

A Research Report on Data Middleware for International Chinese Language Education: An Intelligent Diagnosis and Prediction Model of Multi-module Learning Behaviour

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Received: 14 March 2026; **Accepted:** 4 April 2026; **Published:** 20 April 2026

Abstract:

Chinese studies, originating in China, have become a global spiritual asset. As the Chinese language gains importance worldwide, the number of HSK test takers has grown rapidly (over 810,000 in 2024), with 85 countries incorporating Chinese into their education systems and over 200 million learners/users. However, a global shortage of over 5 million Chinese teachers makes traditional teaching insufficient. In response, intelligent mobile learning has emerged, yet existing apps (e.g., Duolingo, Rosetta Stone, Pleco) face issues such as imbalance between fun and professionalism, lack of cultural depth, payment model controversies, and absence of B-end services. This study proposes “Language Road,” a comprehensive Chinese learning app. Using surveys (100+ samples), multidimensional evaluation, and system design, the app features vocabulary memorization, AI pronunciation correction, writing recognition, and community functions, with an innovative intelligent diagnostic model for learning behavior prediction. Additionally, the app empowers B-end training institutions via a SaaS model, offering solutions from enrollment assessment to cultural branding, exemplified by a partnership with Meimei Studio. The research, conducted from July 2025 to March 2026 in Zhejiang Province, involved interviews, over 300 questionnaires, and literature review, aiming to integrate intelligence with education and promote digital transformation in international Chinese language teaching.

Keywords:

International Chinese Language Education, Language Road APP, Multi-dimensional Assessment, Intelligent Diagnosis, B-side Empowerment, Landed Practice

1. General Study

1.1. Background to the study

1.1.1. National strategic level

In order to rejuvenate the nation, culture must come first. Against the backdrop of global civilisation, the international dissemination of the Chinese language has been elevated to the status of a national strategy. The three strategies of rural revitalisation, cultural strength and common prosperity are overlapping. The Ministry of Education’s

“International Chinese Online Education Action Plan (2021-2025)” clearly puts forward that “the development of international Chinese online education is an inevitable choice in line with the intelligent construction of international Chinese education” [5]. It has become a national need to build an intelligent and precise teaching service system.

1.1.2. Provincial demonstration level

In the context of the construction of common wealth demonstration zone, Zhejiang shoulders the important mission of early and pilot implementation, Zhejiang high-quality development and construction of common wealth demonstration zone, the transformation of education digital intelligence as a key task. However, as an important carrier of Chinese language promotion, Chinese learning APP has long been in the sloppy development stage of “focusing on C-end, light on B-end”, “focusing on function, light on content”, “focusing on customer acquisition, light on retention”. development stage. Cultural heritage and industrial development, “two lines, two skins” phenomenon is prominent: culture is heavy on protection and light on use, heavy static and light on living; industry is heavy on scale and light on characteristics, heavy production and light on brand. How to make Chinese learning APP “live”, so that the Chinese language training industry “strong”, to achieve synergistic enhancement of cultural value and economic value, the industry has become the core proposition of high-quality development. The provincial government attaches great importance to international Chinese language education, and encourages the empowerment of digital technology to create an international Chinese communication brand with Zhejiang characteristics.

1.1.3. Regional practice level

Zhejiang has a large number of international students and Chinese learners, with a strong demand for learning. However, the existing Chinese learning apps generally have the problems of free tool supply, weak user stickiness, cultural heritage disconnection and single business model. Cultural resources have not been effectively transformed into industrial advantages, and industrial revenues have not been steadily fed back into the content ecology. The report adheres to the dual-wheel drive of technology empowerment and cultural casting, adheres to the laws of language education and the bottom line of cultural authenticity, highlights the orientation of marketisation, digitalisation and youthfulness, and aims to provide systematic solutions for the innovative development of Chinese learning APPs and the transformation and upgrading of Chinese language training institutes, to help create a landmark of international Chinese language education, and to provide a learnable, replicable and popularised Zhejiang experience for the Chinese culture to go global. Zhejiang experience.

1.2. The significance of the study

1.2.1. Theoretical implications

It enriches the application theory of international Chinese language education technology, helps to build an intelligent learning tool integrating speech evaluation, grammar check, vocabulary memorisation and comprehensive testing, improves the complete research framework structured by the five-layer system of “data acquisition - feature extraction - diagnosis and analysis - decision-making output”, and further

promotes the construction of the theoretical system of language learning platform design in the context of digital intelligence. “Eco-services”, and further promote the construction of the theoretical system of language learning platform design in the context of digital intelligence.

1.2.2. Practical implications

It provides developers of Chinese learning apps with operable product design guidelines, and Chinese language-related education and training institutions with implementable digital transformation solutions to enhance teaching efficiency and student satisfaction, and to solve the real-life problems of “not learning well, not teaching well, and not managing well”.

