

# Journal of Educational Theory and Practice

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## Journal of Educational Theory and Practice

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## Table of Contents

- 1 The Three-Dimensional Perspective of Artificial Intelligence-Aided University English Course Reform from the Perspective of Core Disciplinary Literacy**  
*Jiarui Zhang*
- 7 Impacts of AI-Enhanced LLS Instruction on the English Performance of College Underachieving EFL Learners**  
*Chen Jiao, Malini Ganapathy, Hongjing Chang*
- 19 Exploring the Significance of Adolescent Sex Education Based on Social Media**  
*Shaixin Zheng, Ming Han*
- 28 Research on the School-running Efficiency of Ordinary Universities in the Western Region Based on the Combined Model**  
*Yan Zhao*
- 36 Discussion on Enterprise Management System of Art Training School**  
*Yuanyuan Liu*
- 41 Teacher Identity in the Era of Intelligence**  
*Jingbo SHAO, Siwei SUN*
- 50 Research on the Interdisciplinary and Interdisciplinary Training of High-Level Legal Talents in Jiangsu Universities under the Background of “Artificial Intelligence+”**  
*Dejun Zhou, Yubing Niu*
- 60 Markedness Theory and Universal Grammar in Chinese Language Acquisition**  
*Hanqiang Li*
- 66 The Development Status and Enhancement Strategies of International Chinese Language Education**  
*Zheng Xianlang, Luo Na*



# The Three-Dimensional Perspective of Artificial Intelligence-Aided University English Course Reform from the Perspective of Core Disciplinary Literacy

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**Abstract:** Artificial intelligence, as an emerging educational technology, has gradually penetrated into the reform of university English curriculum and become an important tool for promoting educational innovation and improving teaching quality. This paper is based on the significance of artificial intelligence to help the reform of university English curriculum, for the current reform of university English curriculum is faced with the teaching concept to be updated, teaching content and methods to be perfected and the construction of teachers to be strengthened and so on, puts forward the promotion of the innovation of teaching concepts, improve the content and methods of teaching and strengthen the construction of teachers, etc., which provides some references to the promotion of China's university English education reform.

**Keywords:** Higher Education; English Curriculum Reform; Artificial Intelligence; Disciplinary Core Literacy

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## Introduction

Artificial Intelligence (AI), as a revolutionary technology, has gradually penetrated into all fields of society, especially in the field of education, where its influence has become more and more significant<sup>[1]</sup>. Especially in university English teaching, with the accelerating process of globalization, English, as an important tool for international communication and cooperation, has become an essential core subject in higher education<sup>[2]</sup>. The traditional teaching mode of university English, although meeting the basic teaching needs for a certain period of time, has exposed many problems with the change of times and social needs, restricting the efficient development of English education. In order to meet the requirements of education in the new era, it has become an important task to promote the reform of college English curriculum.

With the concept of disciplinary core literacy proposed and widely applied, the direction of reform of university English education should not only focus on the teaching of language knowledge, but also on the cultivation of students' comprehensive literacy and core competence<sup>[3]</sup>. Disciplinary core literacy, as the necessary abilities required by students for the future society and workplace, emphasizes the cultivation of the integration of interdisciplinary knowledge, innovation and critical thinking<sup>[4]</sup>. In this context, the application of artificial intelligence technology provides new opportunities and possibilities for the reform of university English curriculum. AI technology can not only effectively improve the efficiency of English learning through intelligent means, but also provide strong support in personalized education, resource sharing and

innovation of teaching methods, further promoting the profound change of the shape of university English education.

This paper combines the current status quo of university English curriculum reform with the perspective of disciplinary core literacy, with a view to exploring the application path of artificial intelligence in the reform of university English curriculum and providing reference for comprehensively improving the quality of university English education.

## **1.The Value Implications of Artificial Intelligence Assisting the Reform of College English Curriculum**

### **1.1 Driving change in the shape of university English education**

Artificial intelligence can make university English education shift from the traditional teacher-centered teaching mode to the student-centered learning mode through intelligent teaching tools and platforms, greatly enhancing students' learning autonomy and participation. With the help of AI, students can not only receive real-time feedback and personalized tutoring in the classroom, but also obtain targeted learning resources and exercises through the intelligent platform after class, forming a more flexible and efficient learning mode. Students are no longer passive recipients of knowledge in English learning, but active participants and self-driven learners, which promotes the diversification of teaching goals and the personalization of teaching effects<sup>[5]</sup>.

The application of artificial intelligence provides the field of English education in higher education institutions with unprecedented data processing and analysis capabilities. Artificial intelligence can monitor and analyze students' learning dynamics in real time through big data analysis technology, providing teachers with more precise and detailed teaching feedback. Data-based teaching methods can help teachers accurately diagnose students' learning needs and weaknesses, and also make the teaching process more scientific, precise and efficient. Students' learning history, behavioral data and interest preferences can be analyzed to intelligently recommend personalized learning resources and practice content, achieve accurate matching of educational resources, and optimize the presentation of teaching content. Transformative technology has driven a profound transformation of the English education model, bringing unprecedented innovation and change to traditional teaching methods.

### **1.2 Contribute to the high-quality development of university English education**

The application of artificial intelligence in university English education profoundly promotes the optimization and integration of teaching resources. In the traditional teaching system, teaching resources often show the characteristics of fragmentation and localization, especially high-quality teaching materials and learning resources are limited to the mastery and use of some schools or specific teachers. The fragmentation of resources limits the dissemination of educational content and the enhancement of learning effects<sup>[6]</sup>. Intelligent platforms based on artificial intelligence and supported by cloud computing technology can break through the traditional time and space constraints, realize the seamless integration and sharing of global high-quality educational resources, and provide teachers and students with richer and more diversified learning content and interactive forms.

The innovation of artificial intelligence in teaching feedback and academic assessment further promotes the high-quality development of university English education. The traditional evaluation system is mostly based on students' test scores as the main measurement standard. A single assessment method cannot fully reflect the actual ability of students, and it is easy to lead to students' mechanized and monotonous dependence on English learning. Artificial intelligence can provide students with richer and more detailed evaluation methods through natural language processing, speech recognition and other technologies. Students' oral expression, listening comprehension and writing ability can all receive real-time feedback through intelligent assessment tools. Intelligent assessment improves the efficiency and accuracy of assessment, and moreover stimulates the improvement of students' abilities in all aspects of listening, reading and writing through a comprehensive and multi-dimensional assessment method. The innovation of artificial intelligence in the field of assessment has changed the traditional mode of assessment, and promoted the improvement of education quality, so that the educational objectives can be more comprehensively implemented.

### **1.3 Promoting equity and resource sharing in higher education**

Artificial intelligence technology can break the geographical and resource limitations existing in the traditional education

model and promote the globalization of the flow of educational resources. Artificial intelligence can realize the global sharing of educational resources through intelligent platforms, cloud computing and big data technology. Whether it is online courses, educational software, or world-leading English learning materials, they can be opened to students in all universities through AI technology, thus enabling students in remote or resource-poor areas to have access to high-quality educational resources. Artificial intelligence breaks down the educational divide between regions and also realizes the fair distribution of educational resources across the country, providing strong support for educational equity.

The application of artificial intelligence in education has demonstrated its far-reaching potential for overcoming learning barriers and promoting educational equity in terms of personalized learning support. The learning progress, ability differences and individual needs of students in the traditional education model often lead to an uneven distribution of educational resources, affecting educational equity. The introduction of artificial intelligence provides tailored learning content and feedback for each student, greatly facilitating the realization of personalized teaching. Based on analyzing students' learning trajectories, knowledge mastery, and cognitive styles, AI is able to recommend the most appropriate learning materials and training strategies for students based on a precise understanding of their learning status. This can effectively help students overcome learning difficulties, especially for students with weak foundations or special needs, and provides efficient learning support.

## **2. Bottlenecks Facing the Reform of College English Courses in the Perspective of Disciplinary Core Literacy**

### **2.1 Teaching philosophy to be updated**

The traditional concept of English teaching is still rooted in the examination-oriented education model, where teachers' and students' understanding of language learning mostly stays at the level of teaching basic knowledge such as grammar and vocabulary, and lacks the cultivation and enhancement of students' comprehensive language ability. Under this concept, the focus of teaching is centered on the mere explanation of language knowledge, ignoring the essence of English as a communication tool, and failing to effectively stimulate the cultivation of students' language application ability and cross-cultural communication ability. The traditional teaching concept of focusing too much on grammar and vocabulary fails to meet the requirements of the core qualities of the discipline, such as "language application ability", "critical thinking" and "intercultural communication ability". The traditional teaching concepts of grammar and vocabulary have not been adapted to the core qualities of the subject, such as "language ability", "critical thinking" and "intercultural communication ability".

The current concept of English teaching lacks attention to students' individual differences. In the past, teachers usually relied on uniform teaching materials and teaching plans, and paid insufficient attention to students' learning progress and differences in interest, and taught in a "classroom-full" manner, neglecting the cultivation of students' subjectivity and independent learning ability. The promotion of core academic qualities requires that we emphasize the cultivation of students' independent learning, critical thinking and innovation ability, but the existing teaching concepts have not yet taken these qualities as the core of the teaching and learning objectives of , which leads to students being in a state of passive acceptance of knowledge in the process of English learning, which restricts the development of students' potential, and makes it difficult to adapt to the diversified qualities of the English language talents needed in the times.

### **2.2 Teaching content and methods need to be improved**

The current teaching content is relatively traditional, still focusing on the explanation of basic knowledge such as grammar and vocabulary, neglecting the cultivation of language application ability and intercultural communication ability. Most of the content settings and textbook arrangements of university English courses are centered on the demands of examinations, favoring the teaching of language knowledge and lacking the cultivation of students' practical language application ability. The knowledge-driven content design deviates from the goal of focusing on the cultivation of ability and the development of comprehensive quality in the core qualities of the discipline, which leads to the fact that although students have a certain language foundation, they lack sufficient practical ability and the ability to cope with complex situations when they actually use English to communicate and express themselves.

The teaching methods of university English courses are relatively single, still dominated by traditional lecture teaching, with

insufficient cultivation of students' active participation and innovative thinking. Under the existing teaching mode, classroom teaching mostly relies on teachers' explanations and students' listening, with limited opportunities for classroom interaction and students' language practice. Although this teaching method can cover certain knowledge points, it is difficult to stimulate students' interest in learning and cannot effectively improve their comprehensive language ability. Under the perspective of disciplinary core literacy, language learning is not only the mastery of grammar and vocabulary, but also the cultivation of critical thinking, creative expression and cross-cultural understanding. Existing teaching methods are insufficient in this regard, and the teaching process relies more on mechanized knowledge transfer, but lacks effective inquiry and practical links, which makes it difficult to fully stimulate students' active learning consciousness and innovation ability.

### **2.3 Teacher training needs to be strengthened**

There are gaps in teachers' professionalism and comprehensive abilities. Modern English education requires teachers to have solid language knowledge and teaching skills, as well as strong cross-cultural communication skills, information technology application skills, and the ability to cultivate critical thinking. However, the current literacy of some English teachers in these areas is relatively weak, especially in the application of information technology and artificial intelligence, where teachers' abilities are generally low. Although education informatization has become an important means to improve the quality of education, many English teachers lack sufficient understanding and mastery of the application of intelligent teaching tools, network platforms, and technologies such as big data analysis, making it difficult to effectively utilize these emerging technologies in teaching to promote the innovation of students' learning modes.

Teacher development suffers from insufficient opportunities for professional development. Many English teachers face the dilemma of narrow space for promotion and development during their professional development, especially for young teachers, and the lack of sufficient training and further education opportunities makes it difficult for them to receive timely academic support and professional growth. The education reform requires teachers to have not only in-depth subject knowledge, but also the ability to continuously update their teaching methods, philosophies, and interdisciplinary integration. However, many teachers rely on traditional teaching experience and lack the ability to learn and practice emerging educational theories and technologies to effectively integrate subject core literacy into their teaching activities. Teachers' professional growth depends on their own efforts, and they also need external academic support and educational training, but the current opportunities and platforms for teachers in this regard are obviously insufficient, which makes the overall level of teacher training lagging behind.

## **3.The Practical Path of Artificial Intelligence Assisting the Reform of College English Curriculum in the Perspective of Disciplinary Core Literacy**

### **3.1 Promote innovation in teaching philosophy**

The application of artificial intelligence provides teachers with richer teaching tools and data support, and promotes the transformation of teachers from the traditional mode of knowledge transmission to student-centered interactive and inquiry teaching. Through the intelligent teaching platform of artificial intelligence, teachers can obtain students' learning data, analyze students' learning status and problems in real time, and tailor a personalized learning plan for each student. The data-driven teaching concept can help teachers better understand the learning progress and needs of students, adjust the teaching content and methods, truly realize the teaching of students according to their aptitude, and enhance the relevance and effectiveness of teaching.

The introduction of artificial intelligence promotes the innovation of classroom teaching, and pushes the teaching concept from centering on "knowledge transfer" to centering on "ability cultivation". By providing personalized learning paths and interactive learning resources, AI makes classroom teaching not only limited to the cultivation of the traditional four basic skills of listening, speaking, reading and writing, but also extends to the cultivation of multi-dimensional abilities such as language practice, cultural understanding and innovative thinking. The AI-based teaching platform can recommend relevant learning materials according to students' interests and needs, promote students' active exploration and participation, cultivate their independent learning ability and innovative thinking, and then realize the comprehensive cultivation of subject core literacy.



The introduction of artificial intelligence breaks through the time and space limitations of the traditional classroom, and also provides new impetus and possibilities for the innovation of online and offline hybrid teaching mode. In the traditional education model, teaching activities are usually limited to a fixed time and space, and the learning process of students often depends on the direct guidance of teachers in the classroom. The use of AI technology, however, has expanded and transformed the model that relies on the physics classroom, promoting the rise of an independent learning model supported by an intelligent platform. This model allows students to no longer be limited to face-to-face lectures in the classroom, but to be able to learn independently outside the classroom through smart platforms, accessing customized learning content, personalized tutoring, and instant feedback anytime, anywhere.

### **3.2 Improvement of teaching content and methods**

Artificial intelligence has profoundly integrated and optimized teaching resources through the application of intelligent recommendation systems, significantly breaking through the limitations of traditional teaching that relies only on textbooks. Intelligent technology enables students to expand their learning horizons not only through traditional textbooks, but also through diversified extracurricular learning resources such as e-books, video courses and online tests. The extracurricular resources complement the classroom teaching content, helping students learn independently outside the classroom and promoting the overall improvement of their language skills. Teachers can use artificial intelligence systems to analyze students' learning preferences, cognitive characteristics and knowledge weaknesses, and dynamically adjust the recommended learning resources based on real-time data. When students make significant progress in listening and speaking, the system can intelligently push more challenging and advanced listening materials, or recommend simulated conversations to further improve oral expression.

It provides teachers with more flexible and interactive teaching tools. Based on speech recognition and natural language processing technology, teachers are able to utilize intelligent tools for language interaction in the classroom in real time, which can effectively improve students' listening and speaking skills through two-way communication with students' voice and text, and also correct students' errors in pronunciation and grammar instantly. Through the support of AI technology, teachers can create richer language practice opportunities for students. Simulated contextualized language learning scenarios allow students to engage in interactive conversations with foreigners on a virtual dialogue platform, which greatly enhances students' contextualized language use ability. This kind of practical teaching method helps students to skillfully use the language they have learned in real contexts, thus enhancing their communicative competence.

Help teachers implement precise teaching interventions. Based on the AI platform, teachers are able to access students' learning data in real time, covering dimensions such as learning duration, learning depth, and question-answering accuracy. These data provide teachers with clear feedback on students' learning status, which allows them to assess students' learning progress and adjust teaching strategies. For students who are slow in learning or have difficulty in understanding certain knowledge points, teachers can provide more tutoring resources and intensive practice in a timely manner. For students who are progressing faster, teachers can push more challenging learning materials to maintain their motivation and interest in learning. The data-driven precision teaching intervention mechanism ensures that each student learns best in an environment that suits his or her pace and difficulty, and promotes personalization and refinement of education.

### **3.3 Strengthening of the faculty**

Based on the intelligent assessment system, teachers are required to reflect and feedback on their teaching activities in real time to continuously refine their teaching abilities. Artificial intelligence can accurately analyze student learning data to reveal weaknesses and potential problems in classroom teaching and provide practical suggestions for improvement based on the data results. The system can analyze students' performance in the classroom, including their accuracy in answering questions, class participation and learning progress, helping teachers identify key issues in teaching and then adjust teaching strategies and methods to achieve more efficient teaching outcomes. The use of AI can also meticulously analyze teachers' teaching styles and classroom interactions, helping teachers understand students' needs and emotional states from a data perspective, optimize classroom management and instructional design, and enhance teaching effectiveness and students' learning experience.

Teachers can access the latest teaching theories and educational research results through AI, and also receive customized teaching support according to their own teaching needs. . The AI platform can intelligently recommend the most suitable teaching methods and resources according to teachers' specific needs, ensuring the richness and diversity of teaching content. The platform can also provide teachers with the latest research progress on the subject, the dynamics of education reform and advanced teaching experiences at home and abroad, further broadening their knowledge and vision and enabling them to respond more flexibly to different teaching challenges in teaching practice.

#### **4.Conclusion**

The assistance of artificial intelligence to the reform of university English curriculum is a process of deep integration of technology and educational concepts, which not only provides new means for education, but also offers more possibilities for the realization of educational goals. In the face of future educational challenges, artificial intelligence will continue to provide a steady stream of power for educational innovation, promote the comprehensive development of educational concepts, teaching content, teaching methods and the construction of teachers, and provide strong support for the cultivation of innovative talents that meet the requirements of the times.

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# Impacts of AI-Enhanced LLS Instruction on the English Performance of College Underachieving EFL Learners

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**Abstract:** This study aims to investigate the impacts of LLS AI-enhanced LLS instruction on the English performance of college underachieving EFL learners. Language learning strategies (LLS) are crucial for English language learning, but few studies exist on LLS instruction for EFL underachievers, highlighting further research needs. This study investigates the frequency and preference of language learning strategies used by EFL underachievers and the impact in increasing their strategy application and English academic achievement. The research involved 450 Chinese EFL college learners and 40 Chinese EFL learners, using the Strategy Inventory for Language Learning (SILL), CET-4, and college English final exam. The results showed that underachievers perceived LLS instruction positively, improved their LLS application, and had a positive effect on their English learning skills and academic achievement. The study revealed the effect of LLS instruction and generated an efficient LLS instruction model on underachieving learners and made a useful attempt in the field of research on LLS of vocational EFL college learners. Further research may investigate the hidden influence factors of LLS use of college underachievers.

**Keywords:** Underachieving EFL Learners; AI-enhanced LLS Training; Language Learning Strategy (LLS); Vocational College

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## 1.Introduction

### 1.1 Research Background and Importance

The foremost objective of English education is to equip learners with strategies essential for the critical reconstruction, analysis, differentiation, and expansion of information to produce strategic insights <sup>[1]</sup>. Teaching language learning strategies is crucial for aiding students in enhancing their autonomy and self-control, has become a key focus in LLS studies as part of a new millennium strategy <sup>[2],[3]</sup>. The core principle of LLS teaching lies in the belief that equipping people with essential skills yields more substantial long-term advantages compared to merely addressing their immediate requirements temporarily. Put differently, merely supplying students with a response to an inquiry might restrict their inquisitiveness. The moment teachers respond to students, the immediate query is resolved; however, by instructing students in efficient language acquisition techniques that enable them to solve the questions independently, students might perceive themselves as influential in controlling their English language learning journey <sup>[4]</sup>. Additionally, this forms the essential prerequisite for the research. Khan and Khan emphasized the advantages of LLS teaching in enhancing English reading, speaking, vocabulary, and pronunciation. Educators ought to guide pupils through both overt and subtle methods of language acquisition.

A primary acknowledged issue is the extensive time and effort Chinese college students dedicate to learning English. Nonetheless, a persistent issue over the years is the insufficient understanding of effective English learning methods<sup>[5]; [6]</sup>. Consequently, students frequently confront the hurdle of ineffective language acquisition, in spite of their arduous tasks. Furthermore, numerous initiatives have been undertaken to formulate various theories, techniques, and approaches for language instruction, including the grammar translation method (utilizing books and worksheets for exercises, translation and memorization exercises, and cramming instruction), audiolingualism (using visual representations for role-playing, conversational activities, and games), and the communicative method (employing books, audio, and visuals for certain drills, memorization exercises), with just three of the most recognized and commonly employed methods<sup>[7]</sup>. Nonetheless, issues pertaining to student learning have been addressed as comparative neglect<sup>[8]</sup>, with significantly less focus on the process of language development from the educational perspective. Despite significant research into language acquisition, considering the learner as part of the teaching/learning duo, it's often surprising that scholars generally overlook the importance of the learner's contribution<sup>[8]</sup>. Consequently, the objective of this research was to investigate the impact of LLS teaching on college students with lower-than-average vocational skills, by pinpointing an effective LLS teaching approach that enables them to autonomously manage and inspire their English education.

Nonetheless, a demographic disparity exists concerning EFL underachievers in vocational schools. Earlier research has mainly concentrated on EFL students in primary and middle schools within standard classroom environments, investigating below-average EFL learners<sup>[9]</sup>. Tang's<sup>[10]</sup> research clearly shows a disregard for underperforming individuals. Furthermore, although Habók, Magyar, and Molnár<sup>[11]</sup> examined the impact of specific educational tactics on secondary schoolers, these results are not broadly applicable to English as a Foreign Language (EFL) environments. Likewise, research like Wyra and Lawson's<sup>[12]</sup>, focusing on experimental strategy teaching, was confined to primary language environments and failed to sufficiently cater to the requirements of EFL students. Consequently, pinpointing efficient LLS tailored for those with low EFL vocational success is crucial to aid TESOL professionals in improving teaching quality and streamlining the educational journey for these learners. This extends past just attaining high grades, aiming to equip them for practical situations. Therefore, the research focused on examining the impact of LLS teaching on vocational EFL underachievers and addressing the previously mentioned gaps in the population.

## 1.2 Research Objectives

Ultimately, considering the previously stated deficiencies, this research intends to utilize practical philosophical foundations, LLS training models, and Gagné's theory of information processing to explore the impact of LLS instructions on vocational college students. According to the aforementioned theories, learning is perceived as a dynamic and ongoing process where learners choose from new information, store it in their long-term memory, and access it as needed<sup>[13]</sup>. Various elements present in a school or district, like proficiency in LLS and the presence of highly skilled educators, have a direct impact on student achievement. Additional elements outside the influence of educational institutions might encompass community safety. Moreover, vocational college-trained students serve as the primary providers of technical and technical skills, playing a crucial role in enhancing human capital quality, fostering industrial growth, and contributing to superior economic development<sup>[14]</sup>. Nonetheless, the performance level of the majority of English students in vocational schools is relatively low. English holds a crucial position in vocational training, signifying its immense importance to students in vocational fields. Then the research questions are displayed as follows:

RQ1: Does a notable correlation exist between AI-enhanced LLS instruction and the strategy application of EFL underachievers in the Chinese vocational college?

RQ2: Does a notable correlation exist between AI-enhanced LLS instruction and the English academic achievement of EFL underachievers in the Chinese vocational college?

### Research Methodology

It is important to note that a method design involves the use of both quantitative (questionnaire survey; quasi-experiment) and qualitative (semi-structured interview) approaches when conducting research, making it the most suitable approach to answering the research questions of the current study<sup>[15]</sup>. The study was conducted using a quantitative descriptive technique

in the first phase (quasi-experimental approach and questionnaire survey approach), and a qualitative descriptive strategy in the second phase (semi-structured interviews). More specifically, the results from the quantitative data (via Strategy Inventory of Language Learning (SILL), college English test-4 (CET-4), and college English final exam (CEFE)) are supposed to be explained and supported by the qualitative data (through Outline of semi-structure interview (OSIs)). The independent variable is LLS instruction, while the dependent variables are the strategy application and English academic achievement (EAA).

The first phase of the study was conducted via a quantitative descriptive approach, including quasi-experimental and questionnaire survey methods, while the second phase employed a qualitative descriptive approach through semi-structured interviews. Specifically, the qualitative data obtained from semi-structured interviews (OSIs) were intended to explain and support the findings from the quantitative data collected through the SILL, CET-4, and CEFE tests. In this empirical research, the quantitative data are given greater emphasis than the qualitative data <sup>[16]</sup>. Therefore, the primary conclusions of the study were drawn from both quantitative analyses and qualitative insights to reinforce the main findings. Additionally, data collection was conducted via online platforms of QuestionnaireStar, which facilitated sharing with instructor and students. SPSS 26 software was utilized for quantitative data analysis, while thematic analysis was employed to analyze the qualitative interview transcripts.

In this sub-section, the data analysis process is detailed, drawing from four research instruments: (1) the CET-4; (2) the SILL; and (4) the OSIs. The CET-4, and SILL were analyzed quantitatively, while the OSI interviews were analyzed qualitatively. Following a framework adapted from Creswell and Clark [17], quantitative data analysis involved presenting and interpreting statistical information through three types of data: descriptive statistics, frequency counts, and inferential statistics (including paired samples t-tests and Cohen's d).

### 3.Results and Discussion

To ensure the validity of the results, RQ1 and RQ2 was addressed using a mixed-methods approach. This involved a quantitative approach with the SILL questionnaire and a quasi-experiment, complemented by a qualitative approach using OSI questions to triangulate the data.

#### 3.1 Findings and Analysis in Relation to RQ 1

To ensure the validity of the results, RQ2 was addressed using a mixed-methods approach. This involved a quantitative approach with the SILL questionnaire and a quasi-experiment, complemented by a qualitative approach using OSI questions to triangulate the data.

