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AN EXPLORATION OF THE TEACHING PRACTICE AND REFORM OF COLLEGE ENGLISH TRANSLATION MODULE COURSE—TAKING SOUTH CHINA AGRICULTURAL UNIVERSITY AS AN EXAMPLE

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Abstract: Courses are the core of higher education. Higher education attaches great importance to the effective integration of knowledge impartment, quality cultivation, and value orientation in various courses. As an important basic course, the College English Translation Module Course has a particularly prominent connection with cultural connotations and values. Taking the College English Translation Module Course of South China Agricultural University as an example, this paper aims to enhance students' translation competence and comprehensive quality, and achieve the goal of holistic education. It explores the teaching practice of College English Translation from two aspects: "exploring the cultural connotations and values in the specific textbook of *A Practical Translation Course for College English*" and "cultivating students' rational application of translation skills and methods", and finally puts forward reform measures to improve the teaching effects. Through teaching practice and exploration, this paper comes to the conclusion that the translation module course not only enhances students' translation competence but also improves their cultural literacy, sense of social responsibility, and international perspective, helping them establish positive values, thus achieving the comprehensive educational goal of holistic education.
Keywords: College English translation module; Teaching practice; Translation competence; Comprehensive quality; Holistic education

1 INTRODUCTION

"Courses are the core of higher education, the fundamental basis for talent cultivation and teaching work, and also a key factor affecting and even determining the quality of education and teaching" [1]. Higher education particularly focuses on the effective integration of knowledge impartment, quality cultivation, and value guidance in various courses [2], aiming to cultivate students' disciplinary competence while enhancing their cultural literacy and comprehensive quality, helping them establish positive values, and thus achieving the educational goal of holistic education.

South China Agricultural University (hereinafter referred to as SCAU) offers a number of module courses, including listening, speaking, reading, writing, and translation, for second-year non-English major undergraduates. As an important part of the series of module courses, the College English Translation Course attaches great importance to the systematic cultivation of students' translation competence. At present, the textbook adopted by SCAU, *A Practical Translation Course for College English* (hereinafter referred to as PTCCE), has practical content and clear explanations of translation techniques, and the actual teaching in class emphasizes the effective integration of theory and practice.

"Translation is a cross-linguistic, cross-cultural, and cross-social communicative activity. The translation process is not only a process of language conversion, but also a process of cultural conversion reflecting the characteristics of different societies" [3]. Thus, the translation course has an especially close connection with cultural connotations and values. Therefore, how to effectively integrate cultural connotations and values into knowledge impartment and skill training to enhance students' cultural literacy and comprehensive quality, and thus achieve the goal of holistic education, has become an important direction for the teaching practice and reform of the College English Translation Module Course in SCAU.

Taking the College English Translation Module Course of SCAU as an example, this paper analyzes from two aspects, "exploring the cultural connotations and values in PTCCE" and "cultivating students' rational application of translation skills and methods", explores the teaching practice of College English Translation, and puts forward reform measures to improve teaching effects finally.

2 LITERATURE REVIEW

The division of College English into skill-based module courses (listening, speaking, reading, writing, and translation) is one of the cores of College English teaching reform. This is a gradual developing process.

The late 1980s to the 1990s was the exploration stage of College English module courses. During this period, College English textbooks had already been divided into volumes according to different skills, laying a foundation for the

subsequent module courses.

Around 2004 to 2010 was the promotion stage of College English module courses. Under the guidance of the Ministry of Education's document *College English Curriculum Requirements (trial)* (issued in 2004), the traditional single College English course was divided into a series of skill-based module courses for students to choose to learn according to their own competence and interests. It was at this time that "translation", as an independent course, truly entered the course selection scope of non-English major students on a large scale. During this stage, scholars conducted extensive research and discussion on the teaching of College English translation, mainly focusing on the training of students' language conversion ability and translation skills [4-5].

2010 to the present is the deepening and diversification stage of College English module courses. In this stage, scholars' research on translation module courses is no longer limited to the linguistic and skill levels, but shifts to the cultivation of students' systematic translation competence and overall quality [6-7].

It should be noted that many scholars at home and abroad have analyzed and studied the concept of translation competence. Among them, Neubert pointed out that translation competence covers five core modules, including linguistic competence, cultural competence, transfer competence and so on [8]. Liu Heping pointed out that "linguistic knowledge and competence, translation knowledge and skills, and general education" [9] are the three widely recognized components of translation competence in China. Therefore, in the process of studying translation competence, in addition to linguistic competence and skills, scholars at home and abroad consistently emphasize the importance of cultural competence and general education.

The research on the teaching of College English translation in SCAU has also gone through the above three stages. The highlight of this paper is that this is the study of teaching College English translation from two specific aspects based on PTCCE currently used by SCAU. It not only supplements the existing literature but also plays a positive role in promoting the teaching practice and reform of College English translation in SCAU as well.

3 THE TEACHING PRACTICE OF THE COLLEGE ENGLISH TRANSLATION MODULE COURSE IN SCAU

This part analyzes from two aspects, "exploring the cultural connotations and values in PTCCE" and "cultivating students' rational application of translation skills and methods":

3.1 Exploring the Cultural Connotations and Values in PTCCE

PTCCE is both educational and humanistic. "In addition to telling Chinese stories well and promoting the finest aspects of Chinese culture", it is also appropriate "to tell foreign stories and promotes foreign cultures under the guidance of the concept of mutual learning among civilizations" [10]. Therefore, if we can deeply explore the relevant cultural connotations and values in PTCCE during teaching, they can be naturally integrated into the class, which is mainly reflected in the following aspects:

3.1.1 Focusing on current affairs and national development

The Chinese-to-English text *The Most Important Speech of the Century* in the first unit of PTCCE involves important discussions on China's modernization process; while the Chinese-to-English exercise *Our Objectives in the 50 Years* presents China's development blueprint and historical process, helping students understand the direction of national development.

3.1.2 Telling Chinese stories, promoting Chinese culture and introducing social development

The translation materials in PTCCE cover a variety of themes, reflecting China's development and achievements in different fields:

Scientific and Technological Innovation and Economic Development *Eradicating Extreme Poverty* states: "Since the implementation of reform and opening up in the late 1970s, China has helped as many as 400 million people out of poverty. In the next five years, China will provide assistance to other developing countries in various aspects such as poverty reduction, education development, agricultural modernization, environmental protection, health care, etc." [11].

In addition, *Innovation in China* points out: "Innovation in China is flourishing at an unprecedented speed" [11]. And *China-made Products* describes that "China-made products are getting more and more popular in the world. While China has paid a price for its, it does contribute to poverty eradication. Meantime, it has provided jobs to the people around the world" [11].

In a word, these materials demonstrate China's efforts and achievements in poverty alleviation, innovation, globalization, etc.

Urban Development *Urbanization in China* mentions that "the Chinese government has been promoting 'people-oriented' development philosophy" and "also calls for building 'a resource-saving and environment-friendly' society" [11]. In addition, *Shenzhen* tells people that as a special economic zone established by the Chinese government in the 1980s, Shenzhen has undergone tremendous changes.

The materials above introduce China's urbanization process and development concepts, reflecting social changes and governance ideas.

Educational Development *Ensuring the Justice of Education* expounds educational policies and development goals, reflecting the direction of social progress.

Cultural Characteristics *The Mid-Autumn Festival*, *Chinese Garden Architecture*, *Traditional Chinese Paintings*, *Qipao* and *The Traditional Chinese Hospitality* show the diversity and influence of traditional and contemporary Chinese culture. Among them, *The Mid-Autumn Festival* points out that "Since ancient times it has been a custom for the Chinese people to celebrate the mid-autumn harvest season, similar to that of celebrating Thanksgiving in North America." Meantime, it specifically notes that "In 2006, the Mid-Autumn Festival was listed as a China's cultural heritage" [11]. *Chinese Garden Architecture* outlines the historical origin and evolution of Chinese gardens, their cultural symbolic significance, and artistic expression methods. The harmonious relationship between man and nature embodied in Chinese gardens is actually a reflection of the concept of "harmony between man and nature". *The Traditional Chinese Hospitality* tells that "The traditional Chinese hospitality requires food diversity, with plentiful dishes that will never be eaten up". "Today, Chinese people would like to combine Western cuisines with traditional Chinese dishes" [11], which reflects the integration of Chinese hospitality with Western food culture.

Historical Heritage The materials in PTCCE that present the profound heritage of Chinese history and culture and the long tradition of foreign exchanges mainly include *The Han Dynasty*, *The Invention of Paper*, and *The Silk Road*. Among them, *The Invention of Pape*r tells that between the 2nd and 5th centuries AD, people invented a kind of paper, "silk paper". And "some silk books that have been found are over 2,140 years old" [11] In addition, *The Silk Road* introduces the origin and overview of the Silk Road, and particularly highlights the important role of it in developing civilizations in China, South Asia, Europe and the Middle East.

3.1.3 Introducing foreign cultures and social phenomena

Proverbs in Latin American Talk enables people to deeply understand that Latin Americans are good at using proverbs skillfully in their conversations and vividly demonstrating the wit and humor of proverbs, which reflects their national culture and wisdom. *Enchantment of the South Sea Islands* introduces the geography and customs of the South Pacific islands, enhancing our understanding of the geography and culture of these unfamiliar islands. *Beethoven's Music* states that "Beethoven's importance in music has been principally defined by the revolutionary nature of his compositions" [11]. In addition, there are also other related materials such as *Darwin's Intellectual Power*. In translation, these teaching materials can not only expand students' international horizons but also promote their understanding and respect for diverse cultures.