1.2.3. Demonstration

A replicable model of synergistic development of “technology platform + training institution” will be formed, with Zhejiang as the first test base, gradually providing experience for international Chinese language education institutions across the country and even around the world, and helping to build a more accurate and efficient international communication system.

1.3. Scope and object of the study

Geographic scope: Universities and Chinese language training institutions in Zhejiang Province, with a focus on the international Chinese language education market in Hangzhou, Ningbo and Wenzhou as the core sample.

Target users: college students, international students, HSK test preparers, Chinese language enthusiasts, etc.

Targeted Institutions: Offline Chinese language education and training institutions, online Chinese education platforms, Confucius Institutes, etc.

Competitors: Duolingo, Rosetta Stone, Pleco, Hello Chinese and so on.

1.4. Research ideas and methods

1.4.1. research ideas

Problem-oriented, with “two-way empowerment” (technology empowering users, data empowering institutions) as the main line, following the logic of “resource inventory - status quo diagnosis - bottleneck analysis - model construction - path design - case support - countermeasures on the ground”, from theory to practice. The research approach can be roughly summarized as shown in Figure1.



Figure 1. Research Thought Process Diagram.

1.4.2. Research methodology

Literature research method: combing domestic and foreign policy documents and academic papers in recent years to lay the theoretical foundation.

Questionnaire survey method: mainly targeting college students and international students, teachers and students of education institutions, etc., to collect data on their motivation, behaviour and demand.

Multi-dimensional evaluation method: In-depth analysis of Chinese learning APPs categorised by fun type, test type and comprehensive type, and vertical comparison of competitors from four dimensions: interface, content, function and hardware.

Case study method: Using “Meimei Studio” as a sample of field practice, we examined the practice.

System design method: Completing the design of the functional architecture and intelligent model of the Language Road APP, collecting opinions and feedbacks from volunteer users in a small scale, and continuously updating and iterating.

1.5. Core concept definition

1.5.1. Chinese Learning App

It is a software service programme relying on smart devices. As one of the means of new media communication, it is unique in the field of language learning, based on the theory of mobile learning and the innovation of professional and interesting multi-functional or single-functional design [6]. Its core purpose is to help account users to learn Chinese language and culture, which can be analogous to English learning APPs, such as Baisi Chop, not memorising vocabulary, etc. It covers a rich variety of types, and the focus of various types of learning is also different, so this project roughly classifies them into fun learning type, test-specific type and comprehensive learning type.

1.5.2. Multidimensional assessment

This project refers to the coding table for analysing Chinese language learning apps for foreigners developed by previous authors [7]. It refers to the systematic evaluation of Chinese learning APPs from four dimensions: aesthetics and clarity of interface design, professionalism and interestingness of content design, diversity and specificity of function design, and stability and economy of hardware design.

1.5.3. Intelligent diagnostic and predictive modelling

Based on user learning behaviour data (correct answer rate, hesitation time, stroke trajectory, etc.), the system uses machine learning algorithms to automatically identify learners' shortcomings in language proficiency and quantitatively predict their future learning effects (e.g., probability of passing HSK).

1.5.4. B-side empowerment

It refers to the business model of providing Chinese language training institutions (B-end customers) with data services, management tools, teaching content and marketing support through a technology platform (LinguaLu APP) in order to enhance their operational efficiency and teaching quality.

2. Multidimensional Analysis of the International Chinese Language Education Market and Users

2.1. The contradiction between supply and demand in the market against the backdrop of the global “Chinese language boom”

China’s sustained economic growth and rising international status have fuelled a global “Chinese language boom”. Figure 2 shows that by the end of 2024, 85 countries around the world have incorporated Chinese into their national education systems, with a teaching network covering 212 countries and regions, and more than 1,400 HSK test centres, however, the contradiction between supply and demand is extremely acute: by the end of 2024, there will be only 7,500 Chinese language teachers on the job around the world [8] and more than 30 million Chinese learners overseas [9]. The traditional “one-to-many” classroom is unable to meet the demand for personalisation. Traditional “one-to-many” classrooms are unable to meet personalised needs, and Chinese teaching resources are in serious oversupply, so technology is urgently needed to solve the problem of balancing scale and personalisation.