##### 3.1.1 Results and Analysis of Quantitative Data

**A Macro Comparison of the Level of Strategy Use:** A comparison of students' levels of strategy use in experimental classes was conducted before and after the intervention. This comparison included memory, cognitive, compensatory, metacognitive, affective, social strategies, and overall strategy use. The analysis revealed significant differences in all seven areas of strategy use between the pre- and post-intervention phases. The research findings, which were detailed in Table 4.3, assessed the effect of the strategy training on the degree of strategy use among students in the experimental class.

A key finding in quantitative studies is the effect size; while the p-value indicates whether an effect exists, it does not provide information on the magnitude of the effect [18]. To address this, various statistical techniques offer a more precise estimate of treatment effects than relying solely on p-values. One such technique is Cohen's d, also known as the standard mean difference, which quantifies the size of differences between two interventions [19]. Cohen categorized effect sizes as "small effect" ( $d = 0.2-0.5$ ), "medium effect" ( $d = 0.5-0.8$ ), and "large effect" ( $d > 0.8$ ), with d values typically ranging from -1.96 to 1.96. Consequently, this study employed Cohen's d to describe the statistical significance between the two groups.

*Table 1 Comparison of strategy use pre-test and post-test of the experiment class*

Strategy	Pre-test		Post-test		Variation	Significance	
	Means	SD	Means	SD		T-value	ES Cohen's d
Memory	2.44	0.4291	3.04	0.41	0.60	-5.4757	-1.4203
Cognitive	2.57	0.4467	3.13	0.51	0.55	-6.0011	-1.1505

Strategy	Pre-test		Post-test		Variation	Significance	
	Means	SD	Means	SD		T-value	ES Cohen's d
compensate	2.71	0.4521	3.29	0.46	0.68	-4.1125	-1.7508
Meta-cognitive	2.65	0.3697	3.28	0.43	0.64	-6.7473	-1.8687
Affective	2.68	0.3764	3.19	0.35	0.51	-7.093	-1.4311
Social	2.75	0.3739	3.28	0.40	0.53	-6.6314	-1.3713
Overall	2.63	0.4080	3.21	0.43	0.57	-7.3474	-1.3811

Note: SD=standard deviation; ES= effect size

As shown in Table 1, after one semester of the LLS intervention, learners in the experimental class exhibited a statistically significant increase in the use of memory, cognitive, compensatory, metacognitive, affective, and social strategies, as well as in the overall use of strategies. The differences between the two groups were statistically significant at the 0.01 level, with metacognitive strategies showing the greatest improvement, followed by social and compensatory strategies. Additionally, all test items demonstrated progress, with the improvement rate for each of the six strategies exceeding 0.50. This indicated a substantial enhancement in the degree of strategy use among learners in the experimental class following the LLS instruction. Furthermore, the effect sizes for all strategies, as indicated by Cohen's d values, were greater than 0.8, ranging from 1.15 to 1.88, signifying large differences between the experimental group's pre- and post-intervention scores.

*Table 2 Comparison of strategy use pre-test and post-test of the control class*

Strategy	Pre-test		Post-test		Variation	Significance	
	Means	SD	Means	SD		T-value	ES Cohen's d
Memory	2.48	0.0273	2.51	0.0288	0.03	-0.3126	-0.3887
Cognitive	2.56	0.0605	2.59	0.0605	0.03	0.0836	0.1239
compensate	2.70	0.0320	2.74	0.0345	0.04	-0.1434	-0.4988
Meta-cognitive	2.61	0.0151	2.65	0.0153	0.04	-0.0689	-0.2632
Affective	2.66	0.0076	2.68	0.0076	0.02	0.0576	0.3816
Social	2.73	0.0186	2.75	0.0185	0.02	-0.1321	-0.5606
Overall	2.62	0.0092	2.65	0.0088	0.03	-0.1352	-0.3888

Note: SD=standard deviation; ES= effect size

The statistical findings presented in Table 2, based on the SILL pretest and post-test data for the control group, revealed the following: 1) There was no significant difference in the levels of use of the six-dimensional strategies and the overall strategy between the control class before and after the experiment. All students in the control class failed within the "general use" category, with scores ranging from 2.5 to 3.4. 2) The variations in the use of memory, cognitive, compensatory, meta-cognitive, affective, and social strategies, as well as the overall strategy, were 0.03, 0.03, 0.04, 0.04, 0.02, 0.02, and 0.03, respectively. These differences indicated that changes before and after the experiment did not exceed 0.1, showing minimal change. Although there was an increase in the use of memory, meta-cognitive, compensatory, and social strategies, the magnitude of improvement was small, and these changes were not statistically significant (t-values of -0.3126, -0.1434, -0.0689, and -0.1321, respectively; the coefficient is considered significant if the t-value is greater than 1.96 or less than -1.96). Additionally, the effect sizes (ES) of the five strategies had Cohen's d values of less than 0.5, ranging from 0.38 to 0.49, which fell into the small effect size range (0.2-0.5), indicating that there were minimal differences in the control group before and after the intervention.

*Table 3 Comparison of strategy use post-test of control and experiment classes*

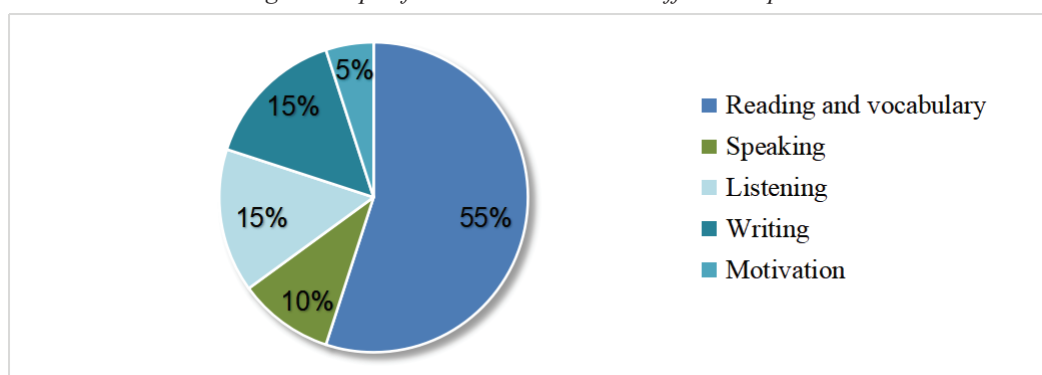
Strategy	Experiment group		Control group		Variation	Significance	
	Means	SD	Means	SD		T-value	ES Cohen's d
Memory	3.04	0.4092	2.50	0.0288	0.53	4.7497	1.8372
Cognitive	3.13	0.5127	2.57	0.0605	0.55	6.3145	1.5149
compensate	3.29	0.4581	2.73	0.0345	0.56	4.1125	1.7177
Meta-cognitive	3.28	0.4285	2.64	0.0153	0.64	7.8404	2.1092
Affective	3.20	0.3491	2.68	0.0076	0.52	7.6148	2.1040
Social	3.28	0.3981	2.75	0.0185	0.53	8.7218	1.8878
Overall	3.21	0.4259	2.62	0.0088	0.59	9.7435	1.9454

Note: SD=standard deviation; ES= effect size



According to the statistics presented in Table 3, after the experiment, students in the experimental class demonstrated significantly higher levels of strategy use across all six dimensions—including memory strategies—compared to students in the control class. All differences were statistically significant at the 0.01 level. Notably, social strategies exhibited the greatest difference with a variation of 1.01 points, followed by cognitive and metacognitive strategies, which showed differences exceeding 0.80 points. Affective and memory strategies also showed differences greater than 0.50 points, with the smallest disparities. Furthermore, the average mean of strategy use among the experimental group was higher by more than 0.5 points compared to the control group. The magnitude of these variations was substantial, and the differences were statistically significant, with t-values for the six strategies being 4.7497, 6.3145, 4.1125, 7.8404, 7.6148, and 8.7218, respectively. The coefficient was deemed significant when the t-value exceeded 1.96 or was less than -1.96. Additionally, the effect sizes for all strategies, as indicated by Cohen's d values greater than 0.8 and ranging from 1.17 to 2.10, underscored that there were large differences between the experimental and control groups following the intervention.

Figure 1 Specific LLS and its Use in Different Aspects



Based on Table 3 and Figure 1, 55% of interviewees indicated that they employed multiple LLSs for reading and vocabulary memorization; 15% used them for listening and writing, respectively; 10% applied them to English speaking; and 5% utilized them for motivational purposes. This suggested that learners who received LLS instruction could effectively use these strategies to enhance their English learning skills. The examples in Table 3 offer a summarized overview of original insights.

Figure 2 Micro comparison of strategy use post-test of the experiment class

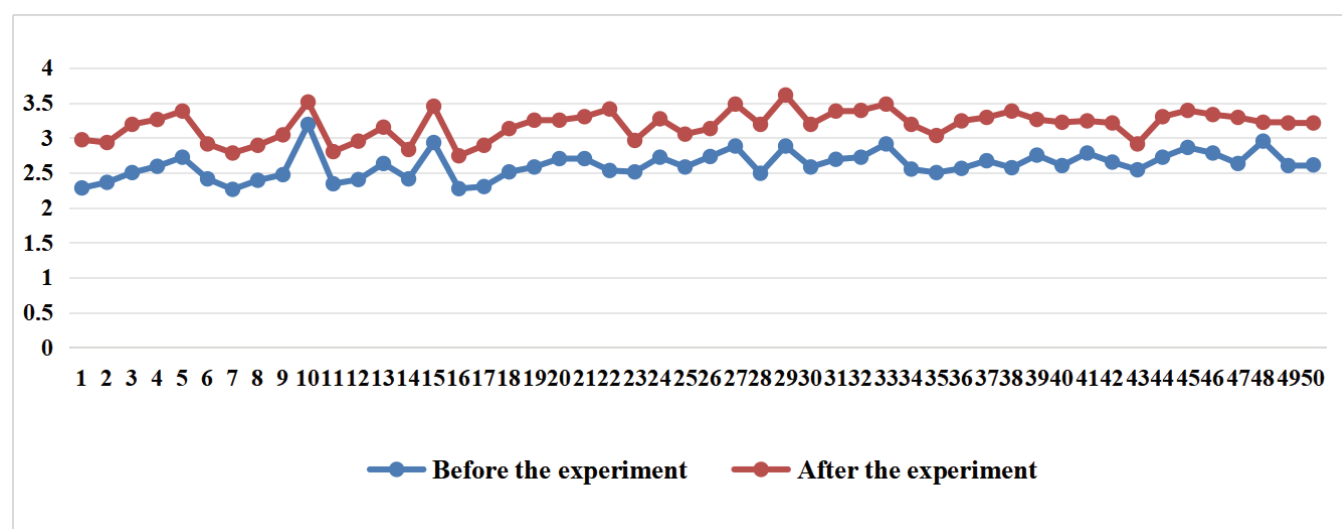


Figure 2 displays a micro-comparison of the post-test mean scores of strategy use. The mean values for the experimental group exhibited a parallel trend, fluctuating by nearly the same amount before and after the intervention program. Notably, after the LLS instruction, the experimental group experienced significant improvements and increases in strategy use, while the strategy use of students in the control class did not change significantly. The results of RQ1 clearly indicated that LLS training has had a cascading effect, significantly enhancing BA learners' strategy use and cultivating a strong sense of strategic awareness. The observed improvements in strategy use reflected the effects of the LLS instruction, demonstrating

its success in fostering greater engagement with learning strategies. These findings aligned with prior research by [20], which also reported substantial gains in strategy use among EFL learners following targeted strategy instruction. The consistency with previous studies underscored the robustness of the current study's outcomes.

*Table 4 Coding process and results of sub-themes of OSIs*

Sub-theme	Original Summarized Answers of Sub-themes
reading & vocabulary	55% of the interviewees believed that after learning LLS, they can sorted words and find key words in reading questions, using some strategies to memorize English words in reading.
Speaking	10% of interviewees stated that they utilized LLS, such as watching English movies, understanding English culture, asking for advice to improve speaking ability.
Listening	15% of interviewees stressed that pre-reading, pre-judging, replying LLS can help to improve accurate listening in English.
Writing	15% of interviewees believed that in order to enhance English writing abilities, they apply advanced words to the same words and improve memory and grasp in writing.
Motivation	5% of interviewees stated that LLS can track progress, set clear goals, and enhance the skills.
Positive effect	95% of interviewees believed that LLS training definitely affected the level of strategy use, as the effect is great. Specifically:
Negative effect	5% of interviewees state LLS had little effect on strategy use because he has learned these strategies before college and already familiar with them, there's a negative impact for him.
Positive effects	40% of interviewees believe that there are still some positive effects on the strategy use level. LLS training promoted the level of strategy use. Practice makes perfect.
Negative effects	55% of interviewees believe that the learning of LLS can significantly improve strategy use and accuracy rate, and faster completion time and higher correct rate. 25% of interviewees considered that there is no effect because he has learned strategies for many times in my senior middle school, so he lost interest of them.
Completely mastered	30% of interviewees stated they mastered LLS completely and can use them correctly. 50% of interviewees believed they have mastered most aspects of the LLS, but struggles with English language differences, such as recitation, listening, sentence, and grammar.
Partly mastered	15% of interviewees have made significant enhancements in LLS skills by understanding the basic general questions and using appropriate strategies.
Seldom	5% of interviewees believe they knew it in middle school but can't use it.
Positive effects	55% of interviewees stated The effect is great for English, which can improve learners' English skills because these strategies they haven't learned before.
Negative effect	35% of interviewees believed that LLS improves English question efficiency, reduces error rates, and increases interest in the subject, leading to improved performance if used wisely. 5% of interviewees found that the impact and effect are not huge.

For the development of a model that effectively communicates these connections and the underlying logic, as illustrated in Table 4, it is essential to clarify the internal relationships between the core theme and its associated sub-themes. The examples offer a summarized overview of these original insights:

A04, A06, A09, A12, A20: Using LLS can better understand and comprehend questions. For example, in reading, read the question first, find key words, and then find the corresponding answer. First, look for the keyword in the question and then look at the original text to locate the correct answer.

A05: I used LLS, tracking progress in English, setting clear goals, and reading English articles and news simultaneously to enhance their skills.

A08, A11, A17: Pre-reading, pre-judging, replying, and just a few of the LLS that can help us improve accurate listening in English.

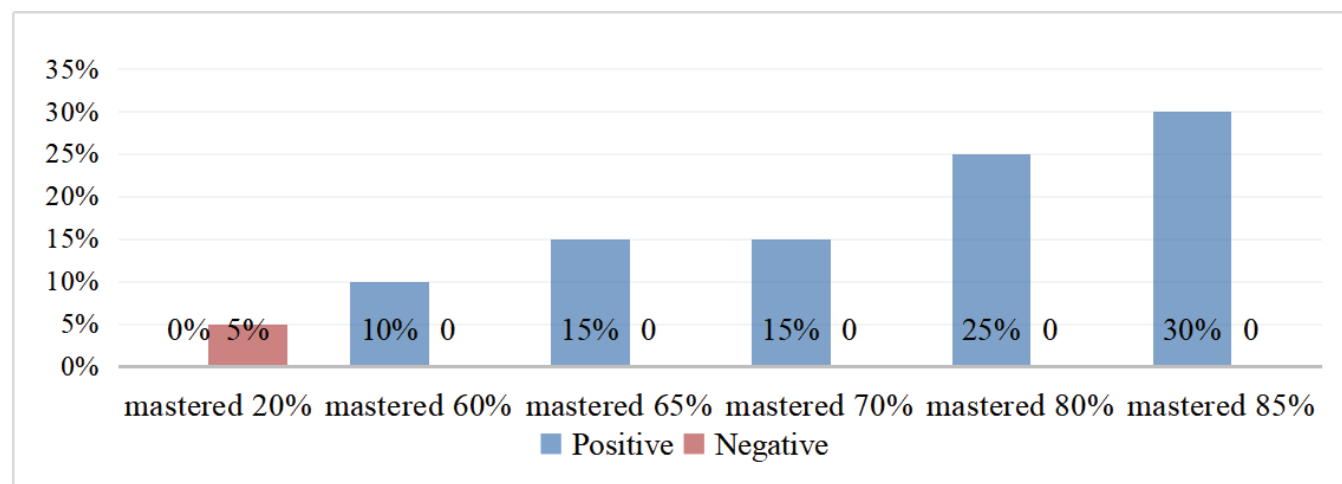


A13, A18: Some LLSs were used, such as watching English movies, listening to dialogues, understanding the culture of English-speaking countries, and asking for pronunciation advice.

A04, A06, A07, A08, A15: The teacher's LLS instruction are designed to enhance effect in answering questions by providing a clear goal and strategy. This approach encourages relentless effort and self-discipline, enable individuals to answer questions correctly and achieve their goals.

A09: It is effective in improving English skills. But strategies like finding native English speakers and reading English independently are not beneficial for struggling students, as they may be difficult to engage with.

Figure 3 Degree of LLS Instruction on Affecting Level of Strategy Use



Based on the data presented in Table 4 and Figure 3, 95% of interviewees believed that LLS instruction had a substantial impact on the level of strategy use, indicating a significant effect. Specifically, 10% of the interviewees reported mastering 60% of LLS; 15% had mastered 65%; another 15% mastered 70%; 25% achieved mastery of 80%; 30% attained mastery of 85%; and 5% mastered 20%. These figures collectively suggested that LLS instruction effectively improved learners' levels of strategy use. The exception noted was an interviewee who had mastered only 20% of the LLS, attributed to prior extensive exposure to LLS during middle school, which led to a diminished interest and boredom with LLS instruction. The examples in Table 4.8 provided a summarized overview supporting these insights.

### 3.2. Findings and Analysis in Relation to RQ 2

During the pre-test phase, CET-4 scores were utilized to assess the learners' academic English achievement. Both quantitative and qualitative data were analyzed to evaluate the impact of LLS instruction on participants' CET-4 and CEFE scores. Following the LLS instruction program, both the experimental and control classes took the CET-4 and CEFE tests. The significance of the differences between the test scores was analyzed, and the results are presented in Table 5.

Table 5 Comparison of CET-4 pre-test and post-test of experiment class

Pre-test		Post-test		Variation	Significance	
Means	SD	Means	SD		T-value	ES Cohen's d
341.50	24.1565	365.43	29.7079	23.93	-3.9519	-0.8827

Note: SD=standard deviation; ES= effect size

As indicated in Table 5, following a semester of LLS instruction, learners in the experimental class exhibited a statistically significant increase in their English academic achievement, as measured by CET-4 scores. The difference between the two groups was statistically significant, with a t-value of -3.9519, which exceeded the critical thresholds of 2 and -2, confirming that the two groups were significantly different. The mean difference of 23.93 further underscored the substantial improvement in the EAA of learners in the experimental group after the intervention programme. Additionally, the effect size, represented by Cohen's d value of 0.8827, indicated a large difference in EAA between pre-test and post-test of the experimental group.

Table 6. Comparison of CET-4 pre-test and post-test of the control class

Pre-test		Post-test		Variation	Significance	
Means	SD	Means	SD		t-value	ES Cohen's d
342.15	18.0548	343.03	22.6450	0.88	-0.1911	-0.0427

As shown in Table 6, learners in the control class did not exhibit any statistically significant improvement in their academic English achievement (CET-4 score) following the LLS instruction. The difference between the two groups was statistically insignificant, with a t-value of -0.1911, which fell within the range of -2 to 2, indicating no meaningful difference before and after the experiment. Additionally, the mean variation was minimal at 0.88, further suggesting that the control group's EAA showed negligible improvement after the intervention programme. Furthermore, the effect size, represented by Cohen's d value of -0.0427, was less than 0.2, signifying that the differences in the control class before and after the intervention were quite modest.

Table 7 Comparison of CET-4 post-test between experiment and control classes

Experiment class		Control class		Variation	Significance	
Means	SD	Means	SD		T-value	ES Cohen's d
365.43	29.7079	343.03	21.5424	22.40	3.7926	0.8633

According to Table 7, after receiving LLS instruction, learners in the experimental class demonstrated a statistically significant improvement in their academic English achievement (CET-4 score). The t-value was 3.7926, which exceeded the threshold of 2, indicating a statistically significant difference between the experimental and control groups. The substantial mean variation of 22.40 further highlighted the significant improvement in the experimental group's academic English achievement following the intervention programme. Moreover, the Cohen's d effect size was -0.8633, surpassing the 0.8 threshold, underscoring the considerable significance of the differences between the experiment group and control group after the intervention program.

Table 8 Coding Process and Results of Sub-themes of OSIs

Sub-themes	Coding of Sub-Themes
Positive perceptions Negative perceptions	95% of interviewees stated LLS instruction definitely improved their English academic achievement, benefiting for exam, improving grammar, reading, listening, and vocabulary skills. 5% of interviewees indicated that LLS instruction has no significant improvement for his EAA because middle school teacher has taught LLS, similar strategies as current LLS, so he don't feel like it is changed much. He believes his English is under achieved is because vocabulary.
Positive perceptions	85% of interviewees believe LLS instruction has an positive impact on their English academic achievement. LLS instruction has a short-term improvement; It strengthened English learning ability rather than rote memorizing words and sentences; It improved efficiency and accuracy of CET-4 test, saved time; It increased vocabulary by note-writing and guessing; It enhanced English reading and writing skills
Neutral perceptions	It provided a systematical comprehension of LLS.
Negative perceptions	5% of interviewees believe I think the effect to English academic achievement varies from person to person. LLS has a positive impact when using properly, a negative impact when misusing. In addition, some strategies are practical, while others are not useful. 10% of interviewees state it has negative impact because I have studied all LLS systematically and used LLS in middle school, but after I got to college, just felt like it was due to the poor vocabulary, so grade didn't improve much.
Positive perceptions	95% of interviewees believe their English academic achievement has improved after LLS instruction. Before learning LLS, they learn English without strategy, but now use strategy in finishing questions, improving their accuracy and efficiency in English tests; After learning LLS, the most significant improvement is in listening accuracy, which can improve the ability to easily grasp simple words;
Negative perceptions	It has significantly increased interest, awareness and motivation in English, boosted English grade. 5% of interviewee believed his English achievement is no significant change before and after learning LLS because he had learnt it in middle school and it didn't help him much in his college.

Sub-themes	Coding of Sub-Themes
Vocabulary	60% of interviewees stated the big challenge is small vocabulary, as they can employ memory strategies to assist to memorize words.
Reading	15% of interviewees indicated the main challenge is can't finish CET-4 reading questions, then use LLS skimming and find key words.
Motivation	5% of interviewees stressed the main difficulty is lack of motivation, confidence, and interest, as they use social and affective strategies to increase motivation significantly.
Writing	5% of interviewees stressed the challenge is writing a composition, as they use meta-cognitive and affective strategies, which is helpful to achieve CET-4 grade.
Speaking	5% of interviewees indicated the big challenge is poor English speaking, then he used social strategies to practice oral English.
Listening	10% of interviewees believed the big challenge is poor listening due to a lack of practice, then he used metacognitive and social strategies to practice.
LLS practice	65% of interviewees suggested learners should develop LLS skills and English abilities, do intensive practice of LLS with English questions, namely, theory plus practice.
Cooperation	5% of interviewees advised it is essential to communicate with others, ask questions, and find a partner to cooperate by using social strategies.
Motivation	30% of interviewees suggested to overcome fear of making mistakes in English learning, set a goal, encourage and motivate yourself, solving difficulties, rewarding yourself appropriately, and improving your affective strategies.

These codes represented the interviewees' perspectives and judgments regarding how LLS instruction impacts their academic achievement in English. It was evident that opinions varied among interviewees. While the majority believed that LLS had a positive effect on their academic performance, one participant felt it had a negative impact, and others thought the effect depended on the individual and the strategies used. This coding technique facilitated the classification of diverse viewpoints and details, providing a foundation for further analysis. Table 8 clarifies the internal relationships between the core theme and sub-themes, which is crucial for the development of the model as indicated.

In summary, LLS instruction significantly improved learners' EAA, enhancing their English learning attitudes, accuracy and efficiency in English tests, motivation, and cooperative learning. Specifically, after the intervention program (LLS instruction), the experimental group showed notable improvements in EAA, while the EAA of students in the control class did not change significantly. The results of RQ2 clearly indicated that LLS instruction has created a cascade effect, effectively boosting BA learners' English academic achievement. This has fostered a heightened sense of English learning awareness among them, underscoring the success and notable outcomes of the LLS instruction. These findings were consistent with <sup>[21]</sup>, who found that strategy instruction positively impacted students' English proficiency, with higher-level students using strategies more frequently than lower-level students.

## 4. Conclusions and Future Research Directions

Overall, learners perceived LLS instruction positively, recognizing its benefits for strategy use. The instruction notably improved strategy use, with most participants achieving proficiency in various LLS components. Furthermore, LLS instruction had a positive effect on enhancing participants' English learning skills. The findings aligned with previous research <sup>[11]; [20]</sup>, reinforcing the effectiveness of LLS instruction in educational contexts. The study also highlighted the potential for LLS instruction was a valuable tool in enhancing In general, an analysis of the relationship between LLS instruction and the level of strategy use among underachievers revealed the following: From both macro and micro perspectives, the difference of 0.5760 points in the level of strategy use among students in the experimental class before and after the intervention, and the 0.5860-point difference in the cross-sectional comparison between two groups after the intervention, demonstrated that LLS instruction significantly improved the strategy use of underachievers. This effect was notably significant. Specifically, students in the experimental class exhibited improvements in the use of cognitive, compensatory, metacognitive, and social strategies, with their use shifting from an average level before the experiment to a level of usual use afterward. This also supported the validity of LLS instruction, confirming that LLS training effectively enhanced the strategy use of underachievers.