3.2 Cultivating Students' Rational Application of Translation Skills and Methods

In teaching, the rational application of translation skills and methods help to convey the cultural connotations and values of the original text more accurately. A large number of exercises in PTCCE reflect the flexible application of translation methods. The following example of original text and translated text is a representative one from PTCCE:

Original Text: zhōng guó rén zì gǔ yǐ lái jiù zài zhōng qiū jié qìng zhù fēng shōu ， zhè yǔ běi měi dì qū qìng zhù gǎn ēn jié de xí sú shí fēn xiāng sì, guò zhōng qiū jié de xí sú yú táng dài zǎo qī zài zhōng guó gè dì kāi shǐ liú xíng [11](zhōng qiū jié).

Translated Text: Since ancient times it has been a custom for the Chinese people to celebrate the mid-autumn harvest season, similar to that of celebrating Thanksgiving in North America. The custom of observing Mid-Autumn Festival came into vogue around the early Tang Dynasty all over China[11] (The Mid-Autumn Festival).

How is the rational application of translation techniques reflected from the original text to the translated text?

First of all, the translation of "zài zhōng qiū jié qìng zhù fēng shōu " as "to celebrate the mid-autumn harvest season" mainly reflects the technique of part-of-speech conversion. Specifically, the adverbial phrase "zài zhōng qiū jié " (during the Mid-Autumn Festival) in the original text is converted into an adjective used as an attributive ("mid-autumn") in the translated text; while the object "fēng shōu " (harvest) in the original text is also converted into an attributive in the translated text, i.e., the attributives "mid-autumn" and "harvest" together modify the head noun "season".

Secondly, "it has been a custom" in the translated text reflects the flexible use of the pronoun "it" in translation, which serves as a formal subject representing the infinitive phrase "to celebrate the mid-autumn harvest season". The word "custom" reflects the technique of addition in translation, and it is consistent with the pronoun "that" following it. "That" also reflects the flexible use of pronouns in translation, which not only echoes "custom" but also avoids the repetition of this word.

In addition, the technique of sentence splitting is adopted in the translation, dividing one sentence in the original text into two sentences in the translated text to conform to English expression habits.

Finally, the word "observing" in the second sentence of the translated text reflects the technique of free translation, which embodies the most fundamental activity of people's "celebrating" the Mid-Autumn Festival, i.e., "viewing the moon". Moreover, the translation of this sentence also involves word order adjustment, i.e., "around the early Tang Dynasty all over China" is placed after the main part of the sentence "The custom of observing Mid-Autumn Festival came into vogue", which reflects the expression habit of English sentences—generally expressing the main part of the sentence first.

The above example reflects the rational application of various translation techniques, including part-of-speech conversion, the flexible use of the pronoun "it", addition, sentence splitting, free translation, and word order adjustment. Through the rational application of these translation techniques, students can not only understand the cultural connotations of the translated materials better but also improve their expressive ability and thus achieve better translation effects.

4 REFORM MEASURES TO IMPROVE THE TEACHING EFFECTS OF THE COLLEGE ENGLISH TRANSLATION MODULE COURSE

Through practice, the following aspects can be focused on to improve teaching effects.

4.1 Updating Teaching Concepts

First, teachers should have a better understand of the integration and penetration of culture and values, find the right entry points in combination with course content, and naturally integrate them into the teaching of College English Translation at appropriate times. Second, teachers should fully attach importance to the educational function of teaching and realize the effective integration of knowledge impartment and value guidance. Finally, teachers should expand the teaching scope, which is not limited to the classroom but also includes extracurricular and online forms.

4.2 Enhancing Teachers' Comprehensive Competence

On the one hand, teachers should maintain a lifelong learning attitude, strengthen the study of cultural literacy and professional theories, and improve their professional level and teaching ability, especially their adaptability and innovation ability in the current modern teaching environment. On the other hand, teachers should enhance their teaching enthusiasm and sense of responsibility, and create a classroom and learning environment with passion and warmth for students.

4.3 Optimizing Teaching Materials and Resources

On the basis of the present textbooks of PTCCE, supplement with other high-quality teaching resources, such as making full use of relevant content from the College English textbook series, as well as cultural content from the online press, so as to enrich teaching content and expand students' horizons.

4.4 Innovating Teaching Methods

On the one hand, teaching methods such as problem-based learning and interactive participation can be adopted to stimulate students' interest in learning and foster their cultural identity. On the other hand, combined with online teaching tools, such as recorded courses, video lectures, and online discussions, the flexibility and effectiveness of teaching can be improved. In addition, teachers should also conduct timely teaching reflection and experience exchange to continuously improve teaching strategies.

4.5 Strengthening Students' Independent Learning

Students are at the heart of the learning process and its active participants. Therefore, teachers should guide students to clarify the learning goals of the course, enhance their awareness of independent learning, and combine classroom learning with after-class expansion [12]. In addition, teachers can provide diversified methods for the process-oriented assessment of the course learning, such as team cooperation and group discussions, to encourage students to actively participate in learning activities, such as collecting relevant cultural cases and analyzing and sharing their translations with classmates, so as to improve students' learning participation and effects.

5 CONCLUSION

Courses are the core of higher education. Higher education attaches great importance to the effective integration of knowledge impartment, quality cultivation, and value orientation in various courses. To sum up, at this stage, the teaching of College English translation should, on the basis of consolidating students' curriculum knowledge and translation skills, deeply explore the cultural connotations and values in teaching resources, and cultivate students' ability to accurately convey cultural information and conduct cross-cultural communication through the rational application of translation skills and methods. Through teaching practice and exploration, this course not only enhances students' translation competence but also improves their cultural literacy, sense of social responsibility, and international perspective, helping them establish positive values, thus achieving the comprehensive educational goal of holistic education.

COMPETING INTERESTS

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INTEGRATION OF DIGITAL MULTIMODAL COMPOSING ASSESSMENT INTO THE TEACHING REFORM OF INTERCULTURAL COURSES FOR ENGLISH MAJORS

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Abstract: Intercultural courses for English majors in Chinese higher education have predominantly focused on the introduction of basic cultural knowledge from the mainstream English-speaking countries and the relevant linguistic expressions of such cultures. This approach is neither conducive to cultivating students' critical thinking on cultural similarities and differences nor improving their global competence. The globalized development and the new-era mission of enhancing China's international communication capacity have raised higher requirement for English majors to gain intercultural awareness and competence with the combination of "the love for family and country", "global perspective", and "telling China's stories well". This study draws insights from the emerging theory of Digital Multimodal Composing in foreign language education and adopts a formative assessment teaching strategy to organically incorporate the three aforementioned aspects in the reform of the English majors' intercultural course - Comparison of Chinese and Foreign Cultures. Based on the integration of a short video project as the formative assessment into the reform, the study reveals that by facilitating students' analysis of cultural differences between China and other countries via multimodality, we could strengthen their identification with Chinese culture, improve their critical thinking skills regarding cultural similarities and differences, and boost their capacity to effectively tell and disseminate China's stories from the global perspective of Sino-foreign cultural dialogue.
Keywords: Digital multimodal composing; Teaching reform; Intercultural course; English major

1 INTRODUCTION

For a long time, intercultural courses for English majors in Chinese higher education have predominantly focused on the introduction of basic cultural knowledge from the mainstream English-speaking countries and the relevant linguistic expressions of such cultures[1]. This approach is neither conducive to cultivating students' critical thinking on cultural similarities and differences across nations nor improving their global competence—that is, the ability to not only understand but also actively engage in intercultural dialogues and spur cooperation across nations[2]. In the new era of China's development, foreign language education in university bears the new mission of fostering students with both good language skills and international communication capacity so as to enhance the global influence of Chinese civilization. Intercultural awareness and competence that organically combine "the love for family and country" with a "global perspective" are crucial for "telling China's stories well and spreading China's voice effectively". In this vein, teaching reform on intercultural courses for English majors should focus on raising students' sensitivity to Sino-foreign cultural differences, strengthening their identification with Chinese culture through critical analysis, and fostering their ability to narrate Chinese cultures within a global vision of cross-cultural dialogues.

Currently, short video projects are increasingly valued by language teachers in China due to their novelty and potential to significantly motivate students. By assessing such short video projects, scholars on EFL in China have also begun to examine students' multimodal composing skills[3] and digital narrative abilities for telling China's stories[4]. Drawing insights from the emerging theory of Digital Multimodal Composing (DMC) in foreign language education[5], this study integrates the formative assessment task of creating short videos on "telling China's stories from a comparative perspective of Chinese and foreign cultures" into the teaching reform of English majors' intercultural course - Comparison of Chinese and Foreign Cultures. It aims to: 1) deepen students' identification with Chinese culture through the organic synergy of linguistic and visual modes in a comparative perspective, thereby enhancing their national identity and cultural affinity; 2) improve students' critical reflection on Sino-foreign cultural differences; and 3) promote the formation of a global vision for cultural dialogues between China and other countries, and within this vision, enhance their ability to effectively tell China's stories to the international community.