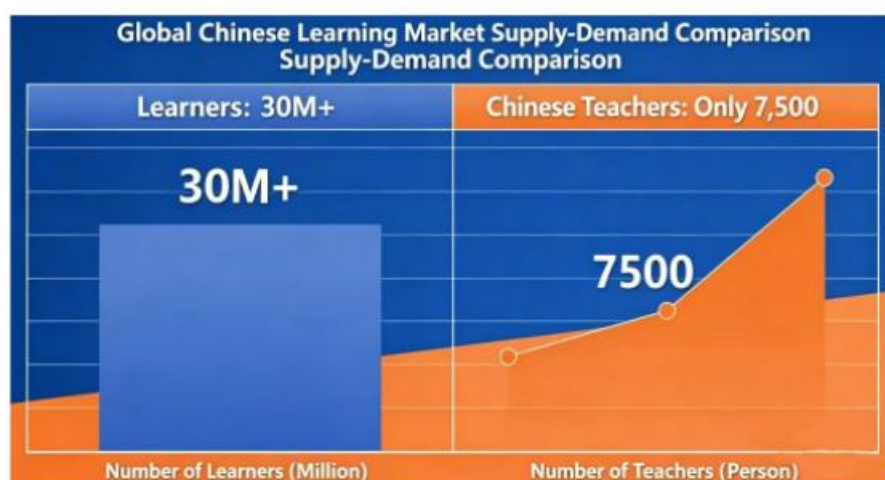


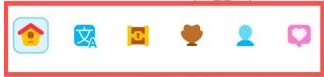
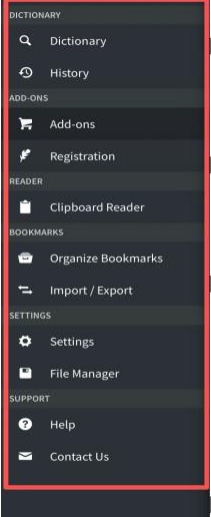
Figure 2. Comparison of Supply and Demand in the Global Chinese Learning Market.

2.2. Multi-dimensional Assessment of Existing Chinese Learning App Competitors

With reference to the evaluation criteria developed by previous researchers, this study conducted a longitudinal comparison of three types of representative APPs (Fun Learning-Duolingo, Comprehensive Learning-Rosetta, and Exam-Specific-Pleco) in terms of four dimensions, namely, interface design, content design, functional design, and hardware design (Table 1).

Table 1. Comparison of different types of APP representative designs.

Comparison term	Duolingo	Rosetta	Pleco
			

Interface design (navigation bar)			
Content design (thematic classification)	names, food, drink, colours, countries, occupations, courses, prepositions, places to visit, daily necessities, ordering food, introducing yourself, sports, hobbies	Language Basics, Greetings and Introductions, Work and Study, Shopping, Travelling, Past and Future, Making Friends and Socialising, Dining and Holidays, Family and Health, Life and the World, Everyday Things, Situational Events, Tourism and Recreation, Professional and Hobby Hobbies, At Home and Visiting Cities, Fashion and Physical Wellness, Business and Industry, Arts and Academics, Emergency Situations, Family and Society	No specific subject classification, mainly dictionary search and parsing
Functional design (fee-based model)	Includes three packages ranging from ¥¥0 to ¥798, as follows: Basic services: free of charge. Individual membership service: annual fee of about ¥588. Super Member Service: Annual fee is about ¥798.	Includes three packages ranging from ¥328 to ¥1298, as follows. Basic service: about ¥328 for three months. Intermediate services: approximately ¥798 per year. Premium Service: Lifetime is about ¥1298.	Including 38 ~ 1298 yuan and other price range of packages, the following are representative of: Basic service: about ¥198. Professional services: approximately ¥398. Additional services: approximately ¥68.
Hardware design (number of updates to version 2025)	25	8	5

2.2.1. Interface design

Duolingo: The UI design is mainly green, with rich colours and vivid animations. However, the navigation bar only has icons without text, which is not good for recognition.

Rosetta: The interface is simple and clear, but not innovative enough and lacks freshness.

Pleco: Serious interface, mainly black and white text, lack of picture animation assistance, easy to cause visual fatigue.

2.2.2. Content design

Duolingo: rich curriculum, good adaptation to fragmentation, but flat knowledge system, vague grammatical explanations and lack of professionalism.

Rosetta: The systematic course is step-by-step, and the immersion design is conducive to cultivating a foreign language mindset, but the zero native-speaker prompts confuse beginners, and there is no single mode of practice.

Pleco: authoritative basic content, large thesaurus, but lack of grammar, listening, speaking, writing and other teaching modules, single function.

2.2.3. Functional design

Duolingo: Gamification mechanisms such as punching cards and ranking are effective in maintaining stickiness, but the training relies too much on repetitive multiple-choice questions and lacks real context. There are a few adverts in the basic service, but the content can basically meet the general learning needs. All premium members have a one-week experience period, and individual members can give it to their friends, while family members can use it for multiple users, which is cost-effective.

Rosetta: The voice recognition technology provides real-time feedback, and the scene simulation is powerful, but it neglects the popularisation of Chinese culture. Higher fees, according to the difficulty of the language and the stage of learning, and the basic service only includes part of the English learning, learning Chinese must open a membership, only the basic service will be equivalent to up to 100 yuan per month, cost-effective and controversial.

Pleco: a professional dictionary tool that supports offline word search, but there is no social and incentive mechanism, which makes it easy to get burned out. Various additional service packages are available for users to freely choose the right package, but the paid functions are mainly reflected in the professional translation, text recognition, etc. There is not much difference in Chinese learning, and users can satisfy their basic learning needs without paying.