The findings of RQs in this study were also consistent with several previous studies that found a significant positive relationship between the use of language learning strategies and academic achievements. Those studies indicated that students

who use strategies less frequently tended to make slower progress<sup>[11]; [22]; [23]</sup>. The implications of RQ1 served as empirical support for the use and instruction of LLS, highlighting their effectiveness in enhancing below-average EFL learners' English achievement. Specifically, this emphasized the need to promote and integrate LLS instruction to help EFL students improve both their academic performance and strategy use.

The conclusion should be concise and engaging, clearly answering the research questions, summarizing the research process, making recommendations for future studies, and highlighting the study's contributions. This study employed a mixed-methods approach, incorporating a quasi-experiment, questionnaire surveys, and semi-structured interviews to provide empirical evidence on the effects of LLS instruction on below-average EFL learners in vocational colleges. It emphasized the impact of LLS instruction on learners' strategy use and English academic achievement. The results from the SILL survey revealed a total mean score of 2.63 for strategy use, indicating "usually not used" strategies. Specifically, meta-cognitive and cognitive strategies were the most frequently utilized, while memory strategies were used less often. These findings were consistent with previous research indicating that compensation, social, and metacognitive strategies were used effectively, whereas memory strategies were less effective<sup>[12]; [24]; [25]</sup>.

The study provided empirical evidence that LLS instruction enhanced the language strategy use and English academic achievement of vocational underachievers. The results aligned with previous research and suggested that a mixed model of LLS instruction was particularly beneficial for underachievers. Additionally, LLS instruction was found to improve learners' English learning motivation, attitudes towards strategy use, mastery of LLS, and the accuracy and efficiency of English tests, as well as overall English learning skills. These findings corroborated earlier studies<sup>[11]; [26]; [27]</sup>. The research underscored the significance of LLS instruction in teaching practice, demonstrating its positive impact on the EAA of underachievers. The study's results aligned with the goals of the SDGs (Sustainable Development Goals), contributing to EFL education by offering insights into effective strategies for enhancing the English learning of vocational students.

Finally, the study employed both qualitative data, analyzed through thematic analysis, and quantitative data to develop a mixed-method LLS instruction model for EFL vocational underachievers. This model incorporated five LLS instruction methods and several stages: presentation, raising awareness, guided practice, independent practice, and evaluation. The findings aligned with those of previous research<sup>[28]; [29]; [30]</sup>. The LLS instruction model and implementation framework proposed in this study may provide valuable references for reforms in college English teaching theory, offering new theoretical perspectives on effective LLS instruction models. Future research can explore LLS instruction across various factors, including learners' awareness, motivation, learning styles, attitudes, abilities, and philosophies. Additionally, future studies should focus on online LLS teaching approaches and their impact on underachievers.

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## Conflict of Interests

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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# Exploring the Significance of Adolescent Sex Education Based on Social Media

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**Abstract:** This study aims to explore the presentation of adolescent sex education in socialized media and its impact on adolescents, especially the role of social platforms and network culture in teenage sex education. Through a review of relevant literature in recent years, the study analyzed the diverse presentation of social media in the communication of sex education and its positive and negative effects. The study finds that social media provide abundant sex education resources for adolescents, especially content related to sexual health, gender awareness, and emotion management, but it is also accompanied by problems such as false information, over-gendering or inaccurate gender role modelling;. However, social platforms can break through the limitations of the traditional education system and provide more personalized and immediate education content, in the absence of effective guidance and supervision, it is easy to lead adolescents to have a negative attitude towards sex education. Although social platforms can break through the limitations of the traditional education system to provide more personalized and immediate educational content, the lack of effective guidance and supervision can easily lead to misunderstandings and the deepening of gender stereotypes. This study suggests that adolescent sexuality education should collaborate with social media platforms to promote the dissemination of scientific, comprehensive and inclusive sexuality education content and to strengthen the guiding roles of parents, schools and the government to minimize possible negative impacts.

**Keywords:** Adolescents; Sex Education; Social Media; Information Dissemination; Sexual Health Education

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## 1.Introduction

Sex education for adolescents is an important part of promoting the healthy development of individuals physically and mentally and constructing a sense of gender equality in society. It is not only related to the cultivation of correct values and healthy behaviours among adolescents but also directly affects their future social adaptability and interpersonal relationships. However, the traditional mode of sex education is limited by time, space, teachers and other factors, and it is difficult to meet the increasingly diversified and individualized needs of adolescents<sup>[1]</sup>. Especially in contemporary society, the absence or inadequacy of sex education has led to some adolescents facing difficulties in sexual health, sexual violence prevention, and gender identity. The persistence of these problems further highlights the urgency of improving the sex education model. With the rapid development of information technology, social media has become an important tool for adolescents to obtain information and socialize. This trend provides new opportunities for disseminating sex education, enabling young people

to break through the limitations of traditional classroom education and access diverse information resources anytime and anywhere. At the same time, the interactivity and sharing of social media provide more possibilities for the dissemination and participation of sex education content. However, the openness of social media also brings problems such as uneven information quality and privacy leakage. These new challenges make the application of social media in sex education require more careful and scientific exploration.

The purpose of this paper is to analyze the significance of social media in adolescent sex education and explore its role in knowledge dissemination, emotional education and value guidance. At the same time, this paper also pays attention to the risks and shortcomings and puts forward targeted suggestions, to provide theoretical reference and practical basis for the innovation and development of the youth sex education model. Therefore, it is of great practical significance to study the significance of social media in adolescent sex education.

## 2. Literature Review

### 2.1 Theoretical basis for the importance of sex education

The psychosocial development theory put forward by Erik H. Erikson (1968)<sup>[2]</sup> points out that during adolescence, individuals are faced with the conflict between self-identity and role confusion, and scientific and reasonable sex education can help adolescents correctly recognise their own body and sexual characteristics, help them effectively cope with physiological and psychological changes, and successfully pass through this critical developmental stage, to establish a healthy self-image and gender role identity. They can then build up a healthy self-image and gender role identity. Several studies have shown that adolescents who receive comprehensive sex education are significantly better than those who lack related education in terms of gender identity and psychological stability, which indicates that sex education is not only an important support mechanism for adolescents' psychological development but also a key way for them to build a healthy self-image<sup>[3-5]</sup>. Sex education can guide adolescents to correctly understand their own bodies and sexual characteristics, and help them better cope with physical and psychological changes in the process of growing up so that they can successfully pass through this critical developmental stage.

According to Lawrence Kohlberg's (1977)<sup>[6]</sup> moral development theory, adolescence is an important period for the gradual formation of an individual's moral concepts, and sexuality education, as a key component, can guide adolescents to make choices consistent with moral norms and promote the development of sexuality when facing sexuality-related issues by teaching them correct sexuality concepts, such as respect for others and a sense of responsibility. Teaching young people correct sexual moral concepts such as respect for others and a sense of responsibility, can guide them to make choices that are in line with moral norms when facing sex-related issues, and promote the continuous improvement of their moral standards. Some scholars have pointed out that sex education not only improves adolescents' moral reasoning but also significantly reduces the incidence of high-risk sexual behaviours<sup>[7-8]</sup>. Through sex education, adolescents are taught the correct concepts of sexual morality, such as respect for others, responsibility, etc., which can help them make decisions when facing sex-related issues. Them to make ethical decisions when facing sex-related issues and promote their moral level.

### 2.2 Research on the Role of Social Media in Education

George Siemens' (2004)<sup>[9]</sup> theory of associational learning proposes and mentions that, in the context of the digital age, learning is no longer limited to the accumulation of knowledge within an individual, but rather to the construction of a wide range of connections between knowledge nodes through networks. A study states that 17% of adolescents access information about sexual health or information about the consequences of substance use through the Internet<sup>[10]</sup>. Social media, as a huge knowledge convergence network platform, provides adolescents with a huge amount of rich sex education resources as well as diversified learning paths, so that they can obtain more comprehensive and in-depth sex knowledge and continuously expand their cognitive boundaries by establishing connections with different information sources and various groups of people. Social media, as a huge knowledge network platform, provides adolescents with abundant sex education resources and diversified learning paths, enabling them to acquire more comprehensive and in-depth sex knowledge and expand their cognitive boundaries by establishing connections with different information sources and people.

Don Tapscott (2008)<sup>[11]</sup> pointed out that adolescents growing up with the Internet have unique learning patterns and infor-



mation intake habits, and they are more inclined to learn new knowledge through interaction, participation and independent exploration. Several studies have shown that adolescents in social media-based sex education programs have significantly higher levels of engagement and knowledge acquisition than in traditional classrooms<sup>[12]</sup>. The instantaneous, interactive and open nature of social media is highly compatible with this learning preference of adolescents, which builds a high-quality platform for them to actively participate in sexuality education and learning, and strongly stimulates their learning interest and subjective initiative. The interactivity, immediacy and openness of social media cater to the learning needs of adolescents and provide a platform for them to actively participate in sex education and learning, and stimulate their interest and initiative in learning.

### **3.Problems in the current sex education for young people in China**

#### **3.1 Limitations of Education Content**

At present, the content of sex education for adolescents in China mainly focuses on the teaching of physiological knowledge and lacks comprehensive attention to sexual psychology, sexual morality and sexual health. This one-sidedness in content cannot meet the needs of adolescents to form healthy cognition and cope with complex problems in the rapidly changing social environment. Studies have shown that the content of sex education for adolescents in China tends to focus on the teaching of physiological knowledge, while the education on sexual psychology, sexual morality and sexual health is not sufficiently in-depth and comprehensive<sup>[13]</sup>. The content of sex education is slow to update, unable to meet the youth's desire for knowledge of the current hot sexual issues in society, such as the network sex culture, gender equality awareness and other aspects of education are relatively lagging<sup>[14]</sup>. This phenomenon not only reflects the problem of slow updating of educational content but also reveals the lack of demand for the breadth and depth of sex education. With the rapid development of society and changes in the way information is disseminated, adolescents are exposed to increasingly complex and diverse sex-related information, but the content of sex education provided by schools and families fails to keep pace with the times, resulting in difficulties for adolescents in understanding and coping with these emerging issues.

Sex education content in China pays relatively little attention to areas such as gender equality, sexual violence prevention and emotional education for adolescents. According to UNESCO's (2018)<sup>[15]</sup> recommendations on the content of global comprehensive education, sex education should cover gender concepts and social issues in multicultural contexts to promote the comprehensive development of adolescents. However, most of the teaching materials in schools in China are still biased towards a biological perspective, failing to achieve full integration of content in the fields of psychology and sociology. This limitation in educational content may lead to confusion and even misunderstanding when adolescents face the impact of multiculturalism and cybersex culture.

#### **3.2 Single-mindedness of Education Methods**

The traditional way of teaching sex education is based on classroom lectures, emphasizing the one-way transmission of knowledge and lacking teacher-student interactions and situational experiences, which often makes it difficult to stimulate young people's interest in learning, and limits their in-depth understanding of the content of sex education. Research shows that in some areas of China's sex education classroom, teachers mostly follow fixed courseware to teach, ignoring adolescents' participation in the classroom content and feedback<sup>[16]</sup>. This teaching mode is not only difficult to adapt to the psychological needs of adolescents but also may make sex education lose its core appeal. Sex education in schools mainly adopts the traditional teaching method of classroom lectures, which lacks innovation and interactivity and makes it difficult to motivate adolescents to learn<sup>[17]</sup>. Students reduce feedback on classroom performance and learning, resulting in a boring sex education classroom, and teachers' one-way instillation of knowledge, resulting in low student participation, which seriously affects the teaching effect of sex education.

The application of modern information technology in sex education is still in the preliminary exploration stage. International experience shows that the application of virtual reality (VR) technology, interactive learning platforms and multimedia tools can significantly enhance the effectiveness of sex education for young people. For example, the "Sex Education Forum" program in the United Kingdom conducts online interactive courses through an online platform, which enhances students' understanding of complex issues. However, there is a lack of diversity in the means of sex education in China, and modern

information technology means, such as multimedia and network platforms, are rarely used to enrich the teaching form of sex education<sup>[18]</sup>. In the digital era, the way young people accept information has changed greatly, and they are more inclined to obtain knowledge through vivid interesting, intuitive and visual ways. However, the current approach to sex education fails to make full use of these modern technological means and cannot meet the learning needs and interest preferences of adolescents.

### 3.3 Uneven distribution of educational resources

There is a large gap between urban and rural areas in terms of resources for sex education for adolescents, with a serious shortage of teachers for sex education in rural areas, a scarcity of teaching materials and a lack of teaching aids, and outdated teaching facilities<sup>[19]</sup>. According to statistics, in rural primary and secondary schools, there is an average of less than one professional sex education teacher per school, and most of the teachers have not received systematic training in sex education, which directly leads to the fact that rural adolescents are unable to obtain high-quality and standardized sex education.

There are also obvious differences in the resources for sex education among different schools, with key schools and schools in developed areas being able to provide relatively abundant resources, while some ordinary schools and schools in remote areas are faced with a lack of resources<sup>[20]</sup>. In the United States, the Federal Grants for Sexual Education program ensures the supply of sex education resources to schools in poor areas, while China has not yet established a similar national mechanism for balancing sex education resources. This uneven distribution not only weakens the popularity of sex education but also affects the realization of educational equity to a certain extent. This uneven distribution of resources has also further exacerbated the uneven levels of sex education for young people, affecting the popularization and equity of sex education.

## 4. The role played by social media in adolescent sex education

### 4.1 Provide rich and diverse educational resources

The International Technical Guidance on Sexuality Education (Revised Edition) published by UNESCO (2018)<sup>[15]</sup> mentions that with the powerful communication efficiency of social media, many professional sex education institutions and public welfare organizations have been able to rapidly disseminate high-quality educational resources to a large number of young people. Many professional sex education institutions and public welfare organizations have been able to rapidly disseminate high-quality educational resources to a large number of youth groups, breaking the double confinement of the dissemination of traditional educational resources in terms of geography and time in one fell swoop. Through the integration of globalized sex education information, social media platforms provide young people with multidisciplinary and multiform educational resources, including sexual physiology, sexual psychology, sexual health and sexual culture<sup>[15]</sup>. These resources are presented in a variety of forms, such as text, pictures, audio and video, to meet the different learning needs of adolescents<sup>[21]</sup>. On platforms such as Zhihu and Baidu Wikipedia, users can search for various professional articles and experience sharing on physiological changes during puberty, prevention of sexually transmitted diseases, and adjustment of sexual mental health; on video platforms such as Jitterbug and Station B, there are many vivid and interesting videos produced by sex education popularization bloggers, which teach adolescents about sex visually and imaginatively, and these rich and varied resources provide more comprehensive and in-depth learning materials on sex education for adolescents. These rich and diverse resources provide adolescents with more comprehensive and in-depth learning materials on sex education.

However, studies have also shown that the quality of sex education content on social media varies, and some of the information lacks scientific basis and may even mislead adolescents<sup>[22]</sup>. Therefore, although social media has a unique advantage in the dissemination of sex education resources, how to screen quality content is still an urgent problem to be solved.

### 4.2 Promote interactive communication and learning

Microblogging and WeChat, as social platforms commonly used by adolescents, not only have significant advantages in information dissemination and social interaction but also can provide an open communication environment for adolescents, which helps to explore sensitive topics and disseminate sexual health knowledge<sup>[23]</sup>. WeChat public platform is used for adolescent sex and gender education, supplementing the shortcomings of the traditional classroom through the form of a virtual classroom, and promoting society's re-recognition of the importance of sex education<sup>[24-25]</sup>. WeChat combined with

traditional missionary methods has also achieved significant results in college HIV health education. Studies have shown that WeChat, as a commonly used software for college students online communication, is a useful exploration of AIDS education in colleges and universities when it is jointly applied with traditional missionary methods in the promotion of AIDS-related knowledge<sup>[26]</sup>.

In online sex education forums and communities, adolescents can find like-minded partners to learn and discuss sex education-related topics together, forming a favourable learning atmosphere and mutual support network<sup>[27-28]</sup>. Spontaneous learning through groups attracts the participation of adolescents from all over the country, who share learning materials, exchange learning experiences, and organize online discussion activities within the groups, etc. Through this group learning approach, adolescents can be more actively engaged in learning about sex education and enhance the learning effect<sup>[29]</sup>. At the same time, through continuous monitoring of feedback and behavioural data of adolescents, the recommended content is constantly optimized, and the recommendation strategy is adjusted according to the interaction of adolescents with the pushed content (such as liking, commenting, sharing, etc.) to improve the acceptance and effectiveness of the content<sup>[30]</sup>.

### 4.3 Realize personalized education services

Relying on big data analysis and artificial intelligence technology, social media can accurately understand each teenager's interest preferences, learning progress, and knowledge needs based on their browsing history, search records, likes and comments, and other behavioural data, to push personalized sexuality education content for them<sup>[17][31]</sup>. Big data technology is used to characterize the collected data to identify the personalized characteristics and group behavioural characteristics of adolescents. By analyzing the frequency of interaction and content preference of adolescents in a specific period, it can be inferred that they may be interested in certain sex education content<sup>[31-32]</sup>; adolescents who are interested in sexual psychology are pushed content about pubertal emotional problems, sexual psychology adjustment, etc. This personalized education service can improve the pertinence and effectiveness of sex education and better meet the personalized learning needs of adolescents.

Based on machine learning and artificial intelligence technology, an intelligent recommendation system is constructed. The system can intelligently push sex education content that matches the needs of adolescents based on their behavioural data and interest models, and develop exclusive sex education learning paths based on their learning situation and goals, helping them systematically master sex knowledge and skills<sup>[33-34]</sup>. Utilizing generative artificial intelligence technology and combining various forms of content such as text, images, audio and video, we provide adolescents with rich and diverse sex education materials. This approach not only enhances the learning experience but also better attracts the attention of adolescents.

## 5. Discussion and recommendations

With the widespread use of social media, adolescents are increasingly relying on the Internet for sex education information in their daily lives. Although these platforms provide adolescents with a wealth of sex education resources, adolescents face many challenges due to the varying quality of information and lack of regulation. Against this background, this study puts forward the following suggestions, aiming to further optimize the role of social media in adolescent sex education.

### 5.1 Strengthen the professionalism and scientificity of platform content

Social media platforms, as one of the main channels of sex education information for adolescents, have content of varying quality, and some of the information lacks scientific basis and even has misleading content. UNESCO (2016)<sup>[35]</sup> has proposed that sex education should be based on scientific facts, emphasizing the responsibility of social media in the dissemination of sex education resources, especially in the stage of adolescents' susceptibility to influence. For adolescents, wrong knowledge about sexual health may affect their physiological and psychological development and even produce negative behaviours<sup>[36]</sup>. Platforms should cooperate with educational institutions and experts to ensure that the published content undergoes strict scientific review and auditing. Social media platforms should not only strengthen the management of sex education content but also utilize artificial intelligence, big data and other technologies to screen and recommend information to ensure that the information accessed by adolescents has a high degree of reliability<sup>[37]</sup>.

### 5.2 Improve the diversity and inclusiveness of sex education content

Comprehensive sexuality education should cover all aspects of psychology, emotion, and gender to help adolescents

establish healthy sexual cognition and values at all levels of physical and mental development<sup>[35]</sup>. Most of the sex education content on social media platforms focuses on physical health, and psychological, emotional, and gender identity content is weak. Research shows that adolescent sex education is not only limited to physical health, but emotional education, gender equality and prevention of sexual violence are also important parts of teenage sex education<sup>[38]</sup>. To meet the diverse needs of adolescents, the platform should increase the discussion of topics such as gender identity, sexual orientation, emotional health, etc., to promote adolescents' comprehensive understanding of and respect for gender differences, and to cultivate a healthy view of sexual morality and gender<sup>[39]</sup>.

### 5.3 Enhancing interactivity and participation

The effectiveness of sex education is closely related to the enthusiasm of adolescents' participation. Most of the existing social media platforms take a one-way communication approach, and adolescents are often in a state of passive acceptance of information, lacking effective interactivity and a sense of participation<sup>[40]</sup>. Whereas participatory learning has been shown to help enhance the effectiveness of sex education for adolescents<sup>[41]</sup>. The design of social media platforms should add more interactive forms, such as online discussions, situational simulations, and virtual classrooms, to enhance adolescents' sense of participation. Through simulated situations, adolescents can apply what they have learned in a more realistic environment, enhancing their critical thinking and problem-solving skills<sup>[42]</sup>. The platform can set up Q&A interactions and online Q&A sessions to enable adolescents to think, ask questions and interact more actively in the learning process.

### 5.4 Promote cooperation between parents and educators

The role of parents and schools in adolescent sexuality education is crucial. Family education and school education are important components of adolescent sexuality education, and social media platforms can serve as a bridge connecting parents, educators and adolescents. Studies have shown that family involvement can effectively improve the effectiveness of sex education and help adolescents develop healthier sexual attitudes and behaviours<sup>[40][43]</sup>. Social media platforms provide parents with resources on sex education and conduct online parent classes and educator training courses to enhance the sex education capacity of parents and educators. At the same time, schools should also maintain good communication with parents and provide regular feedback to parents on students' sex education learning through social platforms to ensure the effectiveness of home-school cooperation<sup>[44-45]</sup>. This model of cooperation can ensure that adolescents receive more comprehensive and continuous sex education with the support of all parties in the family, school and society.

### 5.5 Safeguarding adolescents' privacy and safety

When sex education is conducted on social media, the privacy protection and online safety of adolescents should not be ignored. As adolescents lack sufficient judgment and awareness of self-protection, some online companies and bad actors illegally spy on, collect and abuse the privacy information of adolescents through technical means such as cookies and web bugs, making them susceptible to abuse. Through technical means such as "cookies" and "web bugs", adolescents illegally spy on, collect and misuse their private information, making them vulnerable to harassment, information leakage and other risks on the Internet<sup>[46]</sup>. Meanwhile, adolescents frequently self-disclose personal information on social media, which increases the risk of privacy leakage. Studies have shown that social media use is closely related to privacy issues, and adolescents' privacy-protecting behaviours are influenced by security measures, addiction, and self-disclosure<sup>[47]</sup>. Platforms should strengthen privacy protection measures to ensure that adolescents do not experience identity disclosure or online harassment when viewing sex education content. At the same time, easy reporting mechanisms should be provided to help adolescents report and get effective help when they encounter inappropriate content<sup>[48]</sup>. The platform should protect teenagers' privacy through encryption technology and other means, which can effectively reduce potential security risks.

## 6. Conclusion

This study analyzes the current situation of the application of social media in adolescent sex education, discusses its advantages and problems in disseminating sex education information, and puts forward several suggestions for optimizing the effect of social media sex education. Studies show that the role of social media in adolescent sex education is two-sided. On the one hand, its efficient communication ability, rich resources and diversified interactive forms provide a platform for adolescents' sex education beyond the traditional classroom and family. On the other hand, due to the uneven quality of

content, imperfect information review mechanisms and weak privacy protection, adolescents also face many challenges when using social media to obtain sex education information.

To further enhance the effectiveness of social media in adolescent sexuality education, this paper proposes to strengthen the professionalism and scientificity of platform content, increase the diversity and inclusiveness of sexuality education content, design participatory and interactive education forms, promote in-depth cooperation between families and schools, and safeguard adolescents' privacy and network security, all of which are elaborated on both the theoretical and practical levels. These recommendations aim to provide a reference for educational researchers, practitioners and policymakers to more scientifically and systematically utilize the potential of social media in adolescent sexuality education.

Future research should pay more attention to the in-depth integration of technology and education, and explore the application of artificial intelligence and big data technology in sex education content recommendation, personalized learning path design and content auditing. At the same time, research on sex education needs to further integrate interdisciplinary theoretical frameworks such as psychology, sociology and communication to build a more comprehensive theoretical system. In addition, sex education research should also focus on the analysis of the differences in cultural contexts, explore ways to optimize social media sex education in different socio-cultural contexts, and provide a basis for the construction of a diversified sex education system.

Overall, the application of social media in youth sex education is not only a change in the form of education but also a reflection of social responsibility. By building a scientific and healthy sex education communication environment, social media can provide strong support for the healthy physical and mental development of young people. How to find a balance between technology and education, and to achieve unity between openness and standardization will be an important direction for future research and practice.

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# Research on the School-running Efficiency of Ordinary Universities in the Western Region Based on the Combined Model

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**Abstract:** Efficiency is one of the core elements in the “outcome evaluation” within the educational evaluation in the new era. To investigate the differences and dynamic evolution of the efficiency level of ordinary universities in various provinces of western China, this study uses the PCA-DEA combination model from the perspective of input-output to measure the efficiency of universities in various provinces of western China from 2012 to 2021. Research shows that the overall efficiency of ordinary universities in the western region is in a non-effective state, with 70.8% of decision-making units achieving pure technical efficiency effectiveness, and the vast majority of decision-making units in a state of constant or increasing returns to scale. The overall efficiency of universities in the western region fluctuates relatively greatly, with a positive trend. However, there are significant differences in total factor productivity changes between different provinces. Finally, based on the research conclusions, corresponding countermeasures and suggestions are proposed.

**Keywords:** Regular Universities; School Efficiency; PCA-DEA Combination Model

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## 1.Introduction

The “Modernization of Education in China 2035” explicitly proposes to build a higher education system with Chinese characteristics and world-class standards, emphasizing the use of performance as a lever to construct an evaluation system with Chinese characteristics. As China’s higher education enters the stage of comprehensive popularization, the scale of higher education continues to expand, and the improvement of the efficiency of higher education has become an objective requirement for the high-quality development of higher education in the new era. Due to the unique geographical location and economic development of universities in the western region, it is a long and arduous task to improve their operational efficiency. The study adopts DEA-BCC model and Malmquist index model to investigate the efficiency of ordinary universities in the western region from 2012 to 2021, aiming to understand how the efficiency of universities in the western region has improved in recent years? In order to strengthen the understanding of the current efficiency of higher education in the western region, and to propose countermeasures and suggestions for improving the efficiency of higher education, in order to promote the high-quality development of higher education in the western region.

