference recognition and high-order ability evaluation, there is still room for further optimization of the existing system. Follow-up research can be further deepened in the aspects of multimodal learning behavior analysis, adaptive recommendation mechanism and fine-grained ability diagnosis, so as to improve the support ability of the platform for different learning groups, and provide more stable technical support for the continuous upgrading of foreign language talent training mode in colleges and universities.

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