2.2.4. Hardware design

Duolingo: runs smoothly, but updates frequently

Rosetta: The login screen is lagging and has flashed back many times, seriously affecting the experience.

Pleco: few updates, fast search, no ads, high security, but higher fees for advanced features.

Conclusion: Each of the three apps has its own characteristics: the fun learning app represented by Duolingo has a novel interface and interesting content, but the depth is not enough; the test-specific app represented by Pleco has rigorous professional knowledge and powerful functions, but the interface is too simple and the learning is boring; and the comprehensive learning app represented by Rosetta is sufficiently interesting and professional, but the cost is high and the operation is unstable. To sum up, none of them can satisfy the comprehensive demands of professionalism, fun, cultural depth and reasonable payment at the same time. There is a significant structural gap in the market.

2.3. Empirical investigation of user needs and behavioural characteristics

In this study, questionnaires were distributed to university students and international student groups in Zhejiang, and 100 valid samples were recovered. Combined with interviews and surveys, the following key conclusions were drawn:

2.3.1. Behaviour of use

78% of learners have used Chinese learning APPs, and 72% of users use them more than 3 times a week, showing that APPs have become an important learning tool (Figure 3). The most popular APPs are Multi-Neighbourhood, Pleco and Rosetta.

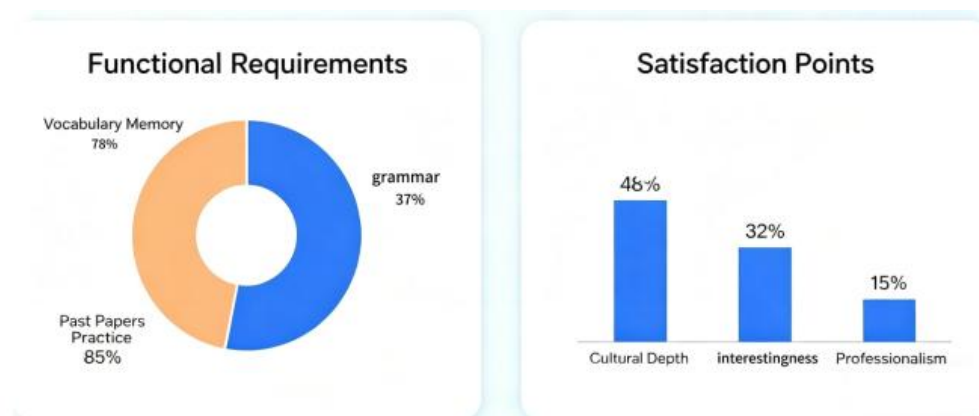


Figure 3. Functional Requirements and Satisfaction Points Graph.

2.3.2. Functional requirements

Vocabulary memorisation (78%), grammar parsing (37%) and question practice are the three core needs. The aspects that users are most dissatisfied with the existing APP are insufficient cultural depth (48%), insufficient fun (32%) and professional errors (15%).

2.3.3. Willingness to pay

35 per cent of users said they would not accept any payment and were sensitive to high subscription fees (most of them were students). Among those who are willing to pay, 28% prefer the free combination package of 'free basic functions + reasonable payment for value-added services', while another 15% are willing to pay for 'AI one-on-one coaching' separately. It is worth noting that high-frequency users (more than 5 times a week) have higher requirements for the professionalism and cultural depth of the APP, and they are willing to pay extra for 'authoritative grammar analysis' and 'in-depth cultural topics', which provides a clear direction for the differentiated value-added services of the Language Road APP. This provides a clear direction for the differentiated value-added services of LanguageMap.

In the subjective questions (Figure 4), “Chinese culture”, “grammar analysis”, “practice questions”, “socialising”, “AI training” became high-frequency keywords. High-frequency users (more than 5 times a week) have higher requirements for the professionalism and cultural depth of the app.



2.4. Diagnosis of core issues

Three blue trapezoidal panels arranged horizontally, each representing a pain point. The first panel on the left is titled 'Pain Point 1' and contains the text 'Imbalance between professionalism and interestingness'. The middle panel is titled 'Pain Point 2' and contains the text 'Lack of cultural cural depth'. The third panel on the right is titled 'Pain Point 3' and contains the text 'Blank of B-side service'. Each panel has a white horizontal line above its descriptive text.

Pain Point 1

Imbalance between professionalism and interestingness

Pain Point 2

Lack of cultural cural depth

Pain Point 3

Blank of B-side service

Imbalance between professionalism and interest: Gamification apps are shallow, professional apps are boring, and there is a lack of comprehensive products that balance the two.

Lack of cultural depth: Most apps only focus on shallow culture such as food and attractions, and are not sufficiently developed for deeper cultural content such as philosophical thinking and classical poetry.