## 2.Literature Review

As a type of outcome evaluation, the efficiency evaluation of higher education refers to the ratio of various resources invested



in the university to the direct output results, mainly pursuing the goal of “obtaining the maximum output from a given amount of input”<sup>[1]</sup>. The academic research on the efficiency of higher education has achieved fruitful results, presenting a multidimensional focus.

From the perspective of research objects, domestic research on the evaluation of the efficiency of higher education can be divided into three levels in China: one is to study the external resource allocation efficiency of the education system (external efficiency) and the internal input-output efficiency of the education system (internal efficiency). External efficiency is measured by studying the contribution of education to economic growth, social development, and educational benefits, while internal efficiency is measured by studying the production efficiency, allocation efficiency, utilization efficiency, and X-efficiency of educational inputs<sup>[2]</sup>. The second is to divide the research sample into different levels of research. From a macro perspective, it refers to the ratio of a country’s total investment in higher education to the total economic and social development benefits it brings; From a meso level perspective, it refers to the ratio of input to output in higher education in a certain region or individual administrative area. At the micro level, it refers to the input-output ratio or productivity of a certain link in the process of running a certain type or a certain university. The third is to focus on subdividing the internal efficiency of higher education, such as the teaching efficiency and research efficiency of universities, and strive to accurately perceive the operational effectiveness of different functional sectors.

From the perspective of research methods, common methods for evaluating higher education efficiency include parametric methods represented by stochastic frontier analysis (SFA) and non-parametric methods represented by data envelopment analysis (DEA). The DEA method is suitable for handling situations with multiple inputs and outputs, and does not require strict functional assumptions, let alone considering the dimensions of input-output indicators. Therefore, it has a wide range of applications in the field of education. For example, Yuan Wei<sup>[3]</sup>, Zhong Jianhua<sup>[4]</sup>, Rong Yaohua<sup>[5]</sup>, You Li<sup>[6]</sup>, Pan Dan<sup>[7]</sup> and others used DEA models to evaluate the efficiency of ordinary universities in China.

In summary, although scholars have conducted in-depth research on the efficiency of higher education institutions, there is currently a lack of research on the overall efficiency of higher education institutions, as well as the differences and dynamic evolution characteristics of efficiency in different provinces. Especially, research on the efficiency of higher education institutions in the western region is rare. Based on this, this study takes western universities as the research object and uses DEA-BCC model and Malmquist index model for static and dynamic analysis, respectively.

### 3. Research Design and Research Methods

#### 3.1 Indicator selection

The core of measuring the efficiency of ordinary universities is to select appropriate evaluation indicators. From the perspective of input-output, investment in universities is generally divided into human resources investment, material resources investment, and financial resources investment. In terms of output, there are three basic outputs: general talent cultivation, scientific research, and social services. Referring to the indicator system designed by Pan Dan<sup>[7]</sup>, Song Zhiyan<sup>[8]</sup>, Zhang Qiang<sup>[9]</sup>, Zhang Xingsheng<sup>[10]</sup><sup>[115-116]</sup> and others, the input-output indicators selected in this study are shown in Table 1.

*Table 1 evaluation index system of university running efficiency*

Primary indicators	Secondary indicators	Tertiary indicators	units	symbol
Input index	Human input	student-teacher ratio	%	i1
		proportion of full-time teachers with graduate degree	%	i2
		full time equivalent of research and development personnel	person-year	i3
	Material input	Total floor area	10000sq.m.	i4
		value of teaching and scientific research instruments and equipment	10000rmb	i5
		book stock	ten thousand volumes	i6
	Financial input	total investment in Education	trillion yuan	i7
		R&D expenditure	trillion yuan	i8

Primary indicators	Secondary indicators	Tertiary indicators	units	symbol
Output index	Talent training	number of students in school	ten thousand people	o1
		number of graduates		o2
		number of degrees awarded		o3
	Scientific research	number of R&D projects	term	o4
		number of published scientific papers	piece	o5
		number of published scientific and technological works	type	o6
		number of patent applications	piece	o7
	Social services	actual income in the year of patent sale	10000rmb	o8
		number of R&D achievements application and science and technology service projects	term	o9
		actual income of technology transfer contract in the current year	10000rmb	o10

### 3.2 Data sources

This paper evaluates the efficiency of colleges and universities in 12 provinces in the western region. The input-output data of colleges and universities in each province are from the statistical data released by the state from 2012 to 2022. Specifically, in the input-output index data selected by the Research Institute, i1, i2, i4, i5, i6, o1, o2, o3 are from the China Education Statistics Yearbook, i3, i8, o4, o5, o6, o7 are from the China Science and Technology Statistics Yearbook, and colleges and universities include full-time colleges and their affiliated hospitals. i7 is from the statistical yearbook of China's education funds, and o8, o9 and o10 are from the compilation of scientific and Technological Statistics of colleges and universities.

### 3.3 Research methods

#### 3.3.1 Principal component analysis (PCA)

The principal component analysis method is based on the principle of difference. It realizes data dimensionality reduction without affecting the representative indicators. By analyzing several initial variables, it recombines them into new simplified principal component variables and forms a principal component matrix<sup>[11]</sup>. There are many input-output indicators for running colleges and universities constructed in this paper. If DEA analysis is carried out directly, the results may be inaccurate due to the multicollinearity between the indicators. And in data envelopment analysis, the number of input and output indicators should maintain a certain balance, and the number of samples should be 2-3 times or more than the number of input and output indicators. Therefore, before DEA analysis, the principal components of input-output indicators are extracted, and the dimensionality reduction idea is used to convert many indicators into several components, so as to make the research results accurate.

#### 3.3.2 Data envelopment analysis (DEA)

##### (1) BCC model

BCC model evaluates the relative efficiency of DMU under variable return to scale (VRS). The calculated efficiency value is the comprehensive technical efficiency (TE), which can be decomposed into pure technical efficiency (PTE) and scale efficiency (SE). In practical application, the efficiency value decomposition of BCC model can help decision makers to analyze the root cause of inefficiency. If TE=1, then PTE=1 and se=1, it means that there is neither waste of technology nor mismatch of scale in the decision-making unit. If TE<1, it can be further analyzed: if PTE<1 and se=1, it means technical inefficiency. The decision-making unit may have management or technical problems in the production process, and it needs to improve the efficiency by improving the technical ability and management process. If PTE=1 and SE<1: it means that the size of the decision-making unit may be improperly configured, and the efficiency needs to be improved by adjusting the production scale.

## (2) Malmquist index model

The traditional CCR and BCC models are only applicable to cross-sectional data, that is, they can only compare the production efficiency of decision-making units at the same time. DEA Malmquist index model can measure the dynamic change of the efficiency of decision-making units in different periods, and can be used to analyze panel data, which has a wide range of applications. The total factor productivity change index (TFP) can be divided into technical efficiency change index (EC) and technical progress index (TC). EC is the change of technical efficiency from stage T to stage T+1. If EC is greater than 1, it means that the technical efficiency has been improved and the gap between DMU and the production frontier has been narrowed. TC is the level of technological progress from stage T to stage T+1. If TC is greater than 1, it means that the production possibility boundary expands outward and technological progress. Compare the TFP value with 1 to judge the change of TFP. When  $TFP > 1$ , it means that the total factor production efficiency has been improved and the production efficiency has been improved. The extent of improvement depends on the proportion of more than 1; When  $TFP=1$ , it means that the total factor productivity remains unchanged; When  $TFP < 1$ , it means that the total factor production efficiency decreases and the production efficiency deteriorates.

## 4. Empirical analysis results

### 4.1 Results of PCA

This paper uses SPSS statistical software to standardize the collected index data, and tests the correlation of input-output indicators of colleges and universities in 12 provinces in the western region. It is found that the correlation coefficients of input and output indicators are positive, and the absolute values of most correlation coefficients are greater than 0.3, and some coefficients are 0.8 or more, indicating that the correlation between input and output is large. According to the principle of cumulative variance contribution rate  $\geq 85\%$ , three principal component scores of input and three principal component scores of output can be obtained respectively. Due to the non-positive data of the index volume after dimension reduction, the data conversion is carried out in this study. The conversion formula is:  $A' = (A - \min A) / (\max A - \min A) + 1$ , Where  $A'$  is the new variable,  $A$  is the original variable, and the value range of the new variable after conversion is  $[1, 2]$ . The above transformation does not affect the essential meaning of the variable. The statistical description of the new input-output indicators after data processing is shown in Table 2.

Table 2 statistical description of index data

	index	samples	min	max	mean	sd
University Investment	IN1	120	1	2	1.468	0.208
	IN2	120	1	2	1.340	0.247
	IN3	120	1	2	1.221	0.218
University Output	OUT1	120	1	2	1.302	0.246
	OUT2	120	1	2	1.265	0.254
	OUT3	120	1	2	1.112	0.198

Note: it is obtained from SPSS operation results.

### 4.2 Results of DEA

On the basis of constructing the evaluation index system of university running efficiency mentioned above, this paper uses Dearun tool to measure the university running efficiency of 12 provinces (cities, districts) in the western region from 2012 to 2021, and obtains the following two results.

#### 4.2.1 Static analysis based on DEA-BCC model

(1) Comprehensive efficiency. In the past ten years, the average comprehensive efficiency of universities in Western China has been higher than 0.9 for seven years, and the average comprehensive efficiency in 2016, 2017 and 2021 is lower than 0.9, indicating that there have been major problems in the overall efficiency of universities in Western China in the past three years. At the same time, almost half of the provinces show the problem of school running resource allocation every year, that is, about half of the provinces' school running efficiency is not effective. However, some provinces can reasonably use various

school running resources to achieve more optimized school running output on the basis of achieving efficiency. For example, the comprehensive efficiency value of Shaanxi Province from 2012 to 2021 is 1, which is higher than the average level of the western region, indicating that Shaanxi Province is the benchmark Province in the western region. The input factors not only reach the optimal production scale under the effectiveness, but also achieve the production efficiency of the optimal scale due to the improvement of the local government's decision-making and management level, which is worth learning and reference from other provinces and cities.

*Table 3 comprehensive efficiency of colleges and universities in Western Regions*

tech	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
DMU1	0.984	0.980	0.969	0.977	0.954	0.961	0.987	1.000	0.992	0.985
DMU2	1.000	1.000	1.000	0.998	0.995	0.974	0.997	1.000	1.000	1.000
DMU3	1.000	1.000	1.000	1.000	0.979	0.994	1.000	1.000	1.000	1.000
DMU4	1.000	1.000	1.000	1.000	1.000	0.997	1.000	1.000	1.000	1.000
DMU5	0.999	0.978	0.985	0.973	0.957	0.948	0.976	0.977	0.989	0.988
DMU6	0.994	0.993	0.996	1.000	0.991	1.000	1.000	1.000	1.000	1.000
DMU7	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.971
DMU8	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
DMU9	1.000	1.000	1.000	1.000	0.971	0.984	1.000	0.997	0.989	0.984
DMU10	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.995	0.996	0.958
DMU11	0.996	0.995	0.996	0.989	0.980	0.975	0.987	0.982	0.978	0.961
DMU12	0.987	0.980	0.984	0.960	0.950	0.941	0.966	0.983	0.954	0.969
mean	0.997	0.994	0.994	0.991	0.982	0.981	0.993	0.995	0.992	0.985

Note: according to the results of DEA software, the specific names of 12 provinces are hidden here, and DMU<sub>i</sub> is used instead, where  $i=1, 2, 3, \dots, 12$ .

(2) Pure technical efficiency. The average value of the overall pure technical efficiency in the western region is 0.997, which is in the non-effective range, that is, there is a problem of inefficient utilization of resources in running colleges and universities, there is still room for improvement in resource allocation management, and resource utilization efficiency needs to be further optimized. There are 85 decision-making units with a pure technical efficiency value of 1 in the western region. Among them, Sichuan, Tibet, Shaanxi, Gansu and Qinghai have achieved pure technical efficiency from 2012 to 2021, achieving the maximum output effect in running colleges and universities, and making effective use of resources; The pure technical efficiency value of 35 decision-making units is less than 1, which does not reach the pure technical effective state. The lowest pure technical efficiency of Guizhou in 2017 is 0.953, indicating that the input factors are not fully utilized, and the waste of resources reaches 4.7%; There are 24 decision-making units that achieve weak DEA efficiency. For example, the comprehensive efficiency of Inner Mongolia in 2016 was 0.954, and the pure technical efficiency was 1. Through the input-output redundancy analysis, it can be seen that the decision-making unit can not reduce the input or increase the output in equal proportion, but the human and material inputs may be reduced.

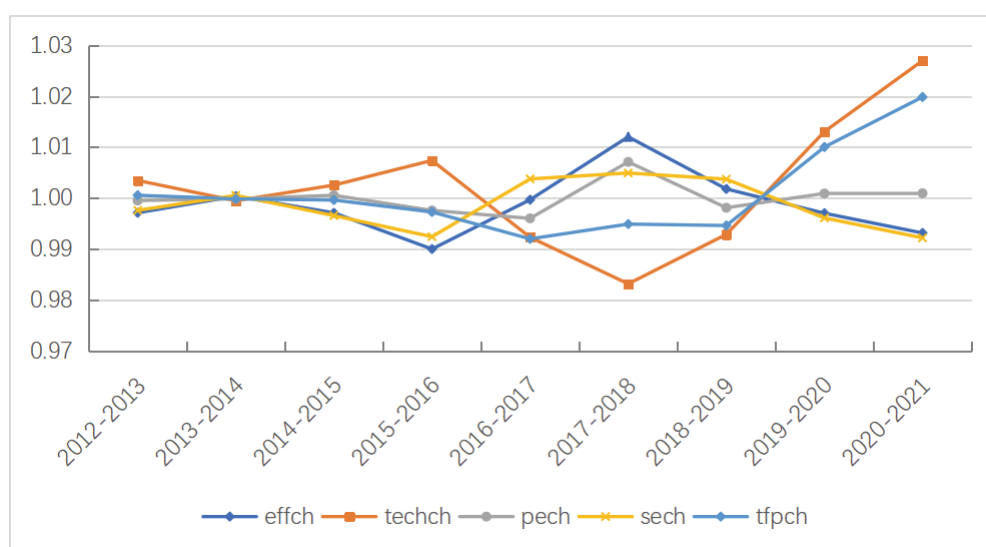
(3) Scale efficiency. From 2012 to 2021, there were 63 decision-making units with the same return to scale, accounting for the highest proportion. The decision-making units with the same return to scale can steadily maintain the synchronous growth of output when expanding input, and can expand or remain unchanged; There are 54 decision-making units in the state of increasing returns to scale, which shows that they have the potential to achieve a higher proportion of output growth by expanding investment. In the process of running a university, it is necessary to increase investment and expand scale to achieve the optimal state of scale; There are three decision-making units with diminishing returns to scale, indicating that there are few decision-making units that need to be scaled down in the western region. This can also reflect that there is room to expand the scale of colleges and universities in the western region, and it is necessary to further increase the investment in

Colleges and universities in the western region.

#### 4.2.2 Dynamic analysis based on DEA Malmquist index model

(1) The time trend characteristics of Malmquist index. During 2012-2021, the average value of the total factor productivity change index, technological progress index and pure technical efficiency change index in the western region were greater than 1, indicating that the overall trend of the total factor productivity of colleges and universities in the western region was positive. From the perspective of stage change, the total factor productivity change index from 2013 to 2019 is less than 1, indicating that the total factor productivity level of the university running efficiency in the western region has declined compared with the previous period, and the efficiency has decreased significantly. From 2019 to 2021, the total factor productivity change index is greater than 1, which indicates that the total factor productivity level of the university running efficiency in the western region has improved compared with the previous period, and the efficiency has improved significantly. On the whole, it tends to be optimized. By improving their own resource allocation ability and management technology level, colleges and universities can correspondingly transform various school running resource inputs into more optimized school running output, so as to maximize the utilization of resources, which also corresponds to the requirements of our current high-quality development of higher education.

Figure 1 time trend chart of Malmquist index and decomposition index



(2) The provincial distribution characteristics of Malmquist index. From the overall change of total factor productivity in the western region, the average value of total factor productivity of university running efficiency in the western regions is 1.001, and there are four evaluation units less than 1, which shows that on the whole, the university running efficiency of most provinces in the western region is on the rise during 2012-2021, and the annual average production efficiency has increased by 0.1%. Among

them, Chongqing has the highest growth rate of total factor productivity, followed by Guizhou, Shaanxi and Yunnan, which means that compared with other provinces in the western region, these four provinces can effectively condense the core competitiveness of high-quality development, follow the rules of running schools, improve the quality and level of running schools, better play their role of demonstration and guidance, and effectively support the development strategy of the western region. From the perspective of technical efficiency change (effch), the change value of technical efficiency in Guizhou, Tibet, Gansu, Qinghai, Ningxia and Xinjiang is less than 1, which means that the technical efficiency of colleges and universities in these provinces has declined, while the technical efficiency of other provinces has remained unchanged or improved. From the perspective of techch, Chongqing has the fastest speed of technological progress, thus the efficiency of colleges and universities has been improved the fastest, and its total factor productivity ranks first; Except Xinjiang, the change value of technological progress in other provinces is greater than 1, indicating that the technology of running colleges and universities in the vast majority of provinces in the western region is in a state of continuous innovation. From the perspective of pure

technical efficiency change (pech), except Ningxia, the change value of pure technical efficiency in other provinces is greater than 1, which means that integrated management and technology improvement play a positive role in improving total factor productivity. From the perspective of scale efficiency change (sech), Guangxi, Sichuan, Yunnan and Shaanxi are among the top in total factor productivity due to their obvious advantages in scale efficiency, which means that the scale of colleges and universities in these provinces plays a role in promoting total factor productivity.

*Table 4 Malmquist index and its decomposition index of different provinces in the western region from 2012 to 2021*

DMU	effch	techch	pech	sech	tfpch	rank
DMU1	1.000	1.001	1.001	0.999	1.001	7
DMU2	1.000	1.001	1.000	1.000	1.001	8
DMU3	1.000	1.006	1.000	1.000	1.006	1
DMU4	1.000	1.002	1.000	1.000	1.002	5
DMU5	0.999	1.004	1.000	0.999	1.003	4
DMU6	1.001	1.004	1.000	1.001	1.004	2
DMU7	0.997	1.002	1.000	0.997	0.999	9
DMU8	1.000	1.003	1.000	1.000	1.003	3
DMU9	0.998	1.003	1.000	0.998	1.001	6
DMU10	0.995	1.000	1.000	0.995	0.995	12
DMU11	0.996	1.003	0.999	0.997	0.999	10
DMU12	0.998	0.999	1.000	0.998	0.997	11
mean	0.999	1.002	1.000	0.999	1.001	-

Note: it is obtained from the operation results of Malmquist index model.

## 5. Conclusions and suggestions

### 5.1 Conclusion

Based on the relevant input-output data of colleges and universities in the western region from 2012 to 2021, and on the basis of previous studies, this paper designs an evaluation index system for the efficiency of running colleges and universities, and calculates the efficiency of running colleges and universities in the western region

From the static analysis results of the efficiency of colleges and universities in the western region, the overall efficiency of colleges and universities in the western provinces was in a non effective state during the sample study period, indicating that there were some problems in the allocation and management of college running resources in the western region. The mean value of pure technical efficiency is relatively high, and 70.8% of the decision-making units achieve pure technical efficiency, which shows that under the condition of limited educational resources in the western region, the ability of each decision-making unit to maximize output with a given input is relatively high. The vast majority of decision-making units are in the state of constant or increasing returns to scale, which means that the development of higher education in the western region urgently needs to increase support and make up for shortcomings.

From the dynamic analysis results of the efficiency of colleges and universities in the western region, the overall change of the efficiency of colleges and universities in the western region fluctuates relatively large, and the development trend is good. This also shows the changes in the efficiency of running colleges and universities due to the changes in school resources caused by the development of economy and society. From the results of total factor productivity of school running efficiency of different decision-making units, there are great differences among provinces in the western region. Chongqing, Sichuan, Shaanxi and Yunnan rank relatively high, while Tibet, Qinghai, Ningxia and Xinjiang rank relatively low. It is necessary to actively adjust and optimize the layout system of Higher Education in the western region.

### 5.2 Recommendations

Based on the research conclusion, the study puts forward the following suggestions: first, strengthen policy guidance and supervision, formulate the medium and long-term development strategic plan of higher education in Western China, and clarify



the development goals and key tasks at different stages. Second, face up to the provincial gap in running colleges and universities, deepen the pairing assistance between eastern and Western Colleges and universities, make up for the shortcomings, and implement the differentiated development strategy. Third, increase investment in education, optimize resource allocation and improve management efficiency. Fourth, we should strengthen the dynamic monitoring and evaluation mechanism for the adjustment of the layout of colleges and universities, and realize the digital empowerment of education evaluation.

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The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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# Discussion on Enterprise Management System of Art Training School

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**Abstract:** As a special educational service enterprise, the management system of art training school is directly related to the quality of service and the sustainable development of the school. Based on the in-depth analysis of the current situation and problems of enterprise management of art training schools at home and abroad, this paper explores and constructs a more scientific and efficient framework of enterprise management system of art training schools. It is pointed out that art training schools have many challenges in personnel training, curriculum setting, teaching staff construction, internal management and market operation. By comparing and analyzing the management modes of different schools, this paper proposes that art training schools should establish a people-oriented management concept, strengthen the construction of teaching staff, formulate curriculum system to meet market demand, improve internal management system, and enhance customer service awareness. At the same time, it also emphasizes the application of information management means, such as improving work efficiency and service level through the establishment of educational administration management system. Finally, this paper provides specific strategies and suggestions for the business management of art training schools, aiming at promoting the healthy development and upgrading of the art training industry.

**Keywords:** Art Training School; Enterprise Management; Management System; Education Service; Sustainable Development

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## Introduction

With the educational reform and the diversification of market demand, art training schools affect the national quality in the aspects of artistic accomplishment cultivation and cultural taste promotion, and the importance of their enterprise management system is self-evident. However, at present, many art training schools have problems in personnel training and curriculum system construction, which hinder their healthy development and industry image building. The purpose of this paper is to build a framework of enterprise management system adapted to the characteristics of art training schools, put forward the concept of people-oriented management, advocate strengthening the talent team, optimize the curriculum, improve internal norms, and enhance the efficiency of market operation. It is expected to promote the further development and upgrading of the art training industry.

## 1.The importance of the management system of art training schools

### 1.1 Relationship between management system and service quality

As a special kind of educational service institution, the service quality of art training schools is directly related to the repu-

tation of schools <sup>[1]</sup>. The establishment and implementation of an effective management system is of great significance to the improvement of service quality. The role of the management system is to ensure that activities are carried out smoothly and orderly in all aspects, and to provide clear guidance and norms for the operation of the school. The systematic management system standardizes the teaching process and ensures the smooth implementation of classroom teaching. For art training schools, classroom teaching is not only a process of imparting knowledge, but also a key link to inspire students' creative inspiration and stimulate students' interest. The management system can effectively regulate the teaching behavior of teachers, create a good learning environment for students, and organize the teaching content reasonably through the scientific formulation of teaching plans.

Good teaching and educating people can not be separated from good teachers, and a good management system can provide a clear direction for the development of teachers and apprentices. Through regular training and assessment, not only the professional ability of teachers has been continuously improved, but also the overall quality of teaching has been further improved.

The optimization of the management system of logistics services is also indispensable. From the maintenance of facilities in the classroom to the arrangement of students' daily life, students' learning experience can be greatly promoted through effective management. Perfect logistics management makes the school meet the basic needs of students, so that the school concentrates on two aspects of learning and art creation.

## **1.2 Impact of management regimes on sustainable development**

The management system plays an important role in the sustainable development of art schools. The scientific and effective management system not only optimizes the allocation of resources, but also promotes the long-term development of the school. Through reasonable system design, the school can better adapt to the changes of the market in the fierce competition. The standardization of the system makes the continuous improvement of the quality of school education, while ensuring the job satisfaction and team cohesion of teachers and staff, builds a stable internal environment, improves and implements the management system, and provides a sustainable development framework for the continuous innovation and progress of the school in the rapid transformation of the education market.

## **2. Current management situation and challenges of art training schools**

### **2.1 Challenges of personnel training and curriculum provision**

Whether it is personnel training or curriculum setting, art training schools are facing a lot of challenges. The diversification of market demand leads to the need for flexibility and foresight in curriculum design, but most of the existing courses are based on traditional art forms, lack of attention to contemporary art and interdisciplinary art, and it is difficult to fully meet the diverse needs of students, so the current needs of students for art courses have not yet been established. Lack of specific ability training objectives and assessment indicators, and the training objectives are out of touch with the actual market requirements. The course content often focuses on the training of technical skills, which can not fully adapt to the rapidly changing art market, and at the same time, ignores the cultivation of innovative ability and comprehensive quality. In the process of curriculum development, limited teachers and single structure make the professional knowledge from different art fields can not be effectively integrated, which has an impact on the depth and breadth of the curriculum. The reform and innovation of curriculum setting are also restricted by the lack of teaching resources and the insufficient application of modern educational technology. These challenges reveal the urgent need for art training schools to improve and innovate their management systems to adapt to market changes and improve the quality of education <sup>[3]</sup>.

### **2.2 The current situation and problems of the construction of teaching staff**

Market-oriented management model is generally applicable to training schools with a certain scale, which emphasizes market demand analysis and profit objectives, and takes customer satisfaction as the core. Its advantage lies in its ability to respond quickly to market changes and formulate corresponding teaching and service strategies. This model may neglect the essence of education because of excessive pursuit of market interests, and it is difficult to strike a balance between curriculum quality and market orientation <sup>[4]</sup>.