2 LITERATURE REVIEW OF TEACHING REFORM ON INTERCULTURAL COMMUNICATION COURSES

2.1 Studies on Theoretical and Practical Models

Since the 1990s, Chinese scholars have conducted a substantial body of research on theoretical models and teaching practices of intercultural competence and communication from the perspective of foreign language education. Sun brought out the theoretical framework of "CREED" to guide the reform of intercultural courses. He pointed out that the five basic principles, that is, "Critiquing","Reflecting", "Exploring", "Empathizing", and "Doing", should be the cores

of the reform and be organically integrated into the curriculum[6]. In the past decade, more and more scholars have attached great importance to studies on the practical models so as to transform the theoretical ones of intercultural communicative competence into teaching practices[7-8]. One of the well-known practical models is called "A Reference Framework for China's Intercultural Competence Teaching in Foreign Language Education", which was proposed by Zhang Hongling and her research team. This framework is constituted by the structure of three dimensions and nine elements - Cognitive Understanding (knowledge of foreign, Chinese, and universal cultures), Affective Attitudes (cultural awareness, national identity, and global vision), and Behavioral Skills (intercultural realization, dialogue, and exploration) and emphasizes the organic synergy of students' "love of family and country", "global perspective", and "intercultural competence"[9].

2.2 Studies on Teaching Design and Strategies

By contrast, studies on the teaching design and strategies in the class is comparatively insufficient. Fu and Zhang introduced the main methods of intercultural training, such as cultural assimilation, intercultural communication workshops and culture-general simulations, and applied them to foreign language classrooms[10]. Huang proposed a process-oriented cultural teaching strategy and accessed students' reflective journals based on comparative readings of Chinese and foreign cultures[11]. In the past few years, more Chinese scholars have begun to explore how to use different teaching methods, e.g., Outcome Based Education (OBE), to implement "Curriculum Ideology and Politics" in intercultural teaching reform so as to cultivate students' critical intercultural awareness and enhance their cultural confidence[12]. By far, scholars mainly reply on three methods to evaluate students' intercultural awareness and competence: questionnaires, self-designed assessment scales, and student interviews[13].

While the extensive research on practical models and teaching strategies of reforming intercultural courses provides great insights for this study, it further adopts the theoretical framework of Digital Multimodal Composing and integrates the formative assessment of short video project in order to bring in the new analytical lens and strategy for teaching intercultural courses.

3 THEORETICAL FRAMWORK OF DIGITAL MULTIMODAL COMPOSING (DMC)

3.1 Definition of DMC

In the age of smart media and digital intelligence, diverse media and semiotic resources play increasingly significant roles in both foreign language teaching and learning. Digital Multimodal Composing (DMC) refers to activities that require learners to use digital tools to construct texts through multiple semiotic modes such as words, images, and sounds[5]. More and more researchers on language education are now investigating in what ways language learners could be affected by DMC and how it could be employed in the second language (L2) teaching classrooms [5, 14-15].

Currently, scholarly research on the assessment of digital multimodal composing and its integration into teaching reform is still in the exploratory phase[3]. Liu and Zhang argued that DMC involved an integrated use of multiple competencies, requiring comprehensive assessment of students' linguistic proficiency, critical thinking, and intercultural competence[16]. Hung et al. proposed evaluating multimodal compositions through five modes—linguistic, visual, dynamic, auditory, and spatial [17]. Hafner and Ho further emphasized assessing how students organized and coordinated multiple modes coherently and effectively to express concepts and contents, and highlighted the importance of combining self-assessment, peer assessment, and teacher assessment during the teaching process[18].

3.2 Video in DMC

Videos play a significant part in DMC, especially for L2 writing classes. Videos enable learners to feel, to be entertained, and to express themselves during their interplay with various semiotic modes. Studies have embarked on how video projects could help students learn foreign languages. Toohey et al. examined how video making could contribute to second language learning and engage L2 learners in higher-level literacy consideration and critical reflection about their agency and expressions[19]. Cimasko & Shin showed that L2 students could become more effective in learning languages by turning their written essays into multimodal digital videos[20]. Salmerón et al. looked into how L2 students' using Internet videos to help themselves learn about complicated issues in a different language[21]. In summary, video projects are one of the useful DCM strategies to be employed by teachers in the language classrooms[5].

Drawing insights from research on DMC in different language classrooms, this paper primarily focuses on the linguistic and visual modes and adopts both peer and teacher assessment in the teaching process. By integrating the DCM strategy of video project, this study explores how students' creation of short videos can help improve their identification with Chinese culture, their ability to reflect on Sino-foreign cultural differences, and their capacity to disseminate Chinese culture within a global perspective of cross-cultural dialogue.

4 TEACHING DESIGN

4.1 Introduction of the Course

Comparison of Chinese and Foreign Cultures is an intercultural course for English majors at the author's institution. After completing the first-year courses on Chinese culture, students take this course in the first semester of their second year. Generally, they have a basic grasp of fundamental Chinese cultural concepts and their English expressions. However, they lack the ability to critically compare and analyze cultural differences between China and other countries and to construct the China's stories from the global perspective of intercultural dialogue.

This course uses the text book entitled Intercultural Communication: A Comparison of Chinese and English Cultures published by Foreign Language Teaching and Research Press and edited by Zhang Guiping. It consists of eight themes of Chinese and foreign cultures: "Language", "Clothing", "Food", "Alcohol Culture", "Tea and Coffee", "Festivals", "Medicine", and "Transportation". The instructor is primarily responsible for introducing the first two themes and adopts an inquiry-based teaching model during classes, which involves the teacher's raising questions at the beginning of the class, students' reading textbook and viewing of videos and documentaries for deeper understanding, group discussions for possible answers, and finally the instructors' comments. This model demonstrates to students how to conduct critical analysis of Sino-foreign cultural differences and encourages open-ended thinking and the formation of new understandings of Chinese culture. For the remaining six themes, the key teaching activities focus on student groups' presentation of their short videos and peer assessment among the groups.

4.2 Integration of the Short Video Project

Short video creation is the most important process-oriented assessment task in this course. Students are divided into six groups, responsible for the introduction and comparative analysis of the remaining six cultural themes. This short video project is limited to 10 minutes and consists of two main parts, requiring English voiceover and English subtitles. In the first part, students are required to search for academic papers on CNKI or Web of Science, conduct literature review, and combine other research methods, such as interview, to demonstrate their in-depth and critical analysis of Sino-foreign cultural differences. The second part requires students to tell a Chinese cultural story related to the theme based on the comparative perspective with the aim to facilitate intercultural dialogue. The second part encourages students to produce original visual design. While appropriate English expressions and fluent narration are crucial in this task, it also highlights the importance of students' using the camera to record Chinese culture from their hometowns or in their daily lives.

4.3 Combination of Peer and Teacher Assessment

Evaluation combines peer and teacher assessments. After screening a group's video in class, its members are evenly distributed among the other five groups to further share their creative insights and reflections, while members of the other five groups provide face-to-face evaluations. Simultaneously, members of the other five groups write down open-ended comments and suggestions for revising the short video in an online shared assessment sheet. The sheet instructs students to offer feedback in these three aspects: Design of Linguistic and Visual Modes; Analysis of Sino-foreign Cultural Differences; Chinese Culture/Stories from the Perspective of Sino-foreign Cultural Dialogue. During this process, the teacher acts as an organizer and supervisor, moving among groups to monitor and observe the discussion. After all groups have completed the sheet, the teacher organizes a class discussion based on these peer assessments. After class, the teacher provides detailed written feedback on the three aspects in the same online shared assessment sheet. Student groups then revise their short videos according to students' and the teacher's comments and submit the final version of the video at the end of the semester as a summative assessment outcome. The teacher determines the final grade based on the ultimate video and conducts semi-structured interviews with group leaders to gain a deeper understanding of their reflection and revision process.

5 TEACHING OUTCOMES

5.1 Strengthening Cultural Identity and Confidence in Telling China's Stories

This multimodal assessment requires students not only to learn English expressions for Chinese culture from the textbook but also to record authentic cultural practices through visual storytelling. This approach transcends the conventional language-centered paradigm of foreign language education and deepens students' experiential understanding of cultural connotations and values so as to strengthen their identification with Chinese culture. In addition, by encouraging students to creatively combine linguistic and visual modes to represent Chinese culture, it enhances their confidence in effectively disseminating Chinese culture. In the course, the third group, who were responsible to introduce Chinese tea culture, visited the city of Chaoshan, as it is very famous for traditional tea culture in China and it is also the hometown of some members in the group. They proactively contacted a local historical tea house in Chaoshan, perfectly combining the six key steps of the Chinese tea ceremony introduced in the textbook with English narration and authentic footage of the tea house owner preparing Kung Fu tea. Furthermore, through panoramic shots of the quiet and comfortable tea house, they successfully represented the core spirit of the Chinese tea ceremony: "Harmony, Peace, Enjoyment, and Truth" (He, Jing, Yi, Zhen). The group leader mentioned in the interview, "Before this task, when reading the textbook or watching Chinese tea culture documentaries, I couldn't fully grasp how tea culture can reflect traditional Chinese culture. Expressing it in English makes me feel unnatural. But through this on-site investigation and the short video production, I genuinely experienced the uniqueness of 'tea culture.' Now I understand

why it is an important representative of Chinese civilization, and I feel more confident in explaining 'Chinese tea culture' to foreigners." Through the multimodal composing strategy of making short video, the group not only gained a deeper identification with tea culture but also increased their confidence in disseminating Chinese tea culture internationally by coordinating linguistic and visual modes.