Business model and B-side service gap: Existing APP focuses on C-end users and fails to provide training institutions with data-based teaching management tools,

making it difficult for institutions to achieve accurate teaching and externalisation of results.

3. Language Path APP System Design and Core Functions

3.1. Overall design concept and architecture

In response to these pain points, the three-layer architecture shown in Figure 6. Language Path APP (Language Path) is positioned as a comprehensive learning platform with “professional, interesting and cultural depth”, and pioneered the dual-wheel drive model of “C-end learning + B-end empowerment”. The system architecture is divided into three layers: foundation layer (cloud service and database), capability layer (intelligent diagnostic model, AI voice and image recognition), and application layer (C-end learner version, B-end institution version). (Figure 6)

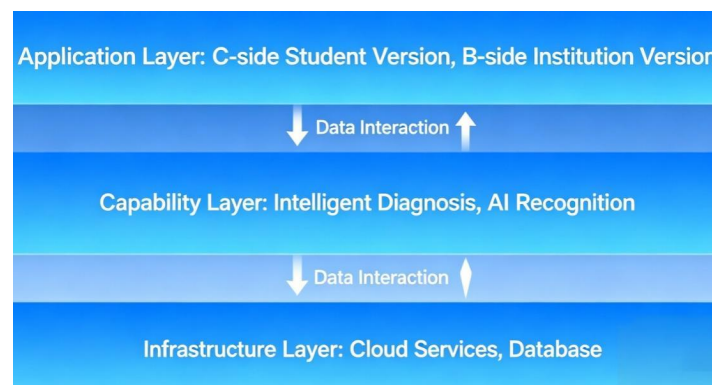


Figure 6. Diagram of the system architecture layers.

3.2. Interface and cultural visual design

3.2.1. LOGO design

As shown in Figure 7, the logo of the app is a road winding through the earth with calligraphic strokes and “YULU” written in seal script, symbolising that the Chinese language is a bridge to the world. The overall colour scheme is a combination of sandalwood and beige, reflecting the ancient Chinese style. The title font is in bold italic, spreading the charm of Chinese calligraphy.

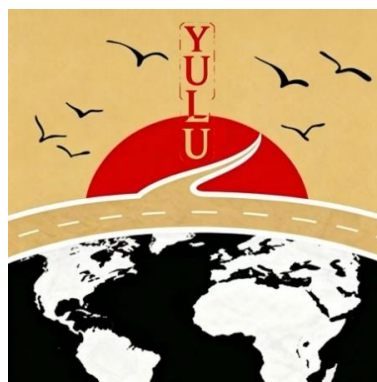


Figure 7. Conceptual diagram of the LOGO of the Language Path APP.

3.2.2. Main interface design

It follows minimalism. The bottom navigation bar is “Learning”, “Community” and “Settings”. At the top of the homepage, there is a quick search bar, at the bottom of

which is “Daily Vocabulary Punch Card” (gold coin animation incentive), and then at the bottom of which are “Vocabulary Memory” and “Course Learning”, “The B-end institutional version” provides an independent management background to display the class data board.

3.3. Core learning function design

3.3.1. Adaptive Vocabulary Memory System

Based on Ebbinghaus’ forgetting curve, the revision process is divided into four phases: “Review - New Learning - Selective Practice - Spelling Practice”. Introducing “Contextual Memory”, which integrates the vocabulary into the sample sentences of HSK questions and uses AI to generate relevant cultural background pictures. Users can set their own daily learning amount (5-30 words) and add vocabulary into the “Key Book” or automatically into the “Error Book”.

3.3.2. The system of questions and mock exams

Provides past years’ HSK questions and practice papers, strictly timed, no screen cutting. Objective questions are automatically corrected, subjective questions (essays) are graded using natural language processing technology for grammar and logic, and speaking questions are corrected in real time using speech recognition to compare with the standard PF map. All questions are equipped with detailed explanations, and a mechanism of “error correction” is set up to reward users with “learning coins” for their feedback on valid errors.

3.3.3. Chinese Character Writing and AI Correction

Aiming at the neglected pain point of Chinese character writing, it develops a writing scoring system based on touch track recognition, which scores the correctness of the stroke order, the completeness of the number of strokes, and the alignment of the structure in three quantifiable dimensions (Figure 8). The spoken language module adopts AI speech recognition technology to provide real-time feedback on pronunciation accuracy and mark difficult issues such as tones and paediatric sounds.



Figure 8. Diagram of the design of the core learning functions.

3.4. Community exchanges and cultural deep-dive designs

In response to the findings of the survey on “insufficient cultural depth”, the “Chinese Cultural Circle” section was established. The content covers three series: “Hall of Thought” (an analysis of the philosophies of Confucianism and Taoism),

“Poetry Workshop” (an appreciation of classical poems and a game of Flying Flower Decree), and “Historical Stories and Characters” (stories and stories of history). (historical stories and characters). The content includes graphics, short videos, and interactive quizzes. Users who post quality cultural learning notes or participate in activities can get “quality sharing” certification and learning coins, forming a UGC cultural ecosystem.