In recent years, some excellent art training schools have gradually adopted the management idea of innovation and

integration. It not only pays attention to strengthening the scientific nature of school internal management, but also pays attention to the construction of teachers and curriculum innovation, and at the same time, pays attention to the combination of traditional teaching experience and modern management technology. This model is characterized by the use of information management tools, such as intelligent course scheduling system, CRM (customer relationship management) system, in order to improve the quality of education and brand influence, and realize the long-term development potential of the school.

By comparing and analyzing different management modes, we can find that each mode has certain limitations for schools of different development stages and different scales. When choosing the management mode, art training schools need to foster strengths and circumvent weaknesses, combine their own characteristics, and maximize the effectiveness of management.

### **3.Evaluation of management mode performance**

Different management modes have obvious differences in the process of managing art training schools. People-oriented management mode can usually promote the harmonious relationship between teachers and students, thus promoting the improvement of teaching quality and service quality, which is conducive to the improvement of teachers' professional satisfaction and the all-round development of students. Although it is superior in efficiency and management control, the traditional hierarchical management model often lacks innovation and flexibility. The effective selection and combination of various management modes and the consideration of the advantages and limitations of various modes are the key to promoting the improvement of the management level of art training schools.

## **4.Strategies for building a scientific management system**

### **4.1 Strengthen the people-oriented management concept**

In constructing the scientific management system of art schools, an important link is to strengthen the construction of people-oriented management ideas. Respect the individual needs of each faculty member and focus on the comprehensiveness of their development. Because art education is not simply imparting knowledge, but a kind of cultivation of personality and creativity, this people-oriented management concept is very important. The management system should encourage teachers to use creative methods, provide individualized guidance to students in teaching, and promote students' ability of autonomous learning and self-innovation. School management needs to establish open communication channels and collect feedback from teachers and students regularly, so as to ensure that the management system is truly targeted. It can not only improve teachers' job satisfaction and enthusiasm, but also create a good environment for active learning.

### **4.2 Improvement strategies of teaching staff and curriculum system**

In the construction of science and education system, teachers are an important part of school art training. Through the introduction and regular training of high-level teachers, the professional level of in-service teachers can be improved. To improve the curriculum system, we should adjust the curriculum content dynamically in close connection with the market demand on the premise of ensuring the practicability and foresight of the curriculum. In order to attract and meet the learning needs of students at different levels, we should constantly optimize the curriculum design through research and feedback, and increase innovative curriculum choices. This two-pronged strategy has a very good role in promoting the quality, competitiveness and sustainable development of the school.

### **4.3 Improvement of internal management system and customer service**

Improving the internal management system and customer service is essential in building a scientific management system<sup>[5]</sup>. Effective internal management requires the formulation of clear rules and procedures and job responsibilities while ensuring efficient collaboration among departments and reducing waste of resources. In the process of management, information technology should be widely used to improve operational efficiency and decision-making quality through data analysis and processing. Only by cultivating staff, optimizing customer communication channels and establishing feedback mechanism, can we ensure the satisfaction of students and parents and improve customer service awareness. At the same time, the establishment of a sound complaint handling process to respond to and solve problems in a timely manner can effectively improve customer loyalty and satisfaction, thus promoting the continuous development of the school.

## **5.Application of information technology in art training management**

## 5.1 Construction and Application of Educational Administration Information Platform

Through the introduction of information management means, schools can realize the automation and intellectualization of educational administration management. Such as unified management of teaching resources, automatic adjustment of course scheduling system, real-time updating of student attendance and performance records and other functions, while improving the accuracy and timeliness of data processing, but also improve the accuracy of data processing.

Information technology platform can share and optimize the allocation of teaching resources, and promote the exchange and sharing of experience. Through the analysis of teachers' teaching effect and students' feedback data, it provides a scientific basis for assessment, and then guides the improvement of teaching. Students can query the course arrangement, examination materials and results through the platform, which provides great convenience for the interaction between students and schools, and also improves the satisfaction.

To strengthen the communication between home and school and promote the all-round development of students, parents can learn about the progress and performance of students in learning through the information platform, and provide a safe and reliable management tool for art training schools.

## 5.2 Cases of Information Management to Improve Work Efficiency

Through the introduction of advanced educational administration information platform, it integrates student management, curriculum arrangement, attendance records, teacher resource allocation and other functions to achieve digital and automated processes. Through the electronic attendance system, the school has greatly reduced the errors of traditional manual records and improved the ability to update information in real time. The schedule module makes the teacher's scheduling more flexible and makes it more convenient for students to select courses.

## 5.3 Informatization Strategy to Promote Industry Upgrading and Transformation

Informatization strategy plays an important role in promoting the transformation and upgrading of art training industry. Through the establishment of a unified information platform for educational administration, student management and resource allocation, the overall operational efficiency has been improved, so as to achieve the purpose of efficient integration. Using big data analysis technology, the school has a deep understanding of market demand and student feedback, carries out precise curriculum adjustment and optimization, and promotes the improvement of service quality. The application of artificial intelligence technology can make educational services more diversified and precise, and help the development of personalized teaching. The overall upgrading and transformation of the art training industry will further expand its coverage.

## Conclusion

This paper makes an in-depth analysis of the current situation of enterprise management in art training schools, and discusses the framework of scientific and efficient management system. It is found that the management efficiency and service level of art training schools can be improved by giving people-oriented management concept, strengthening the construction of teaching staff, formulating curriculum system adapted to market demand, improving internal management system, enhancing customer service awareness, and improving personnel training, curriculum setting, teaching staff construction, internal management and market operation. However, one of the major problems facing art training schools is how to effectively combine these theories with practical operations to meet the challenges of the market. One of the key points of future discussion is how to establish a sound evaluation and incentive mechanism to encourage teachers and staff to actively participate in the work of improving the quality of educational services. The current management situation and future development trend of art training schools, standing at a new historical starting point, deserve our continuous in-depth study. It is expected that the specific strategies and suggestions for art training schools provided in this paper will contribute to the healthy development and industrial upgrading and transformation of the art training industry. It is also expected that more researchers will pay attention to the management of art training schools, contribute their wisdom and strength to the development of art education in China, and make suggestions for the management of art training schools.

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# Teacher Identity in the Era of Intelligence

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**Abstract:** With the rapid development of artificial intelligence technology, the field of education is undergoing profound changes, posing new challenges and opportunities for teachers in terms of role, professional identity, and professional development. This paper first analyzes the connotation of teacher identity, encompassing role identity, professional identity, and aspects related to professional growth. Subsequently, the article elaborates on the challenges faced by teachers in the intelligent era, such as the weakening of role authority, the threat to professional status, and the pressure on professional skills. At the same time, the article also highlights the opportunities presented by the intelligent era, including the possibility of role transformation, the advantages of technology empowerment, and new avenues for professional development. On this basis, this paper proposes coping strategies for teachers to address identity challenges in the intelligent era, including re-examining role orientation, improving technology application skills, enhancing professional quality, actively participating in human-machine collaboration, and paying attention to ethics and safety. Finally, through case analysis, the article showcases the practical experiences of teachers who have successfully undergone identity transformation and looks forward to the development trend of teacher identity in the intelligent era, offering research prospects and suggestions for future exploration.

**Keywords:** Smart Age; Teacher Identity; Challenges; Opportunity; Coping Strategies

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## 1.Introduction

The current era is an era of rapid change led by artificial intelligence technology. This technological revolution not only reshapes the economic pattern and social structure, but also profoundly affects the development track of education. Artificial intelligence, with its powerful data processing capabilities, intelligent decision support, and continuously optimized learning algorithms, is gradually infiltrating and changing the face of education, making it more personalized, efficient, and intelligent<sup>[1]</sup>. Education, as the cornerstone of shaping future members of society, inheriting civilization and knowledge, and cultivating innovation ability<sup>[2]</sup>, its transformation and development undoubtedly have far-reaching significance for the overall progress of society.

Under the background of this intelligent era, the role and orientation of teachers are no longer limited to knowledge imparters in the traditional sense, but are facing unprecedented challenges and reshaping. Teachers' identity, a core concept related to their self-cognition, professional value and professional belonging<sup>[3]</sup>, is undergoing profound changes. Identity is not only related to teachers' personal career satisfaction and happiness, but also a key factor affecting the quality of teaching, educational innovation and the stability of teachers<sup>[4]</sup>. The wide application of intelligent technology, on the one hand,

provides teachers with rich teaching resources, efficient teaching tools and accurate teaching evaluation methods, which greatly broadens the boundaries and possibilities of education ; on the other hand, it also puts forward new requirements for teachers' professional skills, information literacy and ways of interacting with students, and even triggers a wide discussion on the irreplaceability of the teaching profession<sup>[5]</sup>.

In the face of the opportunities and challenges brought by the intelligent era, the crisis of teachers' identity is gradually emerging<sup>[6]</sup>. On the one hand, some teachers may feel marginalized due to technical anxiety and lack of skills, fearing that their role in intelligent systems is weakened or replaced ; on the other hand, how to effectively integrate intelligent technology while maintaining humanistic care and education temperature has become a practical problem that every teacher must face<sup>[7]</sup>. In addition, the intelligent transformation of the education evaluation system may also lead teachers to rely too much on data indicators and ignore the essence of education-to promote students' all-round development and personality growth<sup>[8]</sup>.

Therefore, exploring the identity of teachers in the intelligent era is not only a deep concern for the individual career development of teachers, but also a profound reflection on the nature of education, educational equity and the future direction of education. Analyze the connotation of teachers' identity, that is, to understand their self-positioning, value pursuit and career path in the intelligent environment; to reveal the crisis faced by identity, such as technical fear, role ambiguity and the pressure brought by the change of evaluation system ; and put forward effective coping strategies, such as strengthening teacher training, promoting the integration of technology and humanities, building an inclusive and flexible evaluation mechanism, etc.<sup>[9]</sup>, which is of great significance for guiding teachers' professional growth, promoting educational innovation, and realizing the smooth transition and sustainable development in the field of education. In a word, the issue of teachers' identity in the era of intelligence is an unavoidable and important issue in the process of educational modernization, which is worthy of our in-depth discussion and practice.

## 2. Connotation of Teacher Identity

The connotation of teachers' identity is a complex and rich concept. It is not only a simple understanding of teachers' personal identity, but also a deep understanding and acceptance of their multiple roles in the education system. This identity process covers three core aspects: role identity, professional identity and professional identity. They are intertwined and together constitute a complete framework of teacher identity.

Role identity is the basis of teacher identity. In the traditional education mode, teachers are often given the role of knowledge imparter, classroom manager and student guider. These roles define the basic responsibilities and behavior patterns of teachers in the process of education. However, with the advent of the intelligent era, the form and demand of education have undergone profound changes, and the role of teachers has also changed. They are no longer merely indoctrinators of knowledge, but mentors, resource integrators, and collaborative innovators in the student learning process<sup>[10]</sup>. This role change requires teachers to re-examine their own position in the education system, understand and accept the new role responsibilities and mission. This is not only a challenge to teachers' personal adaptability, but also a renewal and reshaping of their educational concepts. Professional identity is the core of teacher identity. It is related to teachers' sense of identity and belonging to their own educational profession, and is the source of teachers' professional satisfaction and happiness. In the era of intelligence, the professional status of teachers is facing unprecedented challenges<sup>[11]</sup>. With the rapid development and application of artificial intelligence technology, some educational tasks have been automated, and there is even a trend of replacing teachers in some fields. This threat has shaken teachers' professional identity to a certain extent and triggered professional anxiety and uncertainty. However, in the face of challenges, teachers should strengthen their professional self-confidence and correctly view the educational changes brought about by artificial intelligence technology. They should realize that although technology can simulate certain educational processes, teachers' humanistic care, emotional communication and personalized guidance are irreplaceable by machines. Therefore, actively responding to professional challenges and improving professional quality and innovation ability are the key to consolidating teachers' professional identity. Professional identity is an important part of teacher identity. It reflects the degree of teachers' self-confidence in the sense of identity and professionalism of the educational profession they are engaged in. In the era of intelligence, the advantages of teachers' professional skills have been suppressed to a certain extent<sup>[12]</sup>. The application of artificial intelligence in the field of

education is increasingly widespread. From intelligent teaching systems to personalized learning path recommendations, technological innovations continue to challenge teachers' professional skills<sup>[13, 14]</sup>. However, this does not mean that teachers will lose their professional status. On the contrary, it requires teachers to continuously improve their professional quality and adapt to new educational technologies and teaching methods. Through continuous learning, practice and innovation, teachers can strengthen their professional identity and become the leader and promoter of educational reform in the intelligent era.

Therefore, the connotation of teacher identity is a multi-dimensional and multi-level concept, which covers three aspects: role identity, professional identity and professional identity. In the era of intelligence, teachers should actively face challenges, re-examine and position their roles, strengthen professional self-confidence, and improve professional quality, so as to strengthen identity and promote the common development of individuals and education.

### **3.Challenges Faced by Teachers' Identity in the Intelligent Era**

With the rapid development of artificial intelligence technology, the field of education is undergoing unprecedented changes. In this change, teachers' identity faces many challenges, which are not only related to teachers' personal career development, but also affect the future direction of the whole education system. The following will discuss in detail the challenges faced by teachers' identity in the intelligent era from three aspects: the weakening of role authority, the threat of professional status and the pressure of professional skills.

#### **3.1 Weakening of Role Authority**

In the era of intelligence, artificial intelligence technology is gradually changing the face of education with its efficient and accurate characteristics<sup>[15]</sup>. This technology not only provides students with rich learning resources and information, but also makes the learning process more personalized and efficient through intelligent learning paths and evaluation feedback<sup>[16]</sup>. However, this change also weakens the traditional role authority of teachers to a certain extent. In the traditional education model, teachers, as the imparter of knowledge and the controller of the classroom, have a high authority. They guide students to learn and master knowledge through teaching, demonstration and evaluation. However, in the era of intelligence, students can easily obtain a large amount of learning resources and information through artificial intelligence technology, and no longer rely entirely on teachers' teaching. This change in the way of information acquisition has challenged the authority of teachers in imparting knowledge.

In addition, artificial intelligence technology can also provide personalized learning paths and evaluation feedback, so that students can learn independently according to their own needs and interests in the learning process. This change in the way of learning further weakens the control of teachers in the teaching process. Teachers are no longer the only guide of students' learning, but become the tutors and supporters in the process of students' learning. This change of role makes teachers need to re-examine their role and try to adapt to the new educational environment.

#### **3.2 Occupational Status Threats**

With the continuous development of artificial intelligence technology, some simple and repetitive teaching tasks are gradually replaced by machines<sup>[17]</sup>. This trend has aroused people's concern about the professional status of teachers. Some people even believe that in the near future, teachers may be completely replaced by artificial intelligence technology. This concern not only affects the professional stability of teachers, but also may lead to a decrease in teachers' sense of identity and belonging to their own profession<sup>[10]</sup>. In fact, although artificial intelligence technology can complete some simple teaching tasks, its application in the field of education still has some limitations. For example, artificial intelligence technology cannot completely replace the role of teachers in humanistic care, emotional communication, and personalized guidance<sup>[18]</sup>. However, the existence of this concern still has a lot of psychological pressure on teachers. They began to worry about their career prospects, worried that they would be replaced by machines. This concern not only affects teachers' career satisfaction and well-being, but also may lead to their lack of enthusiasm and creativity in their work.

In order to cope with the threat of this professional status, teachers need to constantly improve their professional quality and innovation ability. They need to pay attention to the latest developments and technological developments in the field of education, and understand the application prospects and limitations of artificial intelligence technology in education. At the same time, they also need to actively explore new teaching methods and strategies to meet the educational needs of the

intelligent era. Through these efforts, teachers can enhance their professional competitiveness and improve their status and value in the field of education.

### 3.3 Professional Skills Under Pressure

The era of intelligence requires teachers to have new teaching skills and knowledge. However, many teachers feel powerless in the face of artificial intelligence technology. They lack the necessary technical literacy and knowledge reserve, and cannot effectively integrate artificial intelligence technology into teaching practice. The pressure of this professional skill makes teachers face great challenges in adapting to the educational needs of the intelligent era.

Firstly, teachers need to master certain information technology and data analysis capabilities. They need to understand the basic principles and application scenarios of artificial intelligence technology, and be able to use information technology to carry out curriculum design and teaching implementation. At the same time, they also need to have data analysis capabilities that can collect, analyze and interpret students' learning data to develop personalized teaching strategies and evaluation programs. Secondly, teachers need to have innovative thinking and interdisciplinary integration ability. In the era of intelligence, education is no longer limited to traditional subject knowledge, but pays more attention to cultivating students' innovative thinking and practical ability<sup>[19]</sup>Minzu University of China, No. 27 Zhongguancun South Avenue, 100081, Beijing, China</auth-address><titles><title>Generative artificial intelligence attitude analysis of undergraduate students and their precise improvement strategies: A differential analysis of multifactorial influences</title><secondary-title>Education and Information Technologies</secondary-title></titles><periodical><full-title>Education and Information Technologies</full-title></periodical><pages>1-36</pages><number>prepublish</number><keywords><keyword>Generative artificial intelligence (GenAI). Therefore, teachers need to have interdisciplinary knowledge background and integration ability, and can integrate the knowledge and methods of different disciplines to provide students with a richer and more diverse learning experience. However, the learning and mastery of these new skills is not achieved overnight. Many teachers feel powerless in the face of these challenges and lack the necessary support and guidance. The education sector and schools need to provide teachers with the necessary training and support to help them acquire new teaching skills and knowledge<sup>[20]</sup>. At the same time, teachers also need to maintain a positive learning attitude and innovative spirit, constantly challenge themselves and surpass themselves to meet the educational needs of the intelligent era.

Therefore, the identity of teachers in the intelligent era faces many challenges. These challenges are not only related to the personal career development of teachers, but also affect the future direction of the entire education system. In order to cope with these challenges, teachers need to constantly improve their professional quality and innovation ability, pay attention to the latest trends and technological development in the field of education, and actively explore new teaching methods and strategies. At the same time, education departments and schools also need to provide teachers with the necessary support and guidance to help them adapt to the educational needs of the intelligent era. Through these efforts, we can jointly promote the sustainable development of education and contribute to the cultivation of more talents with innovative spirit and practical ability.

## 4. Coping Strategies of Teachers' Identity in the Intelligent Era

The arrival of the intelligent era not only brings about the innovation of educational technology<sup>[21]</sup>, but also poses new challenges to teachers' role positioning, professional quality and professional identity. In order to effectively deal with these challenges, teachers need to adopt a series of positive strategies to resolve the identity crisis and realize the dual development of individual and career. The following will discuss in detail the coping strategies of teacher identity in the intelligent era from four aspects: re-examining role positioning, strengthening professional self-confidence, improving professional quality and strengthening professional identity.

### 4.1 Re-Examine the Role Positioning

In the era of intelligence, the role of teachers is no longer limited to the imparter of knowledge, but needs to develop in a more diversified and comprehensive direction. In the face of this change, teachers need to re-examine their own role positioning and clarify new role responsibilities and missions.

Firstly, teachers should change from the imparter of knowledge to the tutor in the process of students' learning. With the

help of intelligent technology, students can more easily obtain various learning resources, but how to effectively integrate these resources, how to deeply understand and apply the knowledge learned, still need teachers to provide professional guidance and guidance. Therefore, teachers need to pay attention to students' learning process, understand their learning needs and difficulties, and provide personalized learning suggestions and support. Secondly, teachers should become resource integrators. In the era of intelligence, the diversity and richness of educational resources are unprecedented. Teachers need to have a strong ability to integrate resources, be able to select the most suitable content for students from a large number of learning resources, and build a personalized learning path. At the same time, teachers also need to have an interdisciplinary knowledge background, which can integrate the knowledge and methods of different disciplines to provide students with a more comprehensive and in-depth learning experience. Finally, teachers should become collaborative innovators. Educational innovation in the era of intelligence is no longer limited to a single discipline or field, but requires interdisciplinary and interdisciplinary collaboration. Teachers need to actively participate in various educational innovation projects and practices, and conduct in-depth cooperation with peers, students, enterprises and other parties to explore new educational models and teaching methods.

#### **4.2 Firm Professional Self-Confidence**

In the face of the impact of artificial intelligence technology, teachers' professional self-confidence is often easily shaken. However, firm professional self-confidence is an important prerequisite for teachers to meet the challenges of the intelligent era. Firstly, teachers should correctly view the educational changes brought about by artificial intelligence technology. Although artificial intelligence technology can replace some of the functions of teachers to a certain extent, its unique role and value in the education process cannot be completely replaced. For example, teachers' ability of humanistic care, emotional communication and personalized guidance is incomparable to artificial intelligence technology. Therefore, teachers should actively embrace artificial intelligence technology as an important tool to improve the quality and efficiency of education and teaching, rather than an enemy that threatens their professional status. Secondly, teachers should pay attention to their own career development. In the era of intelligence, teachers need to continuously improve their professional quality and teaching ability to adapt to new educational needs and technological changes. By participating in various trainings, seminars and exchange activities, teachers can constantly broaden their horizons and knowledge and enhance their professional competitiveness.

#### **4.3 Improving Professional Quality**

In the era of intelligence, teachers' professional quality is the key to meet the challenges. In order to improve professional quality, teachers need to strengthen learning and practice, and constantly adapt to new educational technology and teaching methods. Firstly, teachers should strengthen the study and research of artificial intelligence technology. By deeply understanding the basic principles and application methods of artificial intelligence technology, teachers can better master this technology and apply it to educational practice. For example, teachers can use artificial intelligence technology to explore and practice learning situation analysis, personalized learning path design, and teaching effect evaluation. Secondly, teachers should actively participate in the practice of educational innovation. By participating in various educational innovation projects and practices, teachers can constantly try new teaching models and teaching methods to improve their teaching ability and professional quality. At the same time, teachers can continue to expand their educational horizons and knowledge through cooperation and exchanges with peers, students, enterprises and other parties.

#### **4.4 Strengthen Professional Identity**

Strengthening professional identity is one of the important strategies for teachers to cope with the challenges of the intelligent era. By strengthening professional identity, teachers can enhance their self-confidence and sense of belonging, so as to better cope with various challenges and difficulties.

Firstly, teachers should constantly improve their professional quality and academic level by participating in professional training, academic exchanges, educational research and other activities. These activities can not only help teachers understand the latest educational concepts and teaching methods, but also improve their academic literacy and research ability. By participating in these activities, teachers can continuously enhance their professional identity and self-confidence.



Secondly, teachers should also actively participate in educational practice. Applying the knowledge and skills learned to practical teaching can not only verify and improve their professional ability, but also enhance teachers' sense of professional achievement and belonging. Through interaction and communication with students, peers and parents, teachers can have a deeper understanding of their own educational practice and teaching effect, so as to constantly adjust and optimize their teaching strategies and methods.

Therefore, the coping strategies of teachers' identity in the intelligent era need to comprehensively consider many aspects such as role positioning, professional self-confidence, professional quality and professional identity. Through the implementation of strategies such as re-examining role positioning, strengthening professional self-confidence, improving professional quality and strengthening professional identity, teachers can effectively cope with the challenges brought by the intelligent era and realize the dual development of individuals and professions. At the same time, the implementation of these strategies will also help to promote the sustainable development of education and contribute to the cultivation of more talents with innovative spirit and practical ability.

## **5. Case Analysis of Teacher Identity in the Era of Intelligence**

In order to better understand the identity of teachers in the intelligent era, the following will be analyzed in combination with specific cases.

### **5.1 Case 1: Personalized Teaching Under AI Tools**

In the educational reform of the intelligent era, a primary school actively tried to use AI tools for personalized teaching. This innovative initiative aims to use the powerful functions of artificial intelligence to identify and meet the unique learning needs and interests of each student, thereby improving teaching effectiveness and students' learning experience.

#### **5.1.1 Transformation and Challenges of Teacher Identity**

##### **(1) Role redefinition**

In the traditional teaching mode, teachers are usually the instillers of knowledge and control the dominance of the classroom. However, after the introduction of AI tools, the role of teachers began to change, from the knowledge imparter who dominated the classroom to the mentor who guided and supported students' autonomous learning. This change of role requires teachers to redefine their responsibilities, no longer just to impart knowledge, but to pay more attention to the individual needs of students, provide timely feedback and guidance, and create an environment conducive to deep learning.

##### **(2) Technology integration and application**

Teachers need to learn and master new teaching techniques and tools in the process of using AI tools for personalized teaching. This includes understanding the functions and limitations of AI systems, collecting and analyzing data to optimize teaching decisions, and solving possible technical problems. The integration and application of technology is a challenge for teachers, but it is also an opportunity for learning and growth. By participating in professional training, sharing experience and reflection with other teachers, teachers have gradually mastered new teaching techniques and tools and effectively integrated them into teaching practice.

##### **(3) Balance the role of AI and human teachers**

Although AI can provide personalized learning resources and feedback, it cannot completely replace the role of human teachers in emotional support, moral guidance and interpersonal communication. Teachers need to find a suitable way to combine the advantages of AI with their own teaching expertise to achieve the best teaching effect. This requires teachers to constantly explore and innovate in teaching practice, not only to make full use of the advantages of AI technology, but also to maintain the unique value of human teachers.

#### **5.1.2 Reinforcement and Promotion of Identity**

##### **(1) Professional growth and self-realization**

In the educational reform of the intelligent era, teachers have improved their professional quality and teaching ability through continuous learning and practice. They not only master new teaching techniques and tools, but also learn how to better pay attention to the individual needs of students and provide targeted guidance and help. This process of professional growth and self-realization enhances teachers' sense of identity.



## (2) Teaching innovation and teamwork

In the process of using AI tools for personalized teaching, teachers constantly explore and innovate teaching methods and strategies. Through teamwork and sharing experience, they jointly solve the problems and challenges encountered in teaching. This spirit of teaching innovation and teamwork also enhances teachers' sense of identity.