5.2 Enhancing Critical Thinking Skills about Cultural Differences

The course's short video creation requires students to uncover the different social contexts and values behind the comparison of Chinese-foreign cultural differences, thereby improving their critical thinking skills on these differences. The fifth group, responsible for the theme of "Medicine", scripted and filmed a classmate's experience of visiting both a traditional Chinese medicine (TCM) practitioner and a Western doctor. They vividly and meticulously presented the diagnostic features of TCM—the crucial Wang (Inspection), Wen (Listening/Smelling), Wen (Inquiring), and Qie (Palpation)—in visual form, while contrasting this with the Western medical diagnostic process using modern equipment and laboratory methods like stethoscopes, tongue depressors, and lab tests. This group also interviewed TCM and Western doctors at the university clinic. Based on interview materials and literature review, they summarized the underlying philosophical origins and values in English in the video: TCM is rooted in profound traditional Chinese philosophy, namely the concept of the unity of man and nature (Tian Ren He Yi), which posits that human beings, nature, and society form an indivisible life system. TCM is featured with a holistic perspective (Zheng Ti Lun), in which the human body is essentially indivisible, and an emphasis on relationships and experience. By contrast, western medicine, is rooted in atomism, believing that all things are composed of the smallest atoms, forming a concept of the human body as divisible into parts. It adheres to the belief that the constituent parts of a whole can exist as separate entities, with an emphasis of substance and experimentation, and has been strongly consolidated by the development of Western new scientific medicine since the 19th century. By combining interview materials, literature explanation, and dramatized visual representation, the group not only presented the differences between TCM and Western medicine in a vivid narrative but also deeply explored their distinct philosophical origins and historical reasons of scientific development, fostering a deep reflection on Chinese-foreign cultural differences.

5.3 Integrating Global Vision into the Dissemination of Chinese Culture

Besides comparison and critical thinking, the course aims to help students develop a global vision that promotes dialogue rather than opposition between cultures. The sixth group, responsible for the "Transportation" theme, used contrasting images of Russia's outdated and congested rail system to showcase China's rapid transportation development in their interim short video presentation. During the peer assessment, other groups questioned the authenticity of these contrasting images, noting they were mostly sourced from social media. In the interview, the group leaders admitted that they chose the Russian images because social media had consistently perpetuated a stereotypical image of Russia's rail system as relatively backward, and using these images would better highlight Chinese transportation's modernization and prosperity. After comments from other groups and reminders from the teacher, they realized that this angle for "telling China's story" was "I-culture" centered, lacked empirical support, and, crucially, lacked a global vision of effective dialogue with other cultures. Such kind of visual story-telling was actually a monologue casting the foreign audience aside. In the revised final version, the group added video clips showing the historical development of China's railways since the 1950s. Simultaneously, based on literature, they used texts and images to display Russia's railway development over the past 30 years for comparison. More importantly, they filmed the real experience of group members taking high-speed rail and conducted a detailed interview with a Russian traveler at a high-speed rail station, revealing the progress and the improvement the Chinese railways could make. They also added commentary on how Chinese railways have learned from foreign experiences and what beneficial inspirations China's railway development can bring to the international community. Through such revision, the students in this group recognized that in intercultural communication, while it is necessary to identify differences through comparison, it is more important to seek for common ground beyond differences and to integrate cultural dialogue into the narration of Chinese culture for effective dissemination.

6 THE CHALLENGES

6.1 Technical Challenges

Although students are all digital natives, not all of them are tech-savvy. According to the interviews, some students lacked the technical skills and found short video production difficult. For instance, regarding the video on Chinese cuisines from group 1, when they shot the scene of their members enjoying traditional Cantonese food in a restaurant, the angle was low and some of the group members' heads were cut off the scene. They explained that it was their first time shooting in the public and they did not have a lot of experience of making videos. To solve this, the teacher established a Wechat group that is constituted by the students who are experts in producing short videos so that other students could join in and ask for help. A better solution could be sending out the questionnaire to investigate students' skills and experiences of using AI and technology to make short videos at the beginning of the course. Based on the results of the questionnaire, students could make better decision of forming the group with members of different skills.

6.2 Assessment Challenges

During the peer assessment, students needed to make evaluation and give feedback to the short videos based on three aspects and some students found it quite challenging. On the one hand, it was hard for them to comment on the utility and coordination of the linguistic and visual modes in a short time. On the other hand, they were not confident to make critical comments. To solve this problem, the teacher allowed students to offer extra feedback after class in the online shared assessment form. A better solution will require the teachers to make a video showing how they assess the students' authentic video projects via clear rules and rubrics of assessment and send it to students online for self-study and mock assessment by themselves in the first week of the class.

7 CONCLUSION

This study, by integrating the digital multimodal composing assessment of short video project into the teaching reform of the intercultural course for English majors, has effectively enhanced students' intercultural awareness and competence combining "the love of family and country", a "global perspective", and the ability to disseminate Chinese stories. However, there were and are challenges for such teaching reform. Further theoretical exploration and practice on the intercultural teaching reform through the integration of digital multimodal composing pedagogy will, without doubt, help address the challenges and empower university intercultural courses to better respond to the development of globalism and China's new era mission of enhancing the international dissemination power of Chinese culture.

COMPETING INTERESTS

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THE INFLUENCE OF UNIVERSITY STUDENTS' DIGITAL NATIVE TRAITS ON EFL TEACHING STRATEGIES

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Abstract: This research aims to explore the degree and traits which university students perceive themselves as digital natives, and how these technological proficiency influence the learning and teaching of English as a foreign language. We employed the Digital Native Assessment Scale (DNAS) developed by Teo (2013) to do the research among 305 participants. It measures four variants relating to accepted characteristics of a digital native. The findings indicate that these university students actively used the Internet, computers and smartphones. They are strongly characterized by the features of "growing up with technology" and "thriving on instant gratifications and rewards", whereas they have a medium-level of digital nativity in the dimension of "being comfortable with multi-tasking" in learning, or "reliant much on graphics for communication". Based on the statistical results, we believe it's significant for language teachers to optimize teaching methods and strategies at the levels of language input and output, and meanwhile guide the students to promote their English learning via wise use of their technological advantages.
Keywords: Digital native; Bialystok' language model; Traits; Teaching strategies

1 INTRODUCTION

The rapid development of information technology and the proliferation of multi-media have significantly transformed people's ideologies, living habits and behavioral patterns. These advancement also altered the work content and working methods in all walks of life, including higher education. Contemporary college students are typical representatives of digital natives. They were born and grew up in a social environment where digital technologies and products are evolving rapidly. Their thinking patterns, cognitive processes and learning methods exhibit unique features of the digital era, which exert a significant influence on their learning experiences. For college English teachers, It is essential to recognize these digital native attributes and strategically employ information technology to update curricula, modify teaching strategies, and enhance teaching effectiveness. Addressing these challenges is critical for constructing high-quality foreign language classrooms and remains a central focus in foreign language education research.

This paper takes Bialystok's second language learning model as its framework. By reviewing relevant literature and questionnaire results, it aims to explore what digital native attributes are reflected by contemporary Chinese university students and how their digital ability influences the English learning process at different levels such as language input, knowledge construction, and language output. Furthermore, the paper also explores how teaching strategies and methods can be adjusted based on these characteristics and students' needs. It aims to improve teaching quality, and promote the deep integration of information technology with foreign language education.

2 LITERATURE REVIEW

2.1 Digital Nativity and Its Influence on Learning

The concept of "Digital Natives" was first proposed by Marc Prensky, an expert in educational games in the United States. It refers to members of the generation born after the 1980s, who have grown up with technologies such as computers, mobile phones, video games and the Internet. They possess the characteristics such as proficiency in using various technological products, adaptability to multitasking, reliance on visual communication, and a preference for instant gratification and rewards. Correspondingly, members of the previous generations, who were born without information technology but gradually learn to use the technology in their adult lives are named "Digital Immigrants", mainly referring to older educators. Prensky believes that the student group of digital natives are different from the previous generations of students in the traditional education system. Therefore teachers should adjust their teaching methods according to these characteristics, for example, introducing new technologies (games or videos, etc.) into the classroom[1].

The concept of "Digital Native" has had major influence on educational field and mass media. Age is not the only variable in defining "digital natives". Gender, educational attainment, and especially the experience of technology use are important factors in predicting the behavioral characteristics of digital natives[2]. Currently there is still controversy in the academic circle over the definition of digital natives, compared with the exploration of the concept, it may be more meaningful to investigate what digital characteristics contemporary university students have demonstrated as well as the impact on their English learning and classroom teaching. After all, it is an undeniable fact that information technology has widely penetrated into every field of economic and social life, changing people's ways of learning and

living.

Teo, based on Prensky's research, was the first to develop the Digital Natives Assessment Scale (DNAS for short), a self-assessment instrument to measure attributes of digital natives[3]. It mainly includes four factors, namely "growing up with technology", "comfortable with multitasking", "reliant on graphics for communication", and "thriving on instant gratification and rewards". There are 21 Likert-scale items in this model, which are used to assess the degree and attributes of how students perceive themselves as digital natives. The results of the scale can help teachers know the ways in which students interact with technology and their learning styles, and therefore update teaching resources, modify teaching approaches in their preparation for lessons to satisfy students' needs. Since its introduction, this research scale has been applied by researchers in various countries to measure the digital native traits of pre-service teachers or primary, secondary and tertiary school students. The reliability and validity of the scale have been verified in China, Turkey, Vietnam, and Serbia and other areas[4-7].