3.5. Intelligent diagnostic and predictive modelling of data

3.5.1. Intelligent diagnosis of data

This is the core technical barrier of the Language Road APP. The model collects three types of data: explicit data: correct answer rate, completion time, clocking frequency; implicit data: multiple-choice hesitation time (reflecting the degree of ambiguity of the knowledge point), Chinese character writing consistency, spoken pronunciation spectrum characteristics; emotional data: community posting emotional tendency, course rating and feedback.

3.5.2. Predictive modelling

Using a collaborative filtering algorithm with Item Response Theory (IRT), the model can be realized; learning prediction: predict the probability of students passing the HSK in the future and the expected time to prepare for the exam; churn early warning: when detecting the continuous low activity of the user and a decline in the correctness rate, it automatically triggers an early warning to notify the agency to intervene.

4. Landed Practice Programmes and Cases

This chapter describes how to transform the Language Path App from a learning tool for personal use to a platform to support institutional training and achieve commercialisation.

4.1. Operating modalities and business models

This project targets the dual needs of institutional services and student applications, and proposes a business model that combines both ends.

Charges to institutions: When training institutions or schools use our system, they are charged an annual fee according to the number of teacher accounts or the number of students. We provide a management backend for the organisation, including data view, courseware library, independent question generation and other functions.

Charges to students: In the APP used by students, basic functions (e.g. dictionaries, learning communities, general courses) are free of charge. Higher-order functions (e.g. AI one-on-one practice, lectures by famous teachers, detailed learning analysis reports) are available at a low membership price (monthly recharge).

Generally speaking, the operation logic of this project is to attract a large number of students to use the app through the free function, collect their learning behaviour data, and continuously optimize the analysis model. The results of these analyses are then fed back to the partner institutions to help them recruit students more accurately, teach them in a more targeted way, and serve them in a more detailed way. This not only improves teaching efficiency, but also makes the project sustainable.

4.2. Specific empowerment scenarios and solutions

Table 2 shows that many training organisations find it difficult to provide visual proof of the effectiveness of their teaching in the recruitment process. The Linguapath APP is supported by intelligent assessment tools, which can generate a six-dimensional radar chart of students' ability after completing the assessment, which is more convincing than the traditional audition class. In some institutions, there are problems of inconsistency in the curriculum system and different teaching standards of teachers. Linguapath APP provides a standard courseware library and question bank, and new teachers can directly use the pre-set mature teaching model to teach. The high turnover rate of students is also a common problem. The Language Road APP automatically pushes personalised assignments and sets up class rankings to create a competitive atmosphere and enhance students' motivation to learn, thus reducing the turnover rate. In addition, in response to the lack of brand and cultural connotation of the institution, Linguaphone APP organises cultural activities to help the institution gradually build a brand image featuring cultural communication.

Table 2. Pain points and programme solutions.

Pain Points for Institutions	Yulu APP Empowerment Solutions	Core Value
Difficulty in student recruitment and externalizing teaching results	Smart assessment for lead generation: Provide free "Precise Chinese Proficiency Assessment" that generates a six-dimensional capability radar chart, more convincing than trial classes.	Reduce customer acquisition cost and improve conversion rate.
Non-standardized teaching, uneven teacher quality	Standardized teaching system: Provide HSK standardized courseware library and question bank. New teachers can directly access the "golden teaching model" data.	Improve teaching standardization and accelerate teacher replication.
No after-class supervision, high student churn	Learning alert and supervision: Automatically push personalized homework, class leaderboard creates competitive atmosphere. Automatic alerts for students at risk of churn.	Enhance student stickiness and reduce churn rate.
Single brand image, lack of cultural depth	Cultural IP activities: Organize online "Poetry Chain" and "Chinese Character Writing Competition" to generate high-quality UGC content.	Shape a high-end brand image of "spreading culture".

4.3. Cases of landed practice: the example of the cooperation with the "Mimei Studio"

4.3.1. Overview of the co-operating parties

Meimei Studio is a small educational training organisation for students of all stages, with 20 teachers and an annual average of 3,000 students. Its pain point is more dependent on the offline model, teachers heavy burden of lesson preparation, students are mostly art students with poor foundation and lack of supervision of after-school practice Overall, there is a certain gap between the overall scale and the expected results.

4.3.2. Collaborative implementation process (October 2025-March 2026)

Phase 1 (1 month): System deployment and training. Download the institutional version of Linguaphone APP for the organisation and import their existing students'

data. Conduct two online training sessions for teachers, explaining how to post assignments, view data boards and other specific operations.

Phase 2 (2 months): Teaching and learning integration. Teachers are required to use the APP standardised courseware library to deliver lessons, and to assign personalised homework through the APP after lessons. Beginning to use the “Smart Assessment” tool to test the level of new students entering the school.