## (3) Students' feedback and recognition

In the process of using AI tools for personalized learning, students have obtained better learning experience and results. They give positive feedback and recognition to teachers' hard work and innovative spirit. This kind of feedback and recognition from students also further enhances teachers' sense of identity. Therefore, teacher identity in the intelligent age is a complex and changeable process. Teachers need to constantly adapt to the new educational technology and teaching mode, redefine their roles and responsibilities, and constantly explore and innovate in teaching practice. Through professional growth, teaching innovation and teamwork, teachers can strengthen and enhance their sense of identity and contribute more to students' learning and development

## 5.2 Case 2: Exploration of the Teaching Mode of Human-Machine Collaboration

A university has carried out the exploration of man-machine collaborative teaching mode. In this model, teachers and students jointly use artificial intelligence technology for teaching and learning activities. Teachers can publish learning tasks and resources through the intelligent teaching platform, and students use intelligent devices for autonomous learning and collaborative inquiry. At the same time, the intelligent teaching platform can also collect students' learning data and learning effect feedback in real time, and provide teachers with accurate teaching decision support.

In this case, the man-machine collaborative teaching mode enables teachers and students to make full use of the advantages of artificial intelligence technology for teaching and learning activities. Teachers can understand students' learning situation and needs in real time through the intelligent teaching platform, and provide personalized learning support and guidance. Students can carry out independent learning and collaborative inquiry through intelligent devices to improve their learning effect and innovation ability. At the same time, the teaching mode of man-machine collaboration also promotes the communication and cooperation between teachers, and improves the professional quality and teaching ability of the whole teaching team.

## 6. Conclusion and Prospect

### 6.1 Conclusion

The coming of the intelligent era has undoubtedly brought earth-shaking changes to the field of education. Among them, teachers' identity is facing unprecedented challenges and unprecedented opportunities. Under the background of this era, teachers not only need to adhere to the essence of traditional educational concepts, but also have the courage to accept the baptism of emerging technologies and realize the reshaping and sublimation of their own roles. Based on the above analysis, this paper draws the following conclusions.

(1) In the face of the challenges of the intelligent age, teachers need to re-examine and clarify their own role. In traditional teaching, teachers are the transmitters of knowledge, and in the era of intelligence, teachers have become more of a guide and promoter of learning. This change requires teachers not only to have solid professional knowledge, but also to have the ability to guide students to learn independently and explore learning. At the same time, firm professional self-confidence is very important for teachers. Under the impact of intelligent technology, some teachers may have career anxiety and self-doubt, but only by constantly improving themselves and firming their beliefs can they gain a foothold in the intelligent era.

(2) Improving professional quality and strengthening professional identity are the key for teachers to cope with the challenges of the intelligent era. Teachers need to constantly learn new knowledge and new skills, especially educational technology related to artificial intelligence, in order to better integrate it into teaching practice. In addition, teachers should also actively participate in educational research and explore the deep integration path of intelligent technology and education and teaching, so as to continuously improve their teaching level and professional quality.

(3) Education departments, schools and all sectors of society should also provide teachers with the necessary professional development support and protection. This includes formulating a scientific teacher training plan, providing a variety of educational resources, and establishing a fair and reasonable evaluation mechanism. Through these measures, teachers can be

encouraged to actively participate in professional development, constantly improve themselves, and create a good educational ecological atmosphere to provide teachers with a broad space for development and growth platform.

## 6.2 Prospect

Looking forward to the future, with the continuous development and application of artificial intelligence technology, the field of education will usher in more changes and innovations. Teachers should actively embrace artificial intelligence technology and make full use of its advantages to improve the quality and efficiency of education and teaching. For example, intelligent teaching system is used to realize personalized teaching, and big data is used to analyze students' learning behavior and effect, so as to formulate more accurate teaching strategies. In addition, teachers should also continue to explore new teaching models and teaching methods. In the era of intelligence, students' learning methods and needs have undergone profound changes, and the traditional teaching mode has been difficult to meet their needs. Therefore, teachers need to constantly innovate and try new teaching methods and methods, such as project-based learning, flipped classroom, etc., to adapt to the new educational environment and teaching needs.

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## Conflict of Interests

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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# Research on the Interdisciplinary and Interdisciplinary Training of High-Level Legal Talents in Jiangsu Universities under the Background of “Artificial Intelligence+”

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**Abstract:** Under the background of “artificial intelligence+”, how to cultivate rule of law talents through interdisciplinary and interdisciplinary in Jiangsu universities has become a key issue to enhance the integration of rule of law construction and scientific and technological innovation. With the rapid development of artificial intelligence technology, the traditional legal education system is facing new challenges and opportunities. The purpose of this study is to explore how to use artificial intelligence technology to promote the deep integration of law education and science and technology, and explore the educational model of interdisciplinary collaborative innovation. Based on the analysis of the existing training mode of legal talents in colleges and universities in Jiangsu, combined with the application of artificial intelligence in the field of rule of law, this paper puts forward targeted talent training strategies and policy suggestions to promote the comprehensive quality improvement of legal talents and interdisciplinary cooperation<sup>[1]</sup>.

**Keywords:** Artificial Intelligence; Interdisciplinary Subject; Interdisciplinary; Rule of Law Talents; High Level Personnel Training

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## 1. Introduction

### 1.1 Research background and significance

With the rapid development of artificial intelligence (AI) technology, the digital and intelligent transformation of various industries around the world has been continuously promoted. Especially in the field of rule of law, the application of artificial intelligence is profoundly changing the traditional legal service and legal practice. From intelligent legal retrieval to judicial decision assistance system, artificial intelligence technology not only provides unprecedented tools for legal workers, but also brings new opportunities for the reform and innovation of legal education<sup>[2]</sup>. Entering the era of “artificial intelligence+”, the traditional legal education is facing severe challenges, and it needs to keep pace with the times and integrate interdisciplinary to cultivate high-level legal talents who can master the law and have certain scientific and technological literacy.

Under this background, how to cultivate high-level legal talents that meet the needs of the times through interdisciplinary and interdisciplinary ways in colleges and universities has become an urgent task for today’s educational reform and social development. In particular, as a developed area in economy and science and technology, Jiangsu’s colleges and universities have great potential and challenges in promoting the cultivation of talents under the rule of law and innovative education. How to effectively use artificial intelligence technology and cultivate legal talents with innovative ability and interdisciplinary

knowledge has become a key issue worthy of in-depth discussion.

## **1.2 “Artificial intelligence+”era of demand for rule of law talents changes**

The demand for rule of law talents in the era of “artificial intelligence+”presents the following remarkable characteristics. First of all, with the continuous innovation of artificial intelligence technology, the traditional legal professional role has changed. Legal services are not only limited to traditional occupations such as lawyers and judges, but also need a large number of compound talents who can understand and apply artificial intelligence technology. These talents need to have a solid legal foundation, as well as certain computer science, data analysis and artificial intelligence technology application capabilities. Secondly, artificial intelligence can greatly improve the efficiency and accuracy of legal services, but it also brings a series of new legal problems, such as data privacy protection, algorithm transparency, legal responsibility of AI system, etc<sup>[3]</sup>. The solution of these problems requires the rule of law talents with interdisciplinary knowledge. Finally, the application of artificial intelligence technology makes some processes in the legal system automated, such as intelligent contracts and automatic judgments, which puts higher demands on the quality and skills of legal talents, especially on their technical literacy, cross-disciplinary communication skills and innovative thinking.

## **1.3 The status quo and challenges of the rule of law talents training in Jiangsu universities**

As one of the important bases of law education in China, Jiangsu Province has a number of excellent law colleges and universities. At present, Jiangsu colleges and universities have made some achievements in training talents under the rule of law, but they still face many challenges. First of all, traditional law education still pays more attention to theory and the cultivation of basic subjects, ignoring interdisciplinary knowledge integration and practical application. Secondly, although some colleges and universities have begun to try to integrate artificial intelligence technology into law teaching, this integration is still in the initial stage, lacking systematic and in-depth interdisciplinary course and education model. Moreover, the existing training mode of rule of law talents is relatively simple, and the far-reaching influence of artificial intelligence technology on the legal profession has not been fully considered, and it has not been adjusted and innovated in time according to market demand. In addition, in the process of promoting the integration of the rule of law and science and technology, Jiangsu colleges and universities are also facing problems such as insufficient teachers, lack of interdisciplinary teaching resources and imperfect education platform construction. These challenges make the cultivation of rule of law talents in Jiangsu universities lack effective coping strategies and practical guidance when facing the wave of “artificial intelligence+”.

# **2.The theoretical basis of the rule of law personnel training in the era of “artificial intelligence+”**

## **2.1 The relationship between artificial intelligence and the rule of law personnel training**

Under the background of “artificial intelligence+”,the cultivation of talents under the rule of law no longer depends only on traditional legal knowledge teaching and basic education of humanities, but needs to be deeply integrated with artificial intelligence technology. The wide application of artificial intelligence in the field of rule of law requires that rule of law talents not only have a solid theoretical foundation of law, but also have the ability to understand, apply and supervise artificial intelligence technology. This demand promotes the development of rule of law education in the direction of interdisciplinary integration, and cultivates compound talents who can solve the problem of the intersection of law and technology.

First of all, the rapid development of artificial intelligence has changed the workflow and professional requirements of the legal profession. Traditional legal professional roles such as lawyers, judges and prosecutors have begun to accept the influence of technology. For example, technologies such as smart contract and AI decision-making assistant system require rule of law talents to have certain technical understanding and data analysis ability. Secondly, the application of artificial intelligence in legal practice makes the rule of law talents not only the executors of the law, but also need to have innovative consciousness, and be able to use artificial intelligence technology to create new forms for legal services and provide more efficient solutions. Finally, the legal and ethical issues of artificial intelligence, data privacy protection issues and algorithm transparency issues all require the rule of law talents to have an interdisciplinary knowledge background, and can examine the problems from legal, ethical and technical perspectives and make solutions. Therefore, the relationship between artificial intelligence and the cultivation of talents under the rule of law is actually a mutually reinforcing and complementary relationship<sup>[4]</sup>. The



continuous development of law provides a normative framework for the application of artificial intelligence technology, while the innovation and application of artificial intelligence technology requires legal talents to have new skills and qualities in order to adapt to and lead the deep integration of technology and law.

## 2.2 The impact of artificial intelligence technology on legal education

Artificial intelligence technology has had a far-reaching impact on law education, especially in the aspects of law teaching content, methods and personnel training mode.

First of all, artificial intelligence technology has promoted the reform of the law curriculum system. Traditional law courses focus on theoretical teaching, with emphasis on the interpretation of legal provisions and case analysis. However, under the background of “artificial intelligence+”, legal education needs to add a systematic explanation of artificial intelligence and its legal problems. For example, the foundation of artificial intelligence related technologies, artificial intelligence ethics issues, data security and privacy protection issues should all be included in the law curriculum system. In addition, the interdisciplinary courses of law, computer science and data science should be gradually integrated into the legal education system, so that law students can master basic technical literacy while learning legal knowledge, especially in the fields of data processing and algorithm application.

Secondly, artificial intelligence technology promotes the innovation of law education methods. The traditional method of law education is mainly teaching, and students accumulate knowledge by reading legal texts and cases. However, the introduction of artificial intelligence has led to a new development direction of teaching methods. The application of intelligent legal retrieval system, AI judgment assistant tools and other technologies enables students to study and practice more efficiently. For example, through case-based reasoning simulation and online intelligent defense, students can exercise their legal analysis and judgment ability closer to the actual work scene<sup>[5]</sup>. Artificial intelligence technology can also help teachers evaluate students' learning situation more accurately in teaching, thus providing more personalized and targeted guidance.

Thirdly, the influence of artificial intelligence on legal education is also reflected in the interdisciplinary cooperation model. Traditional legal education focuses on imparting knowledge of a single subject, while modern legal practice needs interdisciplinary comprehensive ability more and more. The popularization of artificial intelligence technology requires law education to establish a closer cooperative relationship with computer science, engineering, ethics and other disciplines. Colleges and universities can promote exchanges and cooperation between different disciplines by setting up joint courses and interdisciplinary research centers, so as to provide students with a more comprehensive educational experience.

In addition, the application of artificial intelligence technology has also accelerated the internationalization of law education. With the advancement of globalization, the internationalization of law and cross-border governance are becoming more and more prominent. The application of artificial intelligence technology in cross-border data flow, international trade, intellectual property protection, etc., makes the rule of law talents have a global vision and cross-cultural communication ability. Law education needs to cultivate students' international competitiveness and transnational legal cooperation ability through international cooperation and joint courses.

In a word, artificial intelligence technology has brought revolutionary influence to law education, not only changed the law curriculum system and teaching methods, but also promoted the interdisciplinary and international talent training model. In this context, the cultivation of talents under the rule of law must keep up with the pace of technological development, and ensure that innovative compound talents can be provided for the legal field to adapt to the development of modern science and technology.

## 3. The theoretical basis of interdisciplinary and interdisciplinary.

### 3.1 Definition and development of interdisciplinary subjects

Interdisciplinary Studies refers to the integration of theories, methods and perspectives from different disciplines to form a new discipline field or research paradigm by crossing the boundaries of traditional disciplines. This integration of disciplines is not limited to the integration of academic fields, but also involves cooperation and innovation in practical applications. The core feature of interdisciplinary subjects is to solve complex problems that can't be solved by a single subject with the help of complementarity among disciplines<sup>[6]</sup>.



The concept of interdisciplinary can be traced back to the early 20th century. At that time, scholars began to realize the limitations of a single discipline, especially when faced with complex social, scientific and environmental problems, a single discipline often could not provide comprehensive answers. With the continuous development of science and technology and society, the concept of interdisciplinary has been gradually recognized by academic circles and widely used in various fields, especially in medicine, environmental science, information technology, law and other fields.

In recent years, with the rapid development of cutting-edge technologies such as artificial intelligence, big data and life sciences, the importance of interdisciplinary is further highlighted. For example, the combination of law and artificial intelligence is a typical interdisciplinary field, which requires legal scholars not only to have profound legal knowledge, but also to understand and apply computer science, data analysis and other technologies. Therefore, interdisciplinary not only promotes the innovation of the discipline itself, but also provides a new way to solve complex and diverse problems in the real world.

### **3.2 Interdisciplinary education model and innovation**

Interdisciplinary education mode refers to the organic combination of knowledge, methods and perspectives of different disciplines, breaking the boundaries of traditional disciplines in the teaching process and promoting the cultivation of students' interdisciplinary thinking mode and comprehensive ability. Compared with the traditional single-subject teaching mode, the interdisciplinary education mode pays more attention to the cultivation of students' overall quality and multi-dimensional ability, aiming at cultivating compound talents who can freely switch between multiple disciplines, innovate and solve problems.

The innovation of interdisciplinary education mode is mainly reflected in the following aspects:

#### **3.2.1 Interdisciplinary integration of curriculum design**

Under the interdisciplinary education mode, curriculum design not only pays attention to the depth of a single discipline, but also pays attention to the comprehensive application of interdisciplinary knowledge. For example, in law education, in addition to traditional law courses, basic knowledge in artificial intelligence, computer science, ethics and other fields should be added to the course content. This interdisciplinary course design helps students to understand problems from multiple dimensions and cultivate their interdisciplinary thinking. The course can encourage students to think and solve complex problems brought about by the intersection of law and technology from different disciplines through special lectures, case analysis and practical links.

#### **3.2.2 Innovation and interaction of teaching methods**

In the interdisciplinary teaching mode, the traditional one-way teaching method is gradually replaced by more interactive and innovative teaching methods. Teachers are not only the imparting of knowledge, but also the guide and promoter of interdisciplinary. For example, through interdisciplinary teamwork, collaborative learning and project-based teaching, students are encouraged to cooperate across disciplines to solve practical problems. This way can not only improve students' teamwork spirit and communication ability, but also help students innovate and broaden their thinking in practice.

#### **3.2.3 Construction of practice and experiment platform**

The interdisciplinary education model emphasizes the combination of theory and practice, so the construction of practice platform is particularly important. Colleges and universities can provide students with practical opportunities by establishing interdisciplinary laboratories and joint innovation platforms. For example, law students can carry out simulation practice in the artificial intelligence laboratory and experience the actual situation of combining technology with law. Through this practice, students can apply what they have learned to practical problems and further improve their comprehensive quality and innovative ability.

#### **3.2.4 The construction of interdisciplinary teaching staff**

The key to interdisciplinary education lies in the construction of teachers. To achieve the educational goal of interdisciplinary, colleges and universities need to cultivate or introduce teachers with interdisciplinary background. These teachers not only have profound attainments in their respective disciplines, but also can cross the boundaries of disciplines and carry out interdisciplinary knowledge integration and innovation. Interdisciplinary cooperation and communication between teachers

can provide students with more abundant learning resources and teaching support.

### **3.2.5 Internationalization and cross-cultural cooperation**

Under the background of globalization, the interdisciplinary education mode also emphasizes the cultivation of international vision. There are differences in the development direction and focus of disciplines in different countries and regions. Transnational cooperation and exchange can help students understand globalization problems and solutions and broaden their international thinking mode. For example, international cooperation in legal education and artificial intelligence can promote cross-cultural dialogue and experience exchange between scholars and students, and promote the coordinated development of law and technology on a global scale.

Therefore, interdisciplinary and interdisciplinary education mode is an effective educational path to deal with complex problems in modern society. With the continuous development of technology and the change of social needs, the traditional disciplinary boundaries have gradually blurred, and interdisciplinary cooperation has become the key to educational innovation. For law education, especially under the background of “artificial intelligence+”, interdisciplinary can not only improve students’ comprehensive quality, but also cultivate high-level rule of law talents with interdisciplinary innovation ability, which is of great significance for promoting the integration of law, science and technology and society.

## **4. The theoretical basis for the training of high-level legal talents**

The cultivation of high-level legal talents is the core goal of legal education to meet the needs of society. Under the background of “artificial intelligence+”, the cultivation of high-level legal talents requires not only profound legal literacy, but also interdisciplinary comprehensive ability and innovative thinking. The theoretical basis for training such talents can be expounded from the following aspects:

### **4.1 The basic theory of rule of law theory and legal education.**

The cultivation of talents under the rule of law should first be based on the theory of the rule of law. The rule of law refers to the political, legal ideas and institutional system based on law, which guarantees citizens’ rights and maintains social order. When cultivating high-level talents under the rule of law, we must first teach the basic principles and concepts of the rule of law, so that students can deeply understand the values and goals of a society ruled by law. Legal education plays a vital role in this process, aiming at making students master the basic knowledge, principles, rules and application ability of law through systematic study of legal theory and forming a comprehensive understanding of the rule of law<sup>[7]</sup>.

The cultivation of high-level legal talents depends not only on the traditional teaching of legal knowledge, but also on cultivating students’ critical thinking and innovative consciousness. In the era of “artificial intelligence+”, law is facing many new problems and challenges, such as smart contracts, data privacy, AI ethics, etc., which requires law education to constantly update ideas and pay attention to interdisciplinary knowledge integration and application to meet the rapidly changing social needs.

### **4.2 Interdisciplinary theory and the cultivation of compound talents**

The era of “artificial intelligence+” puts forward new requirements for the cultivation of high-level legal talents, especially for interdisciplinary and compound talents. The interdisciplinary theory emphasizes the knowledge fusion and method complementarity between different disciplines, and advocates the comprehensive application and innovation of various disciplines by breaking the boundaries of disciplines. As a traditional social science, legal education is gradually facing the challenge of technical and scientific development, especially the rapid rise of artificial intelligence technology, which urges legal education to absorb and integrate the knowledge and skills of other disciplines.

High-level rule of law talents not only need to master traditional legal knowledge, but also need to have certain technical literacy, and be able to understand and apply emerging technologies such as artificial intelligence, big data and algorithms. This interdisciplinary ability will help legal talents to better solve problems involving science and technology, ethics and society, and promote the deep integration of law and technology.

The core of interdisciplinary theory is to break down the barriers of disciplines and encourage students to think and practice interdisciplinary. Therefore, the cultivation of talents under the rule of law should be integrated with the knowledge of information technology, computer science, ethics and other disciplines, so as to enhance students’ comprehensive ability

and enable them to respond flexibly and solve problems creatively in the complex and changeable social and technological environment.

## 5. Educational theory and teaching mode innovation

The cultivation of high-level legal talents is not only the accumulation of knowledge, but also the improvement of ability and the cultivation of innovative thinking. In law education, pedagogy theory provides important theoretical support for the cultivation of high-level legal talents. Pedagogy theory emphasizes the change of students' dominant position and pays attention to the cultivation of students' practical ability, innovative ability, teamwork ability and interdisciplinary thinking. Therefore, the modern legal education model should pay attention to the innovation of educational content and teaching methods in order to improve students' comprehensive quality.

First of all, law education should not only rely on traditional lecture teaching, but also strengthen interactive and practical teaching modes, such as case teaching, mock trial, online learning platform, etc., so that students can continuously improve their ability to analyze and solve problems in practice. Especially, the cultivation of innovative ability of rule of law talents can be realized by cultivating students' critical thinking and ability to solve complex problems. In addition, interdisciplinary teaching methods and diversified curriculum design are also important parts of cultivating high-level rule of law talents.

Secondly, the theory of pedagogy also emphasizes the guiding role of teachers. When cultivating high-level talents under the rule of law, teachers should not only have a profound knowledge of law, but also have interdisciplinary knowledge reserves and practical experience. The innovation of teachers' teaching mode and method can help students better understand the relationship between law and technology, and improve their comprehensive analysis and innovative problem-solving ability.

## 6. Talent cultivation theory and ability orientation

The cultivation of high-level legal talents should not only focus on imparting subject knowledge, but also focus on cultivating students' comprehensive ability. The theory of talent cultivation puts forward that the process of talent cultivation is not only a process of knowledge learning, but also a process of ability development. In law education, besides cultivating students' legal knowledge, we must pay attention to the cultivation of students' practical ability, innovative ability and interdisciplinary cooperation ability.

Ability-oriented is an important idea in current educational theory, which emphasizes whether students' ability after graduation can meet the needs of society and industry. When training high-level legal talents, we should emphasize the cultivation of students' practical ability, so that students can transform what they have learned into practical ability. Especially in the face of complex legal problems, the rule of law talents need to be able to integrate various resources, coordinate the knowledge of different disciplines, and make reasonable and innovative legal decisions.

In addition, with the rapid development of legal science and technology, talents under the rule of law also need to have the ability to cope with new technologies and new social needs. For example, how to use artificial intelligence to optimize legal services and how to analyze legal issues in big data requires certain technical and data analysis capabilities. Therefore, when cultivating talents under the rule of law, we should take innovation ability and technical literacy as key elements to promote the ability-oriented educational goal.

To sum up, the cultivation of high-level legal talents faces multiple challenges and opportunities in the era of "artificial intelligence+", and its theoretical basis mainly comes from the rule of law theory, interdisciplinary theory, pedagogy theory and talent cultivation theory. The cultivation of talents under the rule of law requires not only solid legal knowledge, but also interdisciplinary comprehensive ability, innovative thinking and practical ability. Through innovative education mode, interdisciplinary integration and ability-oriented training methods, we can cultivate high-level legal talents for the society to meet the needs of the new era and promote the deep integration and development of law and technology.

## 7. The analysis of the current situation of the rule of law talents training in Jiangsu universities

### 7.1 the status quo of rule of law talents training in Jiangsu universities

As one of the important areas of rule of law education in China, Jiangsu Province has many well-known universities, whose

legal education systems have certain influence at home and abroad. In recent years, remarkable progress has been made in the training of rule of law talents in Jiangsu universities, and the quality of education for law majors has been continuously improved. Colleges and universities in Jiangsu pay attention to the teaching of legal theory and gradually strengthen the training of legal practice ability, especially the training of legal professional ability, legal document writing, court debate and so on. However, although some achievements have been made in the cultivation of talents under the rule of law in Jiangsu universities, there are still some limitations under the background of “artificial intelligence+”, especially in the modernization of educational content, the innovation of teaching methods and the integration of disciplines, which still need further exploration and improvement.

## **7.2 The law curriculum and teaching methods**

The curriculum of law major in Jiangsu universities has basically covered all the core fields of traditional law, such as constitutional law, civil law, criminal law, administrative law and so on. However, with the rapid development of society and science and technology, especially in the era of “artificial intelligence+”, law education is facing new challenges and demands. The current curriculum is still relatively traditional, lacking enough interdisciplinary course content, and students lack the combination with technology, data, artificial intelligence and other fields while learning basic legal knowledge, which leads to students’ insufficient ability to cope with new technologies and problems.

In terms of teaching methods, the legal education in colleges and universities in Jiangsu has traditionally adopted a teaching mode based on classroom teaching, focusing on the teaching of legal knowledge and the cultivation of basic ability. However, this traditional teaching method is relatively simple, lacking interactivity and practicality, and cannot fully meet the needs of rule of law talents in the new era. In recent years, some colleges and universities have begun to try innovative teaching methods, such as case teaching, mock trial, legal practice courses, etc. However, on the whole, the innovation of legal education is still slow, and it still fails to effectively combine emerging technologies with interdisciplinary teaching models.

## **7.3 The comprehensive quality and training mode of rule of law talents**

The training mode of rule of law talents in Jiangsu universities mainly focuses on two aspects: on the one hand, through systematic curriculum education, students are trained with solid legal theory knowledge; On the other hand, through practice and internship, students’ legal practice ability is improved. On the whole, the cultivation of rule of law talents in Jiangsu universities pays attention to students’ legal professional foundation, but the efforts to cultivate students’ interdisciplinary literacy, innovation ability and global vision are still insufficient.

The cultivation of comprehensive quality, especially its application in emerging fields such as information technology and artificial intelligence, is a weak link in the cultivation of talents under the rule of law. The existing training mode involves little knowledge and technology in these emerging fields, which leads to students’ lack of ability to deal with complex legal problems under the background of “artificial intelligence+”. The cultivation of legal talents should not only pay attention to students’ professional knowledge and skills, but also strengthen their innovative thinking, interdisciplinary ability and social responsibility.