2.2 Bialystok' Second Language Learning Model

Linguist E.Bialystok holds that the second language learning model consists of three levels: input, knowledge and output[8]. Language input refers to the environment in which learners are exposed to the target language, which can be in the classroom, extracurricular reading or life experiences in the target language country. The knowledge part consists of three types of knowledge - explicit linguistic knowledge, implicit linguistic knowledge and other related knowledge. Explicit knowledge refers to the knowledge about the target language that learners are aware of and can clearly express, such as pronunciation, vocabulary and grammar, etc. Implicit knowledge is the knowledge that learners have internalized subconsciously. It is often not easily detectable but still governs the language behavior of learners. Other knowledge refers to all knowledge other than that of the target language, that is, the background information of learners. The third level is language output, that is, the understanding and expression of the target language. Generally speaking, understanding includes listening and reading, and expression includes speaking and writing. This model describes the fundamental factors, functions and interrelationships involved in second language learning. Figure 1 shows more specific details (solid lines represent the process and dashed lines represent the strategy) :

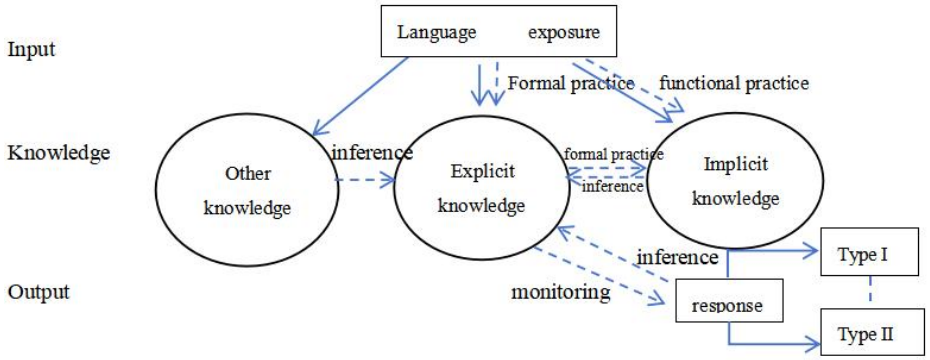

Figure 1 Bialystok' Language Learning Model

As shown in Figure 1, language input comes first, referring to any language contact. It is crucial in the learning process, as it determines the quality of the internalized knowledge and language output, and directly affects the improvement of language proficiency. At the knowledge level, comprehensible input is internalized by learners into explicit/implicit knowledge through formal and functional practicing. Explicit knowledge and implicit knowledge can also be mutually transformed through inference or formal practicing. To achieve success in language learning, the role of effective language output cannot be ignored. Two types of responses occur in output, namely, spontaneous and instantaneous (Type I) responses, and cautious, delayed responses (Type II). The three levels are interrelated, forming a dynamic and circular process of second language learning, which has provided guiding principles for language course design.

3 RESEARCH DESIGN

Although there are many studies on the validity of Teo's DNAS model with different age groups, relatively little research has been devoted to exploring how the four digital native traits respectively influence students' language input and learning outcomes. The current study aims to investigate the degree and attributes of how university students perceive themselves as digital natives, as well as the impact of digital traits on language learning and teaching in EFL contexts. The three specific research questions are:

1. What degree and attributes of digital natives have been demonstrated on EFL students in Chinese university?
2. What are the effects of digital traits on these students' language input and output?
3. What teaching strategies will be appropriate for teachers to apply at different levels of language learning?

3.1 Participants

Participants included 305 non-English sophomore students in Canton province, in southern part of China. All the

students learned English as a foreign language, aged from 18 to 20, coming from different majors such as vehicle engineering, software engineering, agriculture, and animal science in 8 secondary colleges. There were 181 male students, accounting for 59.34%, and 124 female students, accounting for 40.66%. They were reportedly familiar with the use of computers and smartphones. And a total of 259 students have passed the College English Test Band 4 in China, indicating a medium and high level of language proficiency.

3.2 Instrument

A survey was sent to the participants online to collect data. It consisted of three parts. The first part is personal information, covering participants' gender, age, major, language proficiency (mainly referring to CET scores), etc. The second part modified Teo's Digital Native Characteristics Scale (2013) to measure the degree and attributes of Chinese students' digital nativity. To help the participants accurately understand the survey questions, Chinese version of questions were also provided. The word "computer" in the original items of the DNAS scale has been modified to "computer/smartphone", considering the wide use of smartphone among young students. All 21 items of questions are rated on five-point Likert scale, ranging from 1 (not at all true of me) to 5 (very true of me). The third part of the questionnaire mainly focused on the information about the use of digital technology by students in the process of English learning.

3.3 Procedure

To ensure the authenticity and validity of the questionnaire, the instructor distributed it online to the students after class, who completed it on the spot and submitted it immediately. A total of 305 questionnaires were distributed. After excluding 11 invalid questionnaires (with a significantly shorter answering time than the average and multiple consecutive questions with the same option selected), 294 questionnaires were finally retrieved, with an effective rate of 96%.

4 RESULTS AND ANALYSIS

After collecting information from the questionnaires, we conducted data analysis of the research questions.

4.1 The Digital Native Traits of Students

We first examined the four factors of digital native traits. As shown in Table 1, the characteristic of "growing up with technology" among the college students is quite obvious, with an average score of 4.5. More than half of them scored 4.8, and the individual differences are relatively small. With the rapid development of the Internet and digital technology, the external environment for students' learning has undergone tremendous changes. University students spend a considerable amount of time on computers or smartphones for study, socializing or leisure. The other distinct feature is the preference for "instant gratification and rewards", with an average value of 4.1. This may result partly from technological development and the fast-paced lifestyle. We become impatient and stress efficiency in doing everything. Additionally, the convenient use of instant messaging apps and social platforms makes it easy for people to get quick response and rewards, which influences their psychological needs and ways of thinking.

However, the other two features of being "comfortable with multitasking" and "reliant on graphics for communication" are not so prominent, with average values of both below 4. The details of the survey showed that in the dimension of "multitasking", the two sub-questions with relatively low scores are "I can check emails and chat online at the same time" and "I am able to communicate with my friends and do my work at the same time". About 25% of the participants think that it is "not at all true of me" (with a lower quartile of 3), while the average results of other sub-items are close to 4. The reason for this is very likely that high concentration is required while studying and working. For most people, "multitasking" may only be suitable for leisure or entertainment activities. As to "reliant on graphics for communication", although most of the participants use images or emoticons in their daily communications, apparently they rely more on words and text. Therefore, the average scores of several sub-items in this dimension are generally low.

Overall, Table 1 suggested participants demonstrated two relatively prominent traits of digital natives, namely "growing up with technology" and "thriving on instant gratification and rewards", while the other two characteristics were less significant.

Table 1 DNAS Self-assessment Descriptive Results

Factors	Median (Q2)	Mean	S.D
Growing up with technology	4.8	4.5	0.62
Comfortable with multitasking	4.0	3.95	0.79
Reliant on graphics for communication	3.6	3.6	0.72
Thriving on instant gratification and rewards	4.0	4.1	0.63

4.2 Digital Use in English Learning

Next we continued to discover students' use of digital technologies/products in the process of learning English. Survey results show that the digital literacy of most students is sufficient to support their English learning. For instance, 64.6% of the respondents have accesses to online resources they need for learning, and 87.5% can solve the problems they encounter in English learning by searching for information online. It's quite common for students to use various websites or English apps during their studies to practice their vocabulary, translation, listening or reading. Among different devices for English learning, the top three popular apps are "Bubeidanci", "Baicizhan" and "Youdao". More than 76% of the participants believed that their advantage of information technology had facilitated their English learning, which verified the positive effect of digital use on language learning. It is worth noting that a considerable number of students have reported that they use computers/mobile phones every day, but the proportion of those used for English learning is significantly lower than that for entertainment, leisure or socializing, see Table 2.

Table 2 Students' Use of Computers/Smartphones

Factors	Median(Q1)	Median (Q2)	Median(Q3)	Mean
I use computers/smartphones every day.	4	5	5	4.6
I use computers/smartphones for leisure every day.	4	5	5	4.5
I use computers/smartphones to contact my friends every day.	4	5	5	4.5
I use computers/smartphones for English learning every day.	3	3	4	3.2

4.3 Influences of Digital Native Traits on EFL Learning and Teaching Strategies

From the above survey results, it can be seen that contemporary university students live in a digital environment, with a lot of accesses to digital technologies and products anytime and anywhere. The four traits of digital natives exert both favorable and adverse effects on university students. For example, "growing up with technology" provide more convenient access to language learning resources, yet it can also result in increased time wasted on screen just for entertainment. "Thriving on instant gratification and rewards" may encourage more learning engagement online, but it can also diminish the inclination for deep thinking and sustained effort. In the context of foreign language teaching, it's important for teachers to guide students to apply their technical advantages to English learning while minimizing the potential negative effects. In this respect, some teaching practice at the levels of language input and output are suggested as follows.

4.3.1 Enhance language input with technological support

As we discussed before, comprehensible language input is a necessary condition for second language learning. Different ways of language input bring about different learning outcomes. In the traditional foreign language teaching environment, language input is mainly carried out in text form, including textbooks or extracurricular reading materials, etc. Whereas in the new digital era, since many students are technology savvy, in that they can make good use of electronic terminals and are accustomed to screen reading, language input can be enhanced in forms of audio and video materials, picture images, classroom activities or any other interactive activities to stimulate learning interest.