Phase 3 (3 months): deepening operations. Organise an online “Mid-Autumn Poetry Conference” cultural activity, mainly in the APP community. Make use of the APP's activity reminder function to call back the students with low learning frequency.

4.3.3. Empowerment effectiveness data (after 6 months of cooperation)

Recruitment: After using the smart assessment tool, the proportion of students who are willing to take a trial lesson after consultation has increased. A certain percentage of new students are recommended by the assessment function.

Teaching: Teachers spend significantly less time preparing lessons (due to the use of standardised courseware). Entrance tests for new students are mainly done on an app, so that the students' abilities can be clearly checked.

Services: The number of hours per week that students spend on the app has increased. Most of the students who might have been refunded were successfully retained. The proportion of students who renewed their membership increased.

Branding: The online cultural activities received more views, and the quality content generated by the students was used by the organisation to promote the organisation to their friends, so the reputation of the organisation has improved.

4.3.4. Case Insights

This case shows that the empowerment of training organisations by the Language Road App is feasible. The key is:

Firstly, technology needs to be integrated into the whole process of teaching and learning (lesson planning, classroom, homework, testing) and not just used as a stand-alone tool.

Secondly, the data should generate actionable cues (e.g. low activity alerts, personalised recommendations) rather than just displaying reports.

Thirdly, the organisation of appropriate online cultural activities can enhance the activity of students and the image of the institution.

4.4. Implementation pathways and safeguard mechanisms

In order to bring empowerment programmes to scale, the following mechanisms need to be put in place:

First, channel co-operation. Establish contact with local university student tutoring platforms, language learning clubs, and study abroad agents to reach out to training organisations through them. Student teams can make use of their campus and social networks to make connections.

Second, customer service support. The establishment of a special follow-up personnel, responsible for the use of training, daily questions and answers, the effect of regular visits, to ensure that the agency can continue to use and see the results.

Thirdly, content co-creation. Cooperating institutions are invited to co-produce questions and cultural learning materials. Organisations that contribute high-quality content can be given a share of the revenue or free access to advanced functions to encourage continuous updating of content.

5. Project Planning and Future Prospects

5.1. May 2025-June 2025: research to prepare the ground

In this phase, we will start the preparatory work before the start of the project, the main task is to complete the knowledge base required for the start of the project, the analysis of existing software in the market, the research of user requirements and the division of labour among the team members.

Knowledge reserve: through China Knowledge Network, CNKI and other authoritative literature library, with “Chinese learning”, “software development”, “learning platform” as the key words, search for the software development needs. The key points and difficulties of software development will be clarified.

Software Comparison: Research and analysis of existing international Chinese education software (e.g. Multi-Neighbourhood, Pleco, Rosetta Stone, etc.) in the market, and search for potential markets by comparing the differences in functionality, performance and user evaluation.

User Survey: A questionnaire will be designed for international students to investigate their learning priorities and difficulties in phonetics, intonation and grammar. The questionnaire will combine quantitative and qualitative methods, with multiple-choice and fill-in-the-blank questions, in order to collect data as comprehensively as possible and to understand the common problems of the target group.

Team division of labour: according to the members’ specialties and project needs, the programme team, research and development team and analysis team are set up respectively. The responsibilities of each team member are clearly defined in order to promote the efficient promotion of the project.

5.2. July 2025-October 2025: implementation phase

At this stage, the main tasks are to complete the collection and analysis of the questionnaire, and to create a model of international Chinese language education software with basic functions.

Questionnaire collection: After eliminating invalid questionnaires, more than 100 valid samples were collected, covering Chinese learners of different backgrounds. The answers were statistically analysed, and the research and development focuses on common problems and difficulties as representative directions.

Functional construction: The functional modules of this international Chinese education software mainly focus on four parts: phonetics, grammar, vocabulary and comprehensive training, and four core parts are developed to realise the functional construction, i.e. phonetics assessment module, grammar checking module, vocabulary memorisation system, and comprehensive testing function, and the expected results are to complete the development of the basic version in priority, and to set up a basic framework for solving the pain points of international students' learning.

5.3. November 2025-January 2026: analysis phase

In this phase, we need to focus on user evaluation and data indicators, and continuously promote the optimisation and upgrading of the product.

User Feedback: Through cooperation with international students on campus and other ways to establish a long-term test user group, we collect their real feedback, summarise the links that need to be optimised, fix the problems and optimise the upgrades in a timely manner. At the same time, we release beta versions every month, containing new features and optimisation points developed from the feedback, in order to improve the user experience and satisfaction of the product.

Data Indicator: Using the data recording function carried by the software, it automatically records the user's daily study hours and high-frequency error knowledge points, analyses the learning habits and weak links through visual charts, provides data support for personalized learning programs, and focuses on the progress of the integrated part of the user.