## **7.4 The application of artificial intelligence in the rule of law education in Jiangsu universities**

With the rapid development of artificial intelligence technology, some universities in Jiangsu have begun to explore the application of artificial intelligence in the education of rule of law. This process is mainly reflected in the curriculum setting, the construction of experimental platform and the use of intelligent teaching tools. For example, some colleges and universities have begun to introduce artificial intelligence-related contents into law courses, such as artificial intelligence ethics, data privacy protection, smart contracts, etc., and gradually strengthen students’ knowledge and understanding of artificial intelligence technology through academic exchanges, lectures and other forms.

However, the application of artificial intelligence in rule of law education in Jiangsu universities is still in its infancy, mainly focusing on theoretical guidance and the use of some single teaching tools. In actual teaching, although some colleges and universities have begun to try to use artificial intelligence technology to assist teaching, such as intelligent legal retrieval system and automatic scoring system, these applications still have some problems such as immature technology and limited system functions, which fail to play a greater role in comprehensively cultivating talents under the rule of law.

## **8.Problems and challenges**

### **8.1 Limitations of traditional legal education**

Although Jiangsu colleges and universities have made progress in legal education, the limitations of traditional legal education are still outstanding. At present, the legal education system pays more attention to the teaching of theoretical knowledge, but lacks enough technical and interdisciplinary content, which can not meet the needs of cultivating talents under the rule of law in the era of “artificial intelligence+”. In particular, the development of artificial intelligence technology has posed an unprecedented challenge to traditional legal education, and the traditional legal education model has been unable to fully adapt to the changes of modern science and technology.

### **8.2 Difficulties in interdisciplinary integration**

There are still some difficulties in the integration of law with computer science and artificial intelligence. First of all, law teachers often lack technical background and it is difficult to effectively carry out interdisciplinary teaching; Secondly, there are great differences between law courses and technical courses, and there are great differences in curriculum system, teaching methods and thinking modes, which makes the design and implementation of interdisciplinary course more difficult. In addition, at present, many colleges and universities lack systematic planning and design in the introduction of artificial intelligence technology, which is often scattered in technology application and lacks holistic and long-term development strategies.

## **9.The policy suggestions and countermeasures for the training of rule of law talents in Jiangsu universities**

### **9.1 optimize the curriculum and teaching content**

In order to meet the demand for legal talents in the era of “artificial intelligence+”, Jiangsu universities need to optimize the curriculum of law majors, strengthen the modernization and interdisciplinary of curriculum content, and improve the comprehensive quality of law education.

#### **9.1.1 The organic integration of law courses and artificial intelligence courses.**

Law education needs to be combined with emerging technologies, especially artificial intelligence technology, to enhance students' interdisciplinary knowledge. Colleges and universities should integrate artificial intelligence, data analysis and blockchain technology into law courses to provide students with new learning perspectives. For example, courses such as “Law and Artificial Intelligence” and “Legal Issues of Smart Contracts” can be set up to help students understand the application of artificial intelligence in legal practice and cultivate their ability to cope with technical challenges. At the same time, colleges and universities can cooperate with computer science and other majors to design interdisciplinary courses, so that law students can be exposed to the basic principles and application scenarios of artificial intelligence technology, thus providing basic knowledge for future interdisciplinary legal problem solving.

#### **9.1.2 The design of interdisciplinary courses and practice modules.**

Jiangsu universities should further promote the design of interdisciplinary courses. For example, we can combine the fields of law and computer science, law and ethics, design interdisciplinary curriculum modules, and carry out practical teaching activities, such as legal practice, joint simulation of technology and law. Through case teaching, practical training and online courses, students' legal practice ability is enhanced and they are helped to deal with interdisciplinary and complex legal problems.

### **9.2 To strengthen the construction of teachers.**

Teachers are the key factors in the cultivation of high-level legal talents. To promote the high-quality training of talents under the rule of law, we must pay attention to the construction of teachers, especially the training of teachers with interdisciplinary background.

#### **9.2.1 Cultivate teachers with interdisciplinary background.**

Colleges and universities in Jiangsu should strengthen the training of law teachers and encourage them to improve their interdisciplinary quality. Colleges and universities can help law teachers master the knowledge and skills related to artificial



intelligence and data analysis through academic training, interdisciplinary exchanges and further education programs, so that they can meet the new requirements of rule of law education in the era of “artificial intelligence+”. At the same time, colleges and universities can also invite external technical experts, entrepreneurs, industry leaders and so on as part-time professors to provide educational support from different perspectives.

### **9.2.2 Interdisciplinary cooperation and communication among teachers**

In order to strengthen interdisciplinary cooperation and communication among teachers, Jiangsu universities should encourage teachers in the fields of law, computer science, ethics and sociology to jointly carry out teaching and research activities and promote the implementation of interdisciplinary research projects. For example, interdisciplinary research centers and cooperative laboratories can be established to provide more cooperation opportunities and platforms for teachers. At the same time, colleges and universities should support teachers to participate in interdisciplinary academic exchanges at home and abroad, and improve teachers’ international vision and teaching level.

## **9.3 To establish a diversified training platform**

In order to cultivate high-level legal talents to meet the needs of the new era, Jiangsu colleges and universities should focus on establishing diversified training platforms and promoting the effective integration of resources inside and outside the school.

### **9.3.1 School-enterprise cooperation and the construction of interdisciplinary joint laboratories**

Universities in Jiangsu can strengthen cooperation with enterprises, establish joint laboratories between schools and enterprises, and promote the combination of theory and practice. For example, law and artificial intelligence enterprises jointly set up a laboratory to jointly explore the practical application of artificial intelligence technology in the legal field, such as smart contracts and legal data analysis, so as to cultivate students’ technical practical ability.

School-enterprise cooperation can also provide students with opportunities to integrate with the industry through internships, training, enterprise lectures, practical projects and other forms, help students apply what they have learned in practice, and accumulate interdisciplinary knowledge and experience.

### **9.3.2 Increased opportunities for international cooperation and exchange**

In order to broaden students’ international horizons, Jiangsu universities should strengthen cooperation with international universities and scientific research institutions, and set up joint training programs, international exchanges and internship opportunities. Through international academic exchanges and student exchanges, we can help students understand the development trend of international rule of law and enhance their global thinking and competitiveness. Colleges and universities can also actively participate in international academic conferences and forums related to artificial intelligence and the rule of law, organize teachers and students to participate in them, absorb advanced educational concepts and experiences, and promote the innovation of educational content and methods.

## **9.4 Policy guarantee and support**

### **9.4.1 The role of the government in the cultivation of artificial intelligence and rule of law talents.**

The government should provide policy support and financial guarantee for the training of rule of law talents in Jiangsu universities, and encourage universities to explore innovative teaching models and interdisciplinary integration. For example, the government can introduce relevant policies to promote cooperation between universities, enterprises and industries, establish interdisciplinary research platforms and provide special financial support. In addition, the government can set up special funds to support the joint research of law, artificial intelligence, information technology and other related disciplines, and promote the development of teaching and scientific research in the field of “artificial intelligence+rule of law”.

### **9.4.2 Social demand prediction and policy adjustment of talents integrating law and science and technology**

With the wide application of artificial intelligence and other technologies, the integration of law and technology has become the trend of social development. The government should adjust the legal education policy in time according to the social needs and the development direction of science and technology, and predict the future demand for legal talents in advance. For example, by investigating the needs of all sectors of society for talents with legal and technical integration, we can formulate corresponding educational reform programs to cultivate compound talents who can adapt to the future trend of



legal and technical integration. In addition, the government should cooperate closely with universities, enterprises and trade associations to predict and guide the training direction of legal talents, promote the innovation of legal education content and methods, and ensure that legal education can keep up with the pace of social change in time.

## 10.Conclusion

With the rapid development of artificial intelligence technology, traditional law education is facing unprecedented challenges, especially in the process of cultivating talents ruled by law, how to integrate interdisciplinary education mode and scientific and technological innovation has become an urgent problem to be solved. As the key area of rule of law education in China, Jiangsu universities play an important role in promoting the cultivation of rule of law talents, but there are still shortcomings in curriculum setting, teacher team construction and educational model innovation. Under the background of “artificial intelligence+”era, law education still faces challenges such as the limitation of traditional education mode, the difficulty of interdisciplinary integration and the immature application of artificial intelligence technology. In the future, colleges and universities in Jiangsu need to speed up the innovation of education mode, strengthen the design and implementation of interdisciplinary course, promote the in-depth application of artificial intelligence technology, and cultivate high-level rule-of-law talents with profound legal foundation, interdisciplinary ability and innovation ability.

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## Conflict of Interests

The author(s)declare(s) that there is no conflict of interest regarding the publication of this paper.

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# Markedness Theory and Universal Grammar in Chinese Language Acquisition

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**Abstract:** In the field of international Chinese language education, the study of markedness theory and universal grammar is crucial for a deeper understanding of the Chinese language acquisition process among learners from different native language backgrounds. Markedness theory posits that linguistic structures can be categorized into marked and unmarked based on their frequency and regularity in language. Marked structures are typically more complex and less frequently used, whereas unmarked structures are relatively simpler and more commonly used. This study investigates Chinese language learners from various native language backgrounds, employing a mixed-methods approach that combines quantitative and qualitative research methods. Data were collected from learners whose native languages include English, Japanese, Korean, Thai, and Vietnamese. The findings reveal that the parameter settings of learners' native languages significantly influence their acquisition of Chinese parameter settings. When the parameter values of learners' native languages align closely with those of Chinese, their performance in Chinese parameter settings is notably better. Therefore, educators can tailor teaching content and methods based on learners' native language backgrounds. Additionally, marked structures present greater difficulty in Chinese language acquisition compared to unmarked structures. Unmarked structures, being simpler, more basic, and more common, are acquired more quickly by learners. In contrast, marked structures, due to their complexity and rarity, pose significant challenges for learners. This insight is particularly important in teaching practice, as educators need to pay greater attention to marked structures to help learners overcome these difficulties.

**Keywords:** Markedness Theory; Universal Grammar; Chinese Language Acquisition; Second Language Acquisition

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## 1.Introduction

Language acquisition is a critical area of research in linguistics and psychology, addressing fundamental questions about the nature, development, and mechanisms of human language ability. Within the study of language acquisition, markedness theory and universal grammar are two influential yet contentious theoretical frameworks that seek to explain how learners acquire infinite linguistic output from finite input, as well as the universal rules and individual variations that guide this process. Markedness theory posits that linguistic structures can be distinguished as marked or unmarked, with marked structures being more complex and less frequent compared to their unmarked counterparts, leading to differences in acquisition difficulty and sequence (Xia, 2022). Universal grammar, on the other hand, proposes that language learners are innately equipped with a universal set of grammatical knowledge, encompassing principles and parameters that enable them

to extract target language features from input through parameter setting (Wang, 2015). These two frameworks are, to some extent, complementary, as they both reflect the choices and constraints faced by language learners during the acquisition process.

Chinese, as a prototypical isolating language, exhibits unique markedness features in its phonology, lexicon, and syntax, such as tones, classifiers, particles, and null anaphora. These features present both challenges and opportunities for Chinese language learners, as they reflect the markedness choices and universal grammar parameter settings made during the acquisition process (Wang, 2024). Therefore, exploring markedness theory and universal grammar in the context of Chinese language acquisition not only deepens our understanding of the structural properties of Chinese but also sheds light on the psychological and cognitive mechanisms of learners. This has significant implications for Chinese language teaching and assessment. This paper aims to analyze the markedness features and adherence to universal grammar rules in Chinese learners' phonology, lexicon, and syntax from the perspectives of markedness theory and universal grammar. By collecting and analyzing oral and written data from Chinese learners of different native language backgrounds, proficiency levels, and age groups, this study employs statistical and content analysis to provide a comprehensive and in-depth exploration of Chinese language acquisition.

## 2. Theoretical Framework

Markedness theory, proposed by Chomsky in the 1960s, is a linguistic theory that posits a distinction between marked and unmarked structures in language. Marked structures, in contrast to unmarked ones, exhibit greater complexity and lower frequency, leading to differences in acquisition difficulty and sequence. The concept of markedness refers to an asymmetry within a linguistic category, where one member of an opposition is unmarked (or less marked), while the other is marked (or more marked) (Yuan, 2023). The value of markedness theory lies in its ability to explain patterns of errors and developmental trajectories in language learners across different proficiency levels, as well as the universals and variations among languages. However, the theory has limitations, as it does not provide a clear definition of what constitutes markedness or unmarkedness (Wang, 2021), nor does it offer a systematic method for determining the markedness of a structure. Additionally, it fails to account for individual differences among learners and the influence of contextual factors on language acquisition.

Universal grammar, introduced by Chomsky in the 1980s, is a theory of language acquisition that posits an innate, universal set of grammatical knowledge in learners. Universal grammar comprises a set of principles and parameters, and through parameter setting, learners are able to extract the features of the target language from input. The strength of universal grammar lies in its capacity to explain how learners generate infinite linguistic output from finite input, as well as the universal rules and individual variations that guide this process (Wu, 2013). However, universal grammar has its limitations, as it does not sufficiently consider the role of external factors such as input, output, interaction, and feedback in language acquisition. Furthermore, it lacks robust empirical evidence to fully support its theoretical assumptions.

## 3. Research Methodology

This study aims to investigate the setting of universal grammar parameters by international students from different native language backgrounds in the process of Chinese language acquisition, as well as the influence of markedness theory on parameter setting. Four universal grammar parameters were selected as the focus of this study: the subject position parameter, the null anaphora parameter, the null subject parameter, and the verb movement parameter. Specifically, the subject position parameter refers to whether the subject can be omitted or must be overtly expressed; the verb movement parameter refers to whether the verb can be fronted or must remain in a post-verbal position; the null anaphora parameter refers to whether an anaphoric element can be null or must be explicitly realized; and the null subject parameter refers to whether the subject can be null or must be overtly expressed (Sun, 2020).

To achieve the research objectives, this study employs a mixed-methods approach, systematically integrating quantitative analysis and qualitative inquiry to comprehensively reveal the patterns of Chinese parameter setting among learners from different native language backgrounds. In terms of research design, the quantitative method focuses on collecting quantifiable data on the frequency of parameter-setting errors, while the qualitative method delves into the cognitive mechanisms and

native language transfer pathways underlying these errors through textual analysis. These two approaches complement each other, ensuring both the breadth and depth of the data. The participants include 11 learners whose native languages are English, Japanese, Korean, Thai, and Vietnamese, aged between 21 and 28, all with Chinese proficiency levels of HSK 3-4. This ensures a consistent gradient of language ability and diversity in native language types within the sample. Data were collected through simple essay writing tasks, yielding a total corpus of 6,774 Chinese characters. The integration of results is achieved through triangulation: quantitative data reveal macro-level error distribution patterns, while qualitative analysis explains their underlying causes. The error examples in Table 1 and the statistical results in Table 2 corroborate each other, collectively constructing an evidence chain of “phenomenon-frequency-mechanism.” This approach not only highlights the prevalence of specific errors but also provides insights into the cognitive and linguistic factors driving these errors, offering a robust foundation for understanding the complexities of Chinese parameter setting among diverse learners.

*Tables 1 Examples of Parameter Setting Errors*

Native Language	Subject Position Parameter	Null Referential Parameter	Null Subject Parameter	Verb Movement Parameter
English	* 昨天去了北京。 (*Went to Beijing yesterday.)	* 我把书放在桌子上，你可以拿走他。 (*I put the book on the table, you can take him.)	* 今天天气很好，一起去公园吧。 (*Today's weather is great, let's go to the park together.)	* 她听音乐喜欢。 (*She listens to music likes.)
Japanese	* 是我最好的朋友他。 (*Is my best friend he.)	* 她把钱包忘在了出租车上，司机把这个还给了她。 (*She left her wallet in the taxi, and the driver returned this to her.)	* 今天很冷，要多穿点衣服。 (*Today is cold, wear more clothes.)	* 他吃苹果喜欢。 (*He eats apples likes.)

*Table 2. Statistical Analysis of Parameter Setting Errors*

Native Language	Subject Position Parameter	Null Referential Parameter	Null Subject Parameter	Verb Movement Parameter
English	2	5	5	7
Japanese	2	4	3	1
Korean	2	3	3	3
Thai	3	4	3	7
Vietnamese	2	3	5	6

## 4. Discussion and Implications

### 4.1 The Influence of Native Language Parameter Values on Chinese Parameter Setting

This study reveals that international students from different native language backgrounds exhibit variations in setting universal grammar parameters during Chinese language acquisition, which is closely related to the parameter values of their native languages. Specifically, students whose native language parameter values align with or are similar to those of Chinese demonstrate higher accuracy in setting Chinese parameters, whereas those whose native language parameter values diverge from or contradict those of Chinese show lower accuracy. This indicates that native language parameter values significantly influence the acquisition and mastery of Chinese parameter settings. To illustrate this, the study focuses on two representative universal grammar parameters: the subject position parameter and the verb movement parameter.

First, Chinese is a language that permits null subjects, meaning subjects can be omitted or filled by null pronouns. In contrast, English and Vietnamese are languages that do not allow null subjects, requiring subjects to be overtly expressed or filled by explicit pronouns. Japanese and Korean, on the other hand, occupy an intermediate position, allowing subjects to be omitted or expressed depending on context or topic. The study finds that students whose native languages are English and Vietnamese exhibit higher accuracy in the subject position parameter, correctly using or omitting Chinese subjects. In contrast, students whose native languages are Japanese and Korean demonstrate lower accuracy, often misusing or omitting Chinese subjects. This is related to whether their native languages permit subject omission. Students from English and Vietnamese backgrounds, accustomed to the rule of disallowing null subjects, only need to adjust their parameter values from “no” to

“yes” when acquiring Chinese, which permits null subjects. However, students from Japanese and Korean backgrounds, accustomed to the intermediate rules of their native languages, must consider contextual or topical factors more carefully when acquiring Chinese, rather than simply adjusting their parameter values.

Second, Chinese is a language that disallows verb movement, requiring verbs to follow objects. In contrast, English, Thai, and Vietnamese are languages that permit verb movement, allowing verbs to precede objects. Japanese and Korean again occupy an intermediate position, where verbs can precede or follow objects depending on sentence structure or modality. The study finds that students whose native languages are Japanese and Korean exhibit higher accuracy in the verb movement parameter, correctly using Chinese post-verbal structures. In contrast, students whose native languages are English, Thai, and Vietnamese demonstrate lower accuracy, often incorrectly using Chinese pre-verbal structures. This is related to whether their native languages permit verb fronting. Students from Japanese and Korean backgrounds, accustomed to the rule of disallowing verb fronting, do not need to adjust their parameter values when acquiring Chinese, which also disallows verb movement, maintaining the “no” setting. However, students from English, Thai, and Vietnamese backgrounds, accustomed to the rule of permitting verb fronting, must adjust their parameter values from “yes” to “no” when acquiring Chinese.

#### **4.2 The Difficulty of Marked Structures in Chinese Parameter Setting**

This study finds that markedness theory has a significant influence on the setting of universal grammar parameters, as marked structures are more challenging to acquire in Chinese language learning compared to unmarked structures. Markedness theory posits that linguistic structures can be categorized into marked and unmarked, with marked structures being more complex, less frequent, and more difficult to acquire than their unmarked counterparts. Generally, unmarked structures are the simplest, most basic, and most common structures, aligning with human cognitive strategies and communicative needs, making them easier to acquire. In contrast, marked structures are relatively complex, specialized, and rare, often violating cognitive strategies and communicative needs, thus posing greater challenges in language acquisition. To illustrate this, the study focuses on two representative universal grammar parameters: the null anaphora parameter and the null subject parameter.

First, Chinese is a language that permits null anaphora, meaning pronouns can be omitted or replaced by abstract pronouns. In contrast, English, Japanese, Korean, Thai, and Vietnamese are languages that do not allow null anaphora, requiring pronouns to be explicitly realized or replaced by concrete pronouns. The study finds that, in the null anaphora parameter, international students exhibit higher accuracy in using unmarked structures such as “他” (he), “她” (she), and “它” (it), correctly employing or omitting these concrete pronouns in Chinese. However, they demonstrate lower accuracy in using marked structures such as “其” (his/her/its) and “之” (it/them), often misusing or omitting these abstract pronouns. This aligns with markedness theory, as unmarked structures are easier to acquire than marked structures.

Second, Chinese is a language that permits null subjects, meaning subjects can be omitted or replaced by abstract subjects. In contrast, English, Japanese, Korean, Thai, and Vietnamese are languages that do not allow null subjects, requiring subjects to be explicitly realized or replaced by concrete subjects. The study finds that, in the null subject parameter, international students exhibit higher accuracy in using unmarked structures such as “我” (I), “你” (you), and “他” (he), correctly employing or omitting these concrete subjects in Chinese. However, they demonstrate lower accuracy in using marked structures such as “咱们” (we/us) and “大家” (everyone), often misusing or omitting these abstract subjects or null subjects. This also aligns with markedness theory, as unmarked structures are easier to acquire than marked structures.

#### **4.3 The Connection and Distinction Between Markedness Theory and Universal Grammar**

Markedness theory and universal grammar are, to a certain extent, complementary, as both reflect the choices and constraints faced by international students during the process of Chinese language acquisition. These choices and constraints arise not only from the parameter values of the students’ native languages but also from the marked structures inherent in Chinese. When acquiring Chinese, students must adjust their parameter values to align with the features of the target language. Simultaneously, they must overcome the challenges posed by marked structures in Chinese to master its complexity and diversity. The connection between markedness theory and universal grammar lies in their shared foundation in generative grammar theory, which emphasizes the innate abilities and creativity of learners. Generative grammar theory posits that language is a complex system generated by a set of abstract rules, rather than a simple list of concrete facts (Xia, 2022).



Therefore, when acquiring Chinese, students do not merely imitate or memorize input; instead, they analyze, reason, hypothesize, verify, and revise through their innate abilities and creativity, thereby generating their own output.

The distinction between markedness theory and universal grammar lies in their focus on different aspects. Markedness theory primarily addresses the varying degrees of complexity and difficulty within linguistic structures, while universal grammar focuses on the core features and variations shared by human languages. Markedness theory posits that linguistic structures can be categorized into marked and unmarked, with marked structures being more complex and challenging to acquire than unmarked ones. As a result, markedness theory helps identify the difficulties and error-prone areas in Chinese language acquisition, as well as the patterns of errors and developmental trajectories among students from different native language backgrounds. Universal grammar, on the other hand, asserts that humans are innately equipped with a universal set of grammatical knowledge, comprising principles and parameters that enable them to extract target language features from input through parameter setting. Thus, universal grammar helps determine the universal rules and individual variations in Chinese language acquisition, as well as how students from different native language backgrounds set Chinese parameter values (Zhang, 2022).

#### 4.4 Practical Applications of Research Findings

Drawing on the conclusions derived from markedness theory and universal grammar, the practical optimization of international Chinese language education can be systematically advanced through three interconnected dimensions—teaching strategies, textbook development, and assessment tools—to form a synergistic and efficient application framework.

Instructional approaches must be closely aligned with learners' native language backgrounds, incorporating differentiated training modules tailored to distinct native language parameter features. For instance: English and Vietnamese speakers, whose native languages permit verb fronting, require contrastive analysis and high-frequency practice to reinforce the “verb-final” rule in Chinese (e.g., correcting “\*\*\* 她听音乐喜欢” to “她喜欢听音乐”). Japanese and Korean speakers, despite sharing a subject-omission tendency with Chinese, rely heavily on contextual cues for subject omission in their native languages. Thus, they need explicit training through situational tasks (e.g., designing “self-introduction” dialogues to avoid errors like “\*\*\* 是朋友 他”). Additionally, hierarchical instruction for marked structures necessitates prioritizing unmarked foundational elements (e.g., “他,” “在”) as core content at the elementary level, reinforced through repetitive input to solidify linguistic foundations. Marked complex structures (e.g., “其,” “咱们”) should be introduced progressively at advanced stages, integrating stylistic comparisons and contextual simulations. For example, specialized training on the formal usage of the abstract pronoun “其” could be embedded in business negotiation scenarios.

Textbooks should integrate native language contrast modules to mitigate negative transfer effects. This can be achieved through: Visualized parameter comparison charts (e.g., contrasting Chinese and English “subject omission” rules). Cross-linguistic cognitive scaffolds (e.g., explaining Chinese null subjects using Korean topic markers). Furthermore, guided by markedness theory, textbooks should adopt a scaffolded exercise system, progressing from elementary mechanical sentence construction (e.g., linking words into sentences) to advanced classical text rewriting tasks, gradually enhancing learners' ability to apply complex structures. Supplementary “language tips” (e.g., noting the formal register of “之”) can clarify usage boundaries.

Assessment mechanisms should incorporate dynamic diagnostics and weighting adjustments: Native language-specific online testing platforms can generate targeted error corpora (e.g., verb position correction exercises for Thai speakers), with error pattern analysis producing personalized feedback reports. Standardized tests (e.g., HSK) can increase the score weight of marked structures (e.g., correct usage of “咱们” or “之”) to more accurately reflect learners' linguistic depth.

### 5. Conclusion

This study, from the perspectives of markedness theory and universal grammar, analyzed the markedness features and adherence to universal grammar rules in the Chinese language acquisition of international students from different native language backgrounds. By collecting oral and written data from students of varying proficiency levels and age groups, and conducting statistical and content analysis, the study reached the following conclusions: (1) Native language parameter values significantly influence the setting of Chinese parameters; (2) Marked structures are more challenging to acquire in Chinese



parameter settings compared to unmarked structures; and (3) Markedness theory and universal grammar are, to a certain extent, complementary.