Furthermore, in the traditional context, language contact mainly occurs in the classroom, and teachers are the dominant factor in language input. In the digital environment, the channels for language input have also been broadened. By designing various kinds of assignments and tasks, instructors can help learners gain more communicative experiences of using the target language. For example, assign students regular news listening, or audio books listening every week; learn more about foreign culture by watching original English films and TV series; utilize learning strategies like setting clear goals of learning or check-in rewards in English apps to monitor self-learning, etc. All these practice can help instructors expand the ways and channels of language input, create a rich and relaxing language environment, thus achieving teaching objectives and improving learners' language proficiency.

4.3.2 Promote knowledge construction by optimize teaching strategies

Second language learning not only requires sufficient high-quality input, but also adequate consolidation and practice to enable learners to actively think about and process the input materials before constructing new knowledge and produce output. In this process, teaching approaches and strategies should also be used in light of course content and students' technological level.

In the part of "lead-in", the direct teaching method can be adopted for introducing new knowledge. Teachers' moderate lecturing and formal practice can enhance students' understanding and memory of new knowledge. After repeated or intensive training, new language forms become part of explicit language knowledge, which may be transformed into implicit language knowledge with further formal and functional practice. To facilitate the process of changing explicit knowledge into implicit knowledge, situational teaching method is a better choice. Since functional practice focuses on meaning and communication in real or simulated environments. Many functional exercises such as project-based assignments, role-playing, group dialogues or discussions, cooperative reading or writing play a major role in helping learners acquire language in an immersive environment.

In view of the current students' preference for immediate feedback and satisfaction, teachers can flexibly utilize functions such as voting and bullet comments in the Rain Classroom(a popular teaching device in China) to enhance classroom interaction and promptly address knowledge difficulties. After class, with the help of the online learning platform, instructors can not only get feedback from learners but also can track the learning situation.

All the above measures are conducive to stimulating students' interest and motivation, and creating a multi-dimensional learning space.

4.3.3 Increase effective output while diminishing negative digital interference

Input is the foundation and prerequisite for language learning, while output is the means and standard to detect language proficiency. Desired output influence students' learning initiative and outcomes. Learners can improve the accuracy and fluency of language application by paying attention to the differences between their language output and the target language. To increase effective output, it is imperative for teachers to recognize learners' digital native traits and their favorite channels of output, while decreasing possible negative interference from digital use.

Firstly, with the ubiquitous use of computers and smartphones, university students tend to spend more time on screen for socializing and entertainment. Instructors should work hard to guide the students to transfer their tech-savvy to English learning, boosting their confidence and academic achievement. Secondly, multi-modal information in forms of pictures and image may be helpful in activating interest, stimulating emotional responses, and promoting understanding of complex content. However, they can also cause negative interference to learning. Research shows that image-dependent individuals tend to passively receive information rather than actively think. Excessive reliance on pictures or images may hinder the development of deep learning and abstract thinking, making it difficult to focus on complex tasks. It implies that pictures or videos can only be used as auxiliary tools in classroom teaching to promote students' multi-sensory participation, but not be abused.

Furthermore, "multitasking" may lead to attention loss or excessive cognitive load[9]. When designing teaching activities and tasks, instructors should pay attention to mobilizing students' "productive" multitask and curbing their "distracted" multitasking behavior[10]. "Productive" multitask emphasizes the collaboration and interconnection among tasks, which can enhance work efficiency. For instance, the simultaneous training of listening, speaking, reading and writing, or the alternating practice of literature reading and thesis writing. Distracted multitasking, such as replying to messages or checking social media while studying, can disrupt concentration, lead to fragmented memory and reduce learning/work efficiency. Teachers should guide learners to keep irrelevant multitasking within a certain range during the learning process.

Finally an effective way of increasing language output is encouraging students to interact with foreign friends on social media like Xiaohongshu, or join virtual language communities to enhance their communication experience. In short, instructors should strive to diminish the negative interference of information technology, guide students to make reasonable use of digital products, therefore creating as many output opportunities as possible for them and improve their language proficiency.

5 CONCLUSION

This study finds that Chinese university students have relatively distinctive digital native traits of "growing up with technology" and "thriving on instant gratification and rewards". while the other two characteristics of DNAS model, "reliant on graphics for communication" and "comfortable with multitasking", although not obvious, also have a profound impact on foreign language learning and teaching. In the digital learning environment with booming technology and complex information, if digital technologies/products are properly utilized, they will surely become powerful tools to facilitate learning; otherwise, they may have even greater negative impacts. For teachers, the urgent problem of teaching reform and research lies in timely recognizing learners' digital traits and learning styles, optimizing teaching strategies at the three levels of language input, knowledge construction and language output. This approach can significantly stimulate students' learning interest and improve the overall quality of foreign language education.

COMPETING INTERESTS

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THE SIGNIFICANCE, TEACHING APPROACH, AND INSTRUMENTAL DESIGN OF BUSINESS ENGLISH AS A GENERAL EDUCATION COURSE IN AGRICULTURAL UNIVERSITIES---A CASE STUDY OF SOUTH CHINA AGRICULTURAL UNIVERSTIY

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Abstract: Chinese university students have learned English since they entered primary schools, whereas most of them focus on learning the grammatical rules and fundamental usages of English, neglecting its application in the field of business. Business English as a General Education (BEGE) course is an integral component of college English teaching in the new era. It effectively enhances students' practical English application skills, helps them acquire business knowledge relevant to their majors, and strengthens their perception and adaptability to diverse business cultures. Taking the teaching practice at South China Agricultural University as an example, this paper elucidates the significance of the BEGE course in cultivating interdisciplinary talents with agricultural characteristics, clarifies the overall teaching approach, and optimizes the instructional design. Analysis of teaching outcomes further verifies the feasibility and necessity of offering the BEGE course within the college English curriculum of agricultural universities. Furthermore, BEGE course could enhance learners' competitiveness in talent market.
Keywords: Business English as a general education course; Interdisciplinary talents; Agricultural characteristics**;** Dynamic evaluation

1 INTRODUCTION

The rise of emerging engineering disciplines and the advent of artificial intelligence present unprecedented challenges to college English teaching, constraining its scope. Some even mistakenly argue that college English is obsolete. In reality, college English teaching is an indispensable part of China's higher education, bearing multiple responsibilities such as fostering virtue through education, improving students' English application skills, and enhancing their humanistic qualities. Facing societal skepticism, how can college English teaching avoid homogenization? How can talent cultivation align with market demands? These are pressing questions that college English educators must address. As former Director of the Department of Higher Education Wu Yan pointed out, the nation needs "to vigorously cultivate international talents with a global vision, understanding of international rules, proficiency in foreign languages, and expertise in Sino-foreign negotiation and communication. There is also a need for targeted cultivation of various professional, technical, and managerial personnel proficient in foreign languages, urgently required for initiatives like the Belt and Road construction" [1]. Years of teaching practice demonstrate that integrating BEGE content into college English teaching can significantly enhance students' practical English skills and cross-cultural business communication awareness, thereby strengthening their competitiveness in the job market. Using the teaching practice at South China Agricultural University as a case study, this paper explores the significance and instructional design of offering BEGE courses in agricultural universities, hoping to provide valuable insights for college English teaching in the new era.

South China Agricultural University has consistently oriented its college English teaching towards national and market demands for talent, striving to serve the economic and cultural development of the Greater Bay Area. The BEGE course is treated as a vital component of the college English program. Leveraging the university's existing strengths in Business English and agricultural English, the course encourages students to develop the habit of using English to understand their majors, industries, and domestic and international markets. It equips them with basic etiquette for international business activities and enhances their ability to engage in cross-cultural business communication in English.

2 THE SIGNIFICANCE OF THE BUSINESS ENGLISH GENERAL EDUCATION COURSE

The BEGE course significantly improves students' comprehensive and practical English language abilities. According to the Content-Based Instruction (CBI) theory, optimal foreign or second language learning conditions are created when language teaching is integrated with subject matter instruction, using the language as a medium for learning disciplinary knowledge [2]. The BEGE course closely combines language knowledge teaching, language skill development, and business knowledge, highlighting the characteristics of language use in different business contexts. It is "the process of meaning-making, experience formation, and gaining understanding and knowledge through two languages"[3]. This enables students to understand linguistic variations across disciplines, perceive real-world scenarios of linguistic and cultural application, and learn about usage taboos. For instance, when teaching marketing English to students majoring in

Economics and Management, instructors can analyze the lexical preferences and syntactic features of business professionals from different countries. This helps students become familiar with English and its variants, enhances the precision of their English expression, and increases their success rate in cross-border marketing.

The BEGE course provides students with broad interdisciplinary perspectives. Its content covers a wide range of areas, including e-commerce, marketing, logistics, negotiation, and international trade, "facilitating knowledge construction"[4] . Students not only improve their listening, speaking, reading, writing, and translation skills in business contexts, thereby enhancing their overall English proficiency, but more importantly, they also gain relevant business knowledge related to their fields of study, forming an objective understanding of their industry and the market. For example, guided by instructors, students from the College of Food Science can read classic English literature related to the entire industrial chain of food sales, production, and demand. This exposes them to basics of consumer psychology, management, and international trade laws and regulations, helps them understand the impact of cultural differences on agricultural product consumption, and integrates knowledge from science and engineering fields like food science with humanities and social sciences like economics, management, and law. Thus, learning content transcends the boundaries of empirical food science, breaking down disciplinary barriers and optimizing knowledge structures.