5.4. January 2026-February 2026: wrap-up phase

The wrap-up phase focuses on a comprehensive review of the effectiveness of the implementation of the software and the launch of a multi-channel publicity campaign (Figure 9).

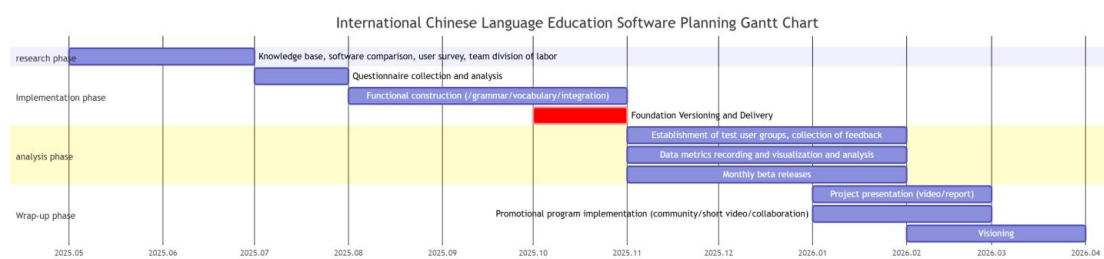


Figure 9. Gantt chart of the International Chinese Language Education Software Development Programme.

Project Presentation: By filming the video of the students, we record the comparison of the real phenomena such as pronunciation, grammar application and other real phenomena when they use the software one after another, and then create a visual case report. In addition, with the help of software-related data, we collated and analysed user learning data, wrote performance improvement reports, and compared HSK mock test scores, error rate changes, and other quantitative indicators to present the actual effect of using the software.

Promotion programme: We will create WeChat groups, QQ groups and other online communities, and shoot short videos to show the product functions and user evaluation through Jittery Voice, B station and other platforms. We will also strive to cooperate with universities to integrate our research and development results into actual international Chinese language teaching, and recommend the product to international Chinese language training institutions to make up for the shortage of teachers.

Long-term development vision: to ultimately realise the construction of the “International Chinese Data Centre”, expecting to make Chinese learning more efficient and interesting through the power of technology, so that Chinese culture can really achieve the leap from “cultural confidence to other’s conviction” through

digital “language path”, and to contribute to the construction of a community of human destiny through the power of language. We hope that through the power of technology, Chinese learning can be made more efficient and interesting, and Chinese culture can truly realise the leap from cultural confidence to other people’s conviction through the digital “language path”, contributing to the construction of a community of human destiny.

6. Conclusions

Based on the multi-dimensional evaluation of existing products such as Multi-Neighbourhood, Rosetta Stone and Pleco, combined with an empirical survey of more than 100 learners, this study summarizes the pain points of the current Chinese learning APP market. The conclusion of the study shows that a personalised learning path driven by big data and artificial intelligence, combined with the deep excavation of cultural heritage, is an inevitable direction for the development of international Chinese language education. Accordingly, this study designs and develops the “Language Path App”, an intelligent learning tool that integrates voice assessment, grammar checking, vocabulary memorisation and comprehensive testing. The project builds a five-layer system architecture of “data collection-feature extraction-diagnostic analysis-decision output-ecological service” to achieve precise analysis of learning and planning of personalised learning paths.

The contribution of this report is that it not only completes the product design, but also focuses on the construction of practical solutions that can be put into practice. Through the cooperation case with “Meimei Studio”, it proves that LinguaLu APP can help training institutions to achieve the purpose of increasing enrolment conversion rate, reducing the burden of teachers, decreasing the turnover rate of students and upgrading the brand. This proves the effectiveness and replicability of the synergistic development model of “technology platform + training institution”.

Intelligent technology to the main force, the “language road” to the longer term. Finally, the road of international Chinese language education is a technology-driven road, precise service road, cultural dissemination road, open sharing road. Only with data-based, algorithmic core, and user-oriented, can we make Chinese language learning more efficient, teaching resources more inclusive, and the road of Chinese culture dissemination farther and farther. This report would like to take this opportunity to bring together the strengths of universities, institutions, technology platforms and learners to contribute to the building of Chinese language international communication capacity and the enhancement of cultural exchanges between China and the world in a small way.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research was supported by the following projects:

Quzhou University 2025 National College Student Innovation and Entrepreneurship Training Program Project “International Chinese Education Data Platform: Intelligent

Diagnosis and Prediction Model for Multi module Learning Behavior”, Project No. 202511488065.

2024 Quzhou University the construction project of the “Mentor+Project+Team” Innovation and Entrepreneurship Workshop, “Smart Book Boat”, Project No. SH20241101.

The key cultivation project of the 15th “Challenge Cup” Undergraduate Entrepreneurship Plan Competition of Quzhou University, “Chinese Children’s Voice - AI Pinyin Learning System for Overseas Chinese Children Enabled by edge computing”.

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