The findings of this study have important implications for Chinese language teaching and assessment. They can help educators and assessors understand the difficulties and error-prone areas encountered by students from different native language backgrounds during Chinese language acquisition, as well as the universal rules and individual variations they follow. This understanding can inform the development of more reasonable, effective, and targeted teaching and assessment strategies. Additionally, the study enriches and deepens our understanding of the psychological processes and cognitive mechanisms of Chinese language learners, as well as the structural characteristics and developmental trends of the Chinese language itself. However, this study also has certain limitations, such as a relatively small sample size and a limited range of data sources. These issues need to be addressed and improved in future research to further validate and refine the findings.

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# The Development Status and Enhancement Strategies of International Chinese Language Education

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**Abstract:** Nowadays, the world situation is changing, the new crown epidemic affects the whole world, the global situation continues to be in the doldrums, in this case, China's epidemic prevention and control achievements are outstanding, able to buck the trend of steady development. The development of the country will inevitably promote the spread of language, I believe that soon there will be a new round of "Chinese fever". International Chinese language education, with its mission of teaching Chinese language and spreading language and culture, deserves our in-depth study. In the post epidemic era, how to better develop the discipline system of international Chinese language education? How to better develop the cause of international Chinese language education? It is precisely the problem that this paper aims to study.

At present, the name of international Chinese language education has been formalized, marking the expansion of the scope of this discipline and the improvement of its status. In the development of things, there are both favorable and unfavorable conditions, and if we want to achieve further development, we must first have a systematic grasp of things as a whole. The development of international Chinese language education is also like this, and it is bound to face both opportunities and challenges at the same time. Therefore, the authors have reviewed the relevant data, considered all the factors of the development of international Chinese language education in a qualitative way, and integrated them organically with SWOT and PEST analyses. Finally, the authors come up with specific enhancement strategies that can make the development of international Chinese language education possible.

**Keywords:** SWOT; PEST; International Chinese Language Education; Enhancement Strategies

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## 1. Preface

### 1.1 Background and Purpose of the Study

Currently, the global Chinese population totals more than 50 million, and there are 20,000 Chinese language schools around the world, with 50% of them having more than 400 students. In terms of the number of international students coming to China, from 2014 to 2017, the number of international students coming to China has risen from 397,000 to nearly 500,000 students. The working target of the State Hanban Program - Chinese language learners will reach 160 million in 2020. It is evident that the world's demand for Chinese language learning is growing dramatically and international Chinese language education is booming. Up to now, a total of 550 Confucius Institutes (CIs) and 1,172 Confucius Classrooms (CCIs) have been established in 162 countries and regions around the world. since 2013, 360 sets of teaching materials in 45 languages have

been published, with 12 million copies sent out for use by more than 5 million people, and about 5,000 volunteers and public teachers have been trained every year nationwide. Judging from the scope and speed of the opening of Confucius Institutes (Classrooms), the volunteers and public teachers sent and the Chinese language teaching materials published, all kinds of data show that our country has paid enough attention to international Chinese language education.

However, with the changing economic situation and environment at home and abroad, international Chinese language education will face some difficulties and challenges. First of all, the direction of the training of relevant professionals in domestic universities is unclear, the depth is insufficient, the students' cultural knowledge and foreign language skills are lacking, and the teaching methods are single and cannot meet the actual needs of the teaching audience. Moreover, surveys show that few students graduated from undergraduate and master's degree programs are able to engage in related Chinese language work after graduation, and the supply and demand of personnel training has long been in the state of mismatch between production and sales, and there is a lack of excellent talents. Secondly, it is the seriousness of the international situation. Due to the influence of the worldwide epidemic, foreign students can seldom stay in the socio-linguistic environment of China to continue their study, and they can only study in their own countries through online teaching, and in the socio-linguistic environment without Chinese language, their ability to learn Chinese has greatly deteriorated, which is very unfavorable for the dissemination of Chinese language. In addition, the imperfection of its own disciplinary theory system, the limited development of localized Chinese language dissemination, the external political environment and other problems have all hindered the development of the discipline and career of international Chinese language education. Under the background of globalization, how to analyze the various factors of the development of international Chinese language education, how to make good use of the existing advantages, how to resolve the risks and threats, and how to better promote the development of the discipline and career of international Chinese language education is the research purpose of this paper.

## **1.2 Research Content and Ideas**

The author believes that if we want to propose ways to enhance the development of things, we must first see the development process and future development direction of things, identify the problems arising from the development of things in a comprehensive manner, and then analyze the internal and external factors of things as well as the macro-environment in which it is located. Then we should analyze the internal and external factors as well as the macro environment in which it is located. In this way, we can formulate ways and measures to solve the problems. In this paper, firstly, the development history and research status of international Chinese language education are fully studied, then according to SWOT analysis and PEST analysis, the micro and macro environment of international Chinese language education is analyzed, accordingly, the problems existing in Chinese language education are analyzed, and finally, according to the conclusion, the group puts forward how to promote the enhancement strategy of international Chinese language education, in order to change the status quo. Promote the discipline and career of international Chinese language education can make great progress.

## **1.3 Research Methods**

This paper examines the basic features and solutions of the problem from a holistic perspective through the overall systematic analysis method. The essence and laws of the problem are grasped on the basis of comprehensive systematic research. Adopting interdisciplinary research method, it combines the relevant theoretical analysis methods of management and economics disciplines SWOT analysis and PEST analysis, and combines them with international Chinese education to form a complete theoretical research system. Using the literature research method, retrieve and analyze the literature from the Internet and other reference books to provide a strong theoretical basis for the research of this paper. Using the survey method, field visits and investigations are conducted on some specific issues in this paper to obtain first-hand materials to provide more adequate arguments.

## **1.4 Overview of relevant theories**

### **1.4.1 SWOT analysis**

SWOT analysis, also known as situational analysis, was first proposed by Prof. Weirick in the United States. It refers to a qualitative analysis method that comprehensively summarizes the contents of internal and external influences on a system or organization, and then analyzes the strengths and weaknesses of the organization, as well as the opportunities and threats it

faces.<sup>[1]</sup> The full name of S is Strengths which denotes the internal strengths of the organization. W is Weakness which denotes the internal weaknesses of the organization. O is Opportunities which denotes the external opportunities of the organization. T is Threats which denotes the external threats of the organization. According to SWOT analysis, four different strategies can be developed based on the dimensions as follows:

*Figure 1.1 SWOT Analysis*

	<b>S Strengths</b>	<b>W Weaknesses</b>
<b>O Opportunities</b>	SO Strategy (Growth Strategy)	WO Strategy (Turnaround Strategy)
<b>T Threats</b>	ST Strategy (Diversification Strategy)	WT Strategy (Defensive Strategy)

Growth strategy: there are opportunities externally and own advantages internally, this is to find the trend and expand the advantages.

Turnaround strategy: there are external opportunities but own disadvantages, then we should seize the opportunity to turn around the disadvantages.

Diversification strategy: there are internal advantages, but there are external threats, at this time to use the advantages, multi-channel to resolve the risk.

Defensive strategy: there are external threats and internal disadvantages, we should focus our resources and shrink our development under the state of internal and external problems.

#### 1.4.2 PEST Analysis

PEST analysis is a method to analyze the macro environment of a system or organization. The analysis mainly consists of four dimensions, including P (Political System), E (Economics), S (Society), T (Technology), and specifics include:

*Figure 1.2 PEST Analysis*

<b>Abbreviations</b>	<b>Analyzing Dimension</b>	<b>Specific Elements</b>
P	Political-Legal Environment	It mainly refers to the relevant policies and regulations proposed and promulgated by the state, as well as the attitudes and actions taken by various political organizations, and also includes numerous political events at home and abroad.
E	Economic Environment	It mainly refers to the stage of economic development, GNP per capita, consumption level and trend, national financial situation, financial risks and economic cyclical fluctuations, etc.
S	Physical Social environment	This refers to the current social environment, which is characterized by a number of complex factors, including population movements, history and culture, values, and so on.
T	Technological Technological environment	Mainly refers to the national scientific and technological system, the advanced level of science and technology, the promotion of scientific and technological achievements, scientific and technological research fields to expand and deepen, and so on.

## 2. Overview of the development of international Chinese language education and its structural system

### 2.1 Overview of the development of international Chinese language education

International Chinese language education is an emerging term, and its meaning has not yet been clearly described. For international Chinese language education, it can refer to both the discipline of international Chinese language education and the cause of international Chinese language education. But this new term is developed from teaching Chinese as a foreign language and international Chinese language education.

The first is Chinese language teaching to foreigners, the teaching of Chinese to foreigners, that is, the teaching of Chinese as a foreign or second language. Teaching Chinese as a foreign language refers to teaching Chinese to foreigners, that is, teaching Chinese as a foreign or second language. Since the founding of New China, especially since the reform and opening up,

the teaching of Chinese as a foreign language has been increasingly developed, and since 1978 it has been established as an independent discipline.

In the early 21st century, the name of Chinese International Education was established to refer to the teaching of Chinese to non-native speakers. At present, a number of colleges and universities in China have set up majors in Chinese international education, which is mainly aimed at cultivating high-level, applied, compound and internationalized professionals with proficient skills in teaching Chinese as a second language, good cultural communication skills and cross-cultural communication skills, who can adapt to the work of promoting the Chinese language internationally, and are competent in a variety of teaching tasks.

At present, Chinese language education has been officially renamed as international Chinese language education, which is still essentially the teaching of Chinese as a second language, but the actual connotation has become more inclusive, more open and more standardized. On the basis of making full use of digital teaching resources and teaching platforms, it pays more attention to the localized development of each country.

From teaching Chinese as a foreign language to international Chinese language education and then to international Chinese language education, the essence of the discipline has not changed, but there are changes in the factors of teachers, teaching objects, teaching contents and teaching locations, showing a new pattern of expanding scope in general. As shown in the figure below :

Figure 2.1 Vertical Comparison of the Development of International Chinese Language Education Disciplines

	Teachers	Teaching Objects	Teaching content	Teaching Place
Teaching Chinese as a foreign language	Mostly Chinese	Foreigners (mainly foreign students)	Foreign language as a second language or Chinese	Within their own country
Chinese language international education	Native Chinese speakers (including foreigners)	People whose mother tongue is not Chinese	Foreign language as a second language or Chinese	Abroad
International Chinese Language Education	Chinese, overseas Chinese or foreigners	Foreigners whose mother tongue is not Chinese, Chinese and descendants whose mother tongue or first language is not Chinese	Chinese as a second, foreign or other language	Domestic and foreign or virtual space

## 2.2 The structural system of international Chinese language education

International Chinese language education is an inclusive concept, including both the previous Chinese language teaching abroad and Chinese language international education, as well as overseas Chinese language education and even virtual space education, and all the above kinds of education are unified under the general framework of international Chinese language education. However, at present, there is no precise division of types and systematic structure of international Chinese language education. Prof. Wu Yinghui has made a division of the structure of international Chinese language education and put forward the basic framework of “3+N”, as shown in the following figure.

Source: Prof. Yinghui Wu 18th International Symposium on International Chinese Language Education

Types of Chinese Education  Types of Education Institution Nature	International Chinese Education						
	Real Space Chinese Education			Virtual Chinese Education			
	Chinese Language Education for Foreigners	Overseas Chinese Language Education		Broadcast Chinese Language Education		Network Chinese Language Education	
		Overseas Chinese as a Second Language (Foreign Language) Education	Overseas Chinese Language Education	Radio Chinese Language Education	Television Chinese Language Education	General Network Chinese Language Education	Intelligent Simulation Chinese Education

Higher Education	Professional Chinese Education	Professional Chinese Education	Professional Chinese Education	Various types of Chinese language education exist
	Curriculum Chinese Language Education	Curriculum Chinese Education	Curriculum Chinese Language Education	
Basic Education	Curriculum Chinese Language Education	Curriculum Chinese Language Education	Curriculum Chinese Language Education	
	Mother Tongue Chinese Language Education	Chinese Immersion Education	General Chinese Language Education	
			Overseas Chinese Language Education	
Training Organization	Non-degree Chinese Language Training			

### 3. Micro-environment Analysis of International Chinese Language Education

For the micro-environment of international Chinese language education, it is analyzed by SWOT analysis as follows:

Figure 3.1 SWOT Analysis of the Development of International Chinese Language Education

<p><b>Strength</b></p> <p>1. International Chinese Language Education has been officially renamed and the status of the discipline has been upgraded.</p> <p>2. The domestic cultivation of the discipline can be combined with the foreign development of the career.</p> <p>3. China has 5,000 years of cultural history and rich cultural heritage.</p>	<p><b>Weaknesses</b></p> <p>The domestic training system for Chinese language education personnel is not perfect, making it difficult to train high-level Chinese language international teachers.</p> <p>It is difficult to prepare nationalized teaching materials to meet the specific needs of learners in each country.</p> <p>The development of Confucius Institutes overseas faces many difficulties</p>
<p><b>Opportunity</b></p> <p>1. Countries along the “Belt and Road” and neighboring countries have economic cooperation and cultural exchanges with China.</p> <p>2. China has made great achievements in the cause of Chinese as a foreign language in the past decades, and the international recognition of Chinese language has been increasing.</p> <p>3. Under the epidemic, technological development has promoted digital online teaching, which is conducive to the spread of the Chinese language.</p>	<p><b>Threats</b></p> <p>Under the Xin Guan epidemic, it is difficult for international students to enter the country, which is not conducive to the spread of Chinese language learning.</p> <p>English is still the most widely spoken language, which will suppress non-English languages.</p> <p>Chinese is recognized as a difficult language to learn among many language families, posing great difficulties for foreign learners.</p>

#### 3.1 Advantages

Firstly, international Chinese education has been formally renamed from the original Chinese international education, and from the original secondary discipline under Chinese language and literature now becomes a primary discipline, and the status and influence of the discipline have been enhanced. Secondly, international Chinese language education realizes the combination of domestic talent training and foreign practice, with different levels of talent training system for bachelor's, master's and doctoral degrees at home, and many volunteers and teachers are sent abroad every year. It realizes the combination of discipline and career. Once again, the development of international Chinese language education also has its cultural development advantages, that is, the Chinese culture has its unique charm, China is the only ancient civilization that exists at present, and the 5,000 years of historical precipitation and cultural heritage is incomparable to other countries. Because of this confidence, we can also tell the Chinese story well and promote the international spread of the Chinese language.



### 3.2 Weaknesses

English-speaking countries set up master's and doctoral degrees under international needs and offer specialized courses to cultivate professionals. In contrast, China's cultivation at the master's and doctoral levels is lagging behind, and undergraduate majors have shown unplanned and oversized growth, and most of them are engaged in other jobs after graduation, which makes the system of cultivating talents and the development of actual work appear as a "mismatch between production and marketing". "The system of talent cultivation and the development of actual work are not in line with each other. In terms of the preparation of teaching materials, since the development of Chinese language international communication is at the primary stage, nationalized teaching materials are indispensable to the dissemination of the Chinese language, and local countries seldom have the "inertia" to prepare such teaching materials.<sup>[2]</sup> However, local countries rarely have the "inertia" to prepare such teaching materials, and the pressure on the ambitious plan of preparing nationalized Chinese teaching materials is enormous. The task of compiling teaching materials is a long one. In addition, there is insufficient financial support for overseas Confucius Institutes, which makes it difficult for the institutes to become self-sufficient. Opinions about Confucius Institutes at home and abroad are mixed, with domestic dissenting voices believing that they are a costless investment, while foreign countries believe that Confucius Institutes are suspected of cultural aggression, and many Confucius Institutes have already been closed down or are facing closure, which is very unfavorable to the cause of Chinese language education.

### 3.3 Opportunity

Countries along the "Belt and Road" and neighboring countries will have more economic cooperation and cultural exchanges with China, and the development of Chinese language dissemination will act as a lubricant.<sup>[3]</sup> This development strategy is not only beneficial to the national economy and diplomacy, but also contributes to the improvement of the international status of the Chinese language and the enhancement of the country's cultural soft power. At present, China's Chinese language dissemination has been going on for decades, and the "Chinese language fever" in the international community is sufficient to show that the international community recognizes the Chinese language, and the international Chinese language education has achieved unprecedented results. At the same time, the power of science and technology is increasingly tilted to the development of Chinese education, online teaching or online and offline combination will become the main way of Chinese teaching in the future, the international Chinese education is increasingly digitalized, technologically networked, overseas Chinese teaching platforms have also shown a long-lasting development trend. It can provide new support for international Chinese education.

### 3.4 Threats

Firstly, under the new crown epidemic, it is difficult for international students to enter the country, and many students do not have a Chinese social environment, so it is easy for them to forget their knowledge of Chinese and degrade their Chinese language ability, which is not conducive to the spread of Chinese language learning. Secondly, English is still the most widely used language in the world, and is the most common intermediary language used in international exchanges. This strong position of English is squeezing the Chinese language and causing great difficulties for the spread of the Chinese language. Again, as for the Chinese language itself, it is recognized that it is difficult to recognize, memorize, write, flexible and changeable, and foreign students will easily have the fear of difficulty and resistance to Chinese language.

## 4. Macro environment analysis of international Chinese language education

### 4.1 Political and Legal Environment

China has always adhered to the foreign policy of peace and the strategy of going out, and has established diplomatic relations with 181 countries, has partnerships with hundreds of countries or organizations, and maintains economic and cultural exchanges with various countries, which is conducive to the spread of the language. At present, China has founded Confucius Institutes in 162 countries and regions, and at the same time specializes in training talents at the undergraduate and graduate levels, as well as dispatching volunteer Chinese language teachers overseas to actively promote Chinese language education. The spread of Chinese language in China is based on freedom and equality, but due to the different cultures and ideologies of different countries, some countries often attack and smear China, and regard the spread of cultural exchanges as

cultural aggression, which will cause unknown foreign people to hold stereotypes about China, which is not conducive to the spread of Chinese language.

## **4.2 Economic environment**

The spread of language cannot be separated from the rapid development of the country and the enhancement of its comprehensive strength, so is the spread of Chinese language. As the second largest economy, the improvement of China's international status has led to the expansion of the scope of Chinese language, which plays a positive role in the spread of the Chinese language and is conducive to the development of international Chinese language education. In addition, under the huge demand, the overseas Chinese education market will usher in a period of rapid growth. Chinese language teaching platforms located overseas Chinese language teachers also said that the current international Chinese language education is still in the early stages of development, but has a huge market development potential, in the context of the importance of Chinese language learning in overseas countries, it is expected that the future market size will reach the level of hundreds of billions of dollars.

## **4.2 Social Environment**

Nowadays, the Chinese language is gaining more and more international influence and is favored by various countries, and the popularity and reputation of the Chinese language have greatly increased. Society According to statistics, more than 70 countries around the world have incorporated Chinese into their national education system, and more than 4,000 foreign universities have opened Chinese courses. It connects the link between China and other countries for the spread of Chinese language. However, there are differences in the cultures and ideologies of countries all over the world, China's Chinese language dissemination is based on freedom and equality, but some countries, especially English-speaking countries, often attack and even discredit China, and regard Chinese language dissemination and cultural exchanges as cultural invasions, which will always cause unknown foreign people to hold stereotypes about China, which is detrimental to the dissemination of Chinese language in the international arena.

## **4.4 Technical environment**

In terms of the technological environment, due to the impact of the Xin Guan epidemic, the learning of Chinese language education has shifted from offline to online, or a combination of online and offline. And the development of many teaching platforms and resource platforms at home and abroad such as Mucon, Microclass, and KDDI has made international Chinese language education focus more and more on digital teaching.<sup>[4]</sup>In addition, the research on the application of technology in international Chinese language education has never stopped spreading the Chinese language, Chinese language teaching and virtual space technology, meta-universe and other emerging concepts are in the development of effective resources, especially virtual space technology such as digital people, which is conducive to the creation of "immersive" Chinese language teaching and learning environment, and to provide more input channels for Chinese language teaching and learning.

# **5.Strategies for the Enhancement and Development of International Chinese Language Education**

## **5.1 Growth Strategies**

### **5.1.1 Improve innovation ability and explore development mode**

Efforts will be made to explore new ideas and modes of innovative development of international Chinese language education, promote the integration of international Chinese language education degree construction and international Chinese language education career, promote multidisciplinary development, and form a characteristic development path. Effectively promote the innovation of teaching resources, talent cultivation and research projects.

### **5.1.2 Make full use of network technology and apply modern technology**

It is necessary to accelerate the development of online international Chinese teaching resources, build a shared resource platform, and improve the quality of Chinese teaching. At the same time, the scientific and technological literacy of front-line teachers should be strengthened, including the application, development, organization and management of online teaching.<sup>[5]</sup> And we should avoid the problems of short boards in online teaching, such as unstable signal, lack of interaction, etc., so that science and technology can become a powerful support for Chinese online education.

## 5.2 Diversification Strategy

### 5.2.1 Focus on cultural elements to complement Chinese language teaching itself

We should do a good job in cultural propaganda, create a good international public opinion environment, use mainstream media platforms at home and abroad to explain the characteristics of China, spread the voice of China, and tell the story of China well, especially at the level of traditional culture, which can better show China's cultural heritage and expressive force. It is necessary to make cultural propaganda better serve Chinese teaching.

### 5.2.2 Attach importance to market-oriented development and establish product thinking

Pay attention to the market-oriented operation of international Chinese education, absorb effective social resources, broaden the channels of capital integration, enhance the market expansion ability, understand the language learning markets of different countries, adopt diversified teaching methods to meet the different learning needs of learners, so that international Chinese education can maintain its advantages in the competition of language teaching projects in other countries and ensure the sustainable development of international Chinese education.

## 5.3 Torsional strategy

### 5.3.1 Innovate the personnel training system and improve the development of the theoretical system

It is necessary to improve the talent training system, adjust the level of running schools, optimize the quality of students, and improve the training objectives of masters and doctors. In view of the situation that \production and sales are not right\, the state should provide assistance and financial support. It is necessary to improve the construction of the curriculum system and focus on highlighting the characteristics of Chinese+major in running Chinese schools. Teaching and research should be combined to research teaching assistants, and teaching should learn from each other.<sup>[6]</sup>

### 5.3.2 Accelerate the transformation of Confucius Institute and support sustainable development

On the one hand, Confucius Institute needs to redefine the orientation of running a school, improve the service level of Chinese teaching, implement characteristic education with rich connotations, adopt different strategies according to the situation of different countries, make good use of existing resources accurately, strengthen economic cooperation with the host countries, and increase financial support for Confucius Institute. Continue to carry out related activities to spread Chinese culture.<sup>[7]</sup>

## 5.4 Defensive strategy

### 5.4.1 Learn from each other and seek common development with China and other countries or organizations

Build an international Chinese education development community in the new era, formulate common cooperation standards, improve cooperation mechanisms, maintain close ties with domestic and foreign departments and organizations, carry out Chinese education projects in depth, and communicate in many ways to jointly promote development.

### 5.4.2 Take external factors to develop and combine with internal growth

International Chinese education itself needs continuous improvement. The cause needs to be constantly adjusted and expanded in the process of development. If we can use the external factor strategy, always grasp the development situation of the times and the situation at home and abroad, we can use various ways to absorb factors that are beneficial to our own development, such as capital and technology, and combine them with our own internal favorable factors, which will be more conducive to improving the competitiveness of international Chinese education.

## Conclusion

This article mainly aims at the development status of international Chinese education, based on the existing theories, grasps the current environmental status of international Chinese education, and makes a strategic analysis of its future development. Finally, it puts forward some measures to improve international Chinese education. The development of disciplines and undertakings of international Chinese education should seek advantages and avoid disadvantages, foster strengths and avoid weaknesses, make full use of existing advantages, face challenges directly, resolve crises and explore new paths for long-term development.

Because personal ability needs to be improved, and the paper cycle is short, there are still many shortcomings in the research methods and research contents, and the strategies to solve the problems may not be mature enough, so it is necessary to

further study the feasibility of the solutions to the existing problems in international Chinese education. In addition, exploring deeper strategic issues in the future is also the direction I will focus on in the future.

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In light of our commitment to disseminating pioneering research across various disciplines, such as medicine, architecture, education, and electronics, we are reaching out with two pivotal opportunities to augment our collaboration with the global academic community:

**Call for Paper Submissions:**

We cordially invite you to submit your original research articles to our fast-growing, peer-reviewed, and open-access journals. Our platform guarantees an extensive, global reach, enabling your work to garner maximum visibility and citation in the academic sphere. Rest assured, your work will be meticulously assessed by experts in the field, ensuring it receives the acknowledgment and exposure it merits.

**Join Our Esteemed Team:**

We are fervently searching for passionate researchers and scholars interested in joining our burgeoning team at Asia Pacific Science Press. We offer numerous roles, such as peer reviewers, editors, and advisory board members, where your expertise will significantly shape the content and quality of our publications. In return, you will gain invaluable experience, network with preeminent scholars, and play a pivotal role in molding the future of global academic publishing.

**Why Choose Asia Pacific Science Press?**

**Global Reach:** Your work will be accessible to a worldwide audience, free from any access barriers.

**Collaboration with Renowned Universities:** We have established extensive publishing systems in cooperation with world-renowned universities, such as Wuhan University, Hong Kong University, and the University of Malaya.

**Diverse Disciplines:** Your research will be housed among numerous journals across a multitude of academic projects and disciplines.

As we stride forward in the academic landscape, we envision a future where our collective efforts shape a more enlightened, innovative, and interconnected global society. We sincerely hope that you consider this invitation to join us on this auspicious journey towards knowledge, discovery, and global impact.

Should you wish to submit your work or express interest in joining our team, please do not hesitate to contact us. You can submit your manuscript or personal profile to [info@apspublisher.com](mailto:info@apspublisher.com) or visit our website at [www.apspublisher.com](http://www.apspublisher.com) for more information.

Thank you for considering this opportunity, and we eagerly anticipate the possibility of welcoming you to the Asia Pacific Science Press family. Together, let's forge a future of unparalleled scientific advancement and discovery.

Warm regards  
Asia Pacific Science Press