The BEGE course equips students with preliminary capabilities for engaging in business activities. The course consistently adheres to the English plus Business teaching philosophy, aiming to cultivate interdisciplinary talents with a solid foundation in English language and culture, capable of conducting cross-cultural business communication within their professional fields. During instruction, teachers integrate content such as business etiquette, business cultures of major world economies, and laws and regulations to be followed in business activities, fostering students' sensitivity to cross-cultural business communication, awareness of rules, and adaptability. For example, when teaching business negotiation to students from the College of Informatics, the instructor can start with the general negotiation styles of China and the United States, using classic cases of chip negotiations between the two countries to help students understand cross-cultural business negotiation strategies and methods. Additionally, experiential teaching methods like simulated negotiations allow students to accumulate practical experience and enhance their ability to connect theory with practice.

3 THE OVERALL TEACHING APPROACH FOR THE BUSINESS ENGLISH GENERAL EDUCATION COURSE

Although the BEGE course is significant for improving the quality of college English teaching in agricultural universities, some shortcomings persist in current course instruction. Ideological and political education elements need better integration with professional knowledge: past teaching had room for improvement in shaping students' correct worldview, outlook on life, and values; the educational concept of educating talent for the country should be organically integrated into all aspects of foreign language classroom teaching. Teaching content often overemphasizes theory over practice: previous teaching frequently remained at the stage of simply overlaying language skills and business knowledge, focusing heavily on theoretical business knowledge while lacking simulations of real cross-cultural business scenarios, resulting in insufficient practical cross-cultural communication experience for students. Teaching methods need to keep pace with the times: traditional lecture-based methods dominated past classrooms, with underutilized case teaching and digital teaching resources; virtual simulation platforms and digital-intelligent teaching tools were not fully applied. Industry-university cooperation lacks depth, providing students with limited practical opportunities. Student assessment methods are singular: previous course assessments relied heavily on final written exams, exhibiting rigid evaluation methods that paid insufficient attention to assessing the learning process, practical abilities, and innovation/entrepreneurship skills, which is detrimental to cultivating top-notch foreign language talents. To implement BEGE course teaching more effectively, the teaching team collaboratively researched and designed the following overall teaching approach.

First, teachers should adhere to the teaching philosophy of teaching students according to their aptitude and implement personalized instruction. BEGE teaching should follow the principle of combining general education with specialized education; teaching content should vary for students from different majors. The course's aim is not to inundate students with extensive and comprehensive business knowledge, but to inspire them to observe economic phenomena around them, stimulate their learning interest and initiative. Using this as a starting point, instruction should be appropriately expanded based on students' existing knowledge, comprehension ability, and professional characteristics. For example, when teaching international trade knowledge to students from the College of Agriculture, instructors can highlight the geographical advantage of the university's proximity to RCEP countries and introduce the characteristics of agricultural product imports and exports between China and ASEAN countries. This enhances students' sense of participation, helps them connect their major studies with market demands, gradually clarifies their career development direction, and helps them find their role in contributing to rural revitalization.

Second, teachers should empower teaching with digital-intelligent means to improve teaching quality. The emergence of artificial intelligence presents new opportunities for BEGE teaching. Digital-intelligent teaching tools can simulate and recreate authentic business scenarios, enabling immersive learning; blended online and offline teaching modes greatly expand learning content. Instructors can use digital-intelligent tools to promptly understand learners' progress and provide personalized guidance, collect common problems encountered by students during learning, and adjust teaching content accordingly. For instance, when explaining tourism English to tourism management students, teachers can use AI devices to allow students to virtually experience lychee picking in Maoming and the joyful atmosphere of ecotourism. Students can be asked to use their professional knowledge and learned vocabulary/communication skills in simulated scenarios to

promote local rural tourism products. Experiential teaching enhances students' sense of achievement and helps them identify shortcomings in their English and professional knowledge learning.

Third, supervisors should stimulate the enthusiasm of both teachers and students through a multi-dimensional ability evaluation mechanism. Teachers and students are the main agents of teaching activities, and good teaching outcomes depend on their collaboration and coordination. Fully mobilizing their sense of participation and enthusiasm is a decisive factor in improving teaching quality. As the BEGE course places high demands on college English teachers' knowledge base and teaching abilities, a long-term mechanism encouraging teachers' self-improvement should be established. Incorporating outcomes of course teaching and guiding students in Business English competitions and various innovation/entrepreneurship contests into the teacher evaluation system is recommended. For student assessment, the reliance on final written exams as the primary means should be changed. Dynamic assessment methods should be adopted, incorporating students' performance in cross-cultural communication activities, Business English competitions, internships like the Canton Fair, etc., into the evaluation system. This creates a virtuous cycle where competitions promote learning, teaching, and reform, facilitating the transformation of knowledge into ability.

4 INSTRUCTIONAL DESIGN OF THE BUSINESS ENGLISH GENERAL EDUCATION COURSE

Based on the overall teaching approach above, instructors optimize teaching mainly from the following aspects:

First, teachers should organically integrate ideological and political education into the course. Through careful instructional design, teachers blend ideological and political education with professional knowledge explanation and communication skills training, promoting students' holistic development and highlighting higher education institutions' responsibility of educating students. The course integrates language skills, business knowledge, and humanistic qualities, aiming to enhance students' professional ethics and social responsibility. For example, when teaching globalization to students from the College of Forestry, instructors can cite cases of Chinese furniture industry investment in the Caucasus region. This helps students understand the development opportunities brought by China's Belt and Road strategy to both cooperating parties and the positive contributions of Chinese enterprises to local ecological protection. Integrating socialist core values into the teaching of business ethics, contract spirit, etc., helps shape students' correct business values and compliance awareness.

Second, teachers should highlight the characteristics of modular teaching. Instructors divide the teaching content into several main modules, with the focus of each module varying according to students' majors and abilities. Students need to use English to discuss disciplinary issues and complete disciplinary tasks. This content-oriented language use greatly promotes the natural improvement of students' language abilities[5]. In the language module, core skills of Business English listening, speaking, reading, and writing are strengthened, such as adding language training for new business formats like cross-border live stream English. In the culture module, thematic cases on Belt and Road cultures can be embedded. In the practice module, simulating real business scenarios like cross-border mergers and acquisitions, cross-border e-commerce, and various forms of industry-university cooperation provide students with more practical opportunities. For instance, students from the College of Horticulture can visit the university's internship base lychee orchard. There, they can utilize their language and professional advantages to conduct cross-border marketing on-site, introduce lychee varieties, product characteristics, and China's advanced lychee preservation techniques in English, interact online with overseas consumers, and answer their questions. Furthermore, during the live stream, students can narrate the allusion of "a steed raising red dust evokes a concubine's smile" to showcase the rich cultural connotations carried by Lingnan (South China) lychees, thereby spreading captivating Chinese culture while potentially increasing product premium. Multi-module teaching content helps cultivate students' language application skills and comprehensive quality, "facilitating the acquisition of new knowledge"[6] and enabling them to accurately grasp English application scenarios and improve their practical level in cross-cultural business communication.

Third, teachers should adopt diverse teaching models. Instructors select appropriate teaching models based on the course content to stimulate student interest and improve teaching quality. Using real business cases, combined with role-playing and virtual negotiation scenarios, immersive and experiential teaching is conducted to enhance students' practical application of Business English. For example, teachers can fully utilize the opportunity of the Canton Fair, taking students to the venue beforehand for in-depth communication with exhibitors. In class, students simulate buyers and sellers at the Canton Fair for business negotiations, with instructors providing timely feedback. After class, students discuss and summarize their experiences from on-site observation and simulation to consolidate the learned negotiation strategies and communication skills. Instructors can also fully utilize blended learning methods, combining online self-directed learning with offline deep interaction. Throughout the teaching process, AI language assistants can aid instruction, helping students with oral practice; big data analysis can identify students' weak areas, enabling personalized learning guidance. For instance, when teaching about cross-border trade of agricultural products, instructors can use digital-intelligent tools to help students master core vocabulary in this field before class. AI learning companions can generate cross-border trade scenarios based on the student's vocabulary level to help them practice using the acquired words and expressions. Teachers dynamically adjust teaching content based on students' language levels, focusing on cultivating practical Business English application skills, achieving the integration of language instrumentality and professional specificity.

Fourth, teachers should implement a comprehensive assessment model. The course evaluation shifts from a single exam to various forms, including process evaluation and outcome demonstration. Dynamic, differentiated, and whole-process assessment methods are introduced, focusing not only on students' language ability and subject knowledge mastery but also on evaluating comprehensive qualities like cross-cultural communication skills, critical thinking, and innovative spirit[7]. Course grades are composed of several main parts: effectiveness of pre-class preparation, quality of classroom

discussion, post-class reflections and practice, competition awards, etc. Students can freely choose the weight of each part in the total grade. At the beginning of the semester, teachers inform students about the teaching content, plan, and assessment methods, encouraging students to form study groups based on their interests for learning and practice. For example, students can choose participating in competitions or interning at the Canton Fair as the main content for course assessment. This differentiated course assessment model helps stimulate students' learning motivation, allowing them to fully utilize their strengths during the learning process and achieve personalized talent cultivation. The optimizations in the above aspects enable the BEGE course teaching to continuously meet market demands for talent while accomplishing the enhancement of students from value guidance to language application ability. It also helps students understand domestic and international markets and cultivate their own workplace adaptability.

5 TEACHING OUTCOMES OF THE BUSINESS ENGLISH GENERAL EDUCATION COURSE

Through continuous exploration and practice, the BEGE course teaching at South China Agricultural University has achieved satisfactory results. The agency of both students and teachers has been enhanced, and their collaboration has become more synergistic. On one hand, students' ideological and moral character, knowledge and skills, and practical abilities have improved. Classroom teaching, online spaces, and practical bases cooperate with each other, jointly constructing a comprehensive, multi-angle teaching environment that cultivates students' comprehensive abilities, innovative capabilities, and problem-solving skills. Through course structure optimization, practice model innovation, and cross-boundary resource integration, teachers have developed the BEGE course into a golden course that enhances students' comprehensive quality. Students' values, language skills, and practical abilities have been improved comprehensively, fully reflecting the educational feature of progressing from cognitive deepening to ability acquisition. On the other hand, teachers' professional qualities have continuously improved. During the teaching process, teachers focus on enhancing their professional qualities and digital-intelligent teaching abilities, broadening their knowledge horizons, and updating their existing knowledge structures to enhance students' language practice ability and sense of acquisition. The teaching team continuously identifies problems during teaching and uses them as breakthroughs for scientific research, transforming research results into practical teaching outcomes. In the virtuous cycle of teaching and learning complementing each other, teachers' teaching standards and research capabilities keep improving.

6 CONCLUSION

The Business English General Education course at South China Agricultural University embodies the teaching philosophy of teaching students according to their aptitude and personalized instruction. It emphasizes both the stylistic features of Business English and general business knowledge, enabling students to understand the lexical, syntactic, stylistic, and discourse structure characteristics of Business English during the input process[8]. During instruction, teachers organically combine the teaching of business knowledge with the cultivation of students' English language skills and cross-cultural communication abilities based on their professional characteristics. This ensures that students acquire basic knowledge related to business activities while mastering the ability to express themselves fluently in English within business scenarios. The course implements the Values-Language-Business tri-core driven teaching philosophy, helping students accurately position and plan their careers, ultimately becoming interdisciplinary talents with agricultural characteristics.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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THE INTEGRATION OF GENERATIVE ARTIFICIAL INTELLIGENCE INTO EFL WRITING INSTRUCTION IN CHINA

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Abstract: The integration of Generative Artificial Intelligence (GenAI) is reshaping English as a Foreign Language (EFL) writing instruction in China, offering a solution to long-standing challenges such as large class sizes, product-oriented pedagogy, and delayed feedback. By integrating GenAI into a structured pedagogical framework, spanning pre-class knowledge delivery, in-class knowledge internalization, and post-class knowledge expansion, this study demonstrates a shift toward a process-oriented, student-centered model. Using a cause-and-effect writing unit as an example, this model demonstrates how AI supports diagnostic analysis, interactive learning, and collaborative feedback, creating a continuous scaffold for writing development. The study highlights GenAI's role as a writing assistant, feedback provider, and motivational tool, while emphasizing the importance of pedagogical design and ethical implementation. The findings underscore GenAI's capacity to foster autonomous, confident writers, enabling a modernized, personalized EFL writing ecosystem that aligns with China's educational modernization goals.
Keywords: Generative Artificial Intelligence; English as a Foreign Language; Writing instruction

1 INTRODUCTION

The landscape of English as a Foreign Language (EFL) education in China is currently experiencing a profound transformation, propelled by the rapid integration of Generative Artificial Intelligence (GenAI). This shift is strategically aligned with national educational directives, notably the China Education Modernization 2035 policy, which calls for accelerating educational reform in the information age. The policy emphasizes the construction of smart campuses, the integration of intelligent teaching and management platforms, and the use of modern technology to revolutionize talent development models, thereby achieving a synergy between large-scale education and personalized learning. Furthermore, the Guide to College English Teaching (2020 Edition) underscores the imperative for educators to leverage modern information technology, promoting its deep integration into curriculum design and instructional practices.

For decades, EFL writing instruction in China has been constrained by systemic challenges, including large class sizes, examination-oriented pedagogies, and a scarcity of opportunities for individualized, process-focused instruction. The dominant product-based approach, which prioritizes the final draft and grammatical accuracy, has often resulted in student struggles with writer's block, limited lexical resources, and difficulties in constructing coherent and persuasive arguments. While technology has long been viewed as a potential lever for change, the advent of sophisticated large language models, such as ChatGPT and domestic equivalents like DeepSeek, represents not merely a technological upgrade but a fundamental paradigm shift. These tools offer unprecedented capabilities to support the intrinsic cognitive and creative processes involved in writing. Consequently, the trajectory for EFL writing instruction must evolve towards intelligent, diversified, personalized, and digitally-enabled methodologies. The traditional, teacher-centered, and monolithic model of EFL writing instruction is increasingly inadequate to meet the demands of the new information era, rendering pedagogical reform both urgent and inevitable. The application of GenAI in EFL writing classrooms thus emerges as a critical priority, promising to deliver scaffolded, immediate, and highly individualized support throughout the entire writing process.

GenAI, defined as artificial intelligence capable of producing novel text, code, and other media, has transitioned from a research frontier to a tangible educational resource in a remarkably short time. Platforms like ChatGPT and various domestic AI tools offer a suite of functions directly applicable to the EFL writing context. These capabilities include facilitating brainstorming sessions, generating and refining outlines, paraphrasing and translating text, providing context-aware vocabulary suggestions, and delivering formative feedback on elements ranging from sentence-level mechanics to overall discourse coherence. The potential of these tools to act as ever-available writing tutors, boundless sources of authentic linguistic input, and patient collaborative partners aligns powerfully with the principles of communicative language teaching and process-oriented writing approaches. These pedagogical models, though widely endorsed, have historically been difficult to implement effectively within the large-scale, resource-constrained contexts typical of many Chinese classrooms.

In essence, the integration of GenAI into EFL writing instruction signifies more than a mere technological adoption. It represents a strategic response to long-standing pedagogical gaps and a proactive step towards realizing the vision of a modernized, student-centered educational ecosystem. By harnessing the capabilities of GenAI, educators can transcend the limitations of traditional methods, fostering a more dynamic, interactive, and supportive learning environment that ultimately empowers students to become more proficient and confident writers in English.

2 LITERATURE REVIEW

The application of Artificial Intelligence (AI), particularly GenAI and large language models, has precipitated a transformative shift in the pedagogy and practice of EFL and English as a Second Language (ESL) writing. Current research has diversified into several key thematic areas, exploring the multifaceted roles AI plays in supporting learners and reshaping EFL writing instructional practices. These areas range from its function as a direct writing tool to its profound implications for educational ethics and curriculum design.

2.1 AI as a Writing Assistant

A primary research direction focuses on AI's role as an intelligent writing assistant that enhances fluency and linguistic quality. Studies investigate how AI tools can help learners overcome immediate writing hurdles, such as finding lexis, rephrasing sentences, and adapting tone. For instance, Zhao X, Sbaffi L, and Cox A explored how digital assistants like Wordtune, by suggesting alternative phrasings with different formality levels and lengths, help EFL writers maintain a continuous flow and acquire new expressions [1]. Similarly, Hwang W Y, Nurtantyana R, et al. developed the Smart RoamLingo app, which uses AI to provide contextually relevant sample sentences and personalized writing feedback, thereby facilitating meaningful content creation in authentic scenarios [2]. This body of work positions AI as an ever-available linguistic resource that reduces cognitive load and supports real-time language acquisition during the writing process.

2.2 AI-powered Feedback

The second research direction is dedicated to AI-powered Automated Writing Evaluation (AWE), rigorously comparing the efficacy and characteristics of AI-generated feedback against human feedback. The central aim is to validate the quality of AI feedback and delineate its appropriate role within educational assessment. A study by Steiss J, Tate T, et al. provided a nuanced comparison, concluding that while well-trained human raters generally delivered higher-quality feedback across most dimensions, ChatGPT still demonstrated considerable utility by offering timely and affordable support [3]. Escalante J, Pack A, and Barrett A found no significant difference in learning outcomes between students receiving AI feedback and those receiving human tutor feedback, with student preferences split between the two, highlighting their complementary strengths [4]. These findings suggest that the future lies not in replacement, but in the strategic integration of both feedback sources.

2.3 The Affective Impact of AI Tools on Learners

The third research strand examines the impact of AI tools on learners' affective domains, including motivation, self-efficacy, and engagement. This line of inquiry recognizes that the psychological experience of writing is crucial for long-term development. Research by He Y indicated that learners using an AWE system outperformed their peers in motivation, enjoyment, academic buoyancy, and writing success [5]. And Zare J, Al-Issa A, and Madiseh F R found that interacting with ChatGPT had a positive and lasting effect on L2 learners' task motivation for argumentative essay writing, with students perceiving the AI as a supportive tutor [6]. These studies underscore that the immediacy and non-judgmental nature of AI assistance can alleviate writing anxiety and foster a more positive and motivating learning environment.

2.4 Ethical Dilemmas in AI-Mediated Writing

The fourth research theme addresses the ethical and practical dilemmas introduced by sophisticated AI writing tools. Tsai C Y, Lin Y T, and Brown I K demonstrated that ChatGPT-assisted revisions led to significantly higher scores, with the most substantial gains among lower-proficiency students, thereby raising serious concerns about fairness in evaluation [7]. From a socio-critical perspective, Higgs J M and Stornaiuolo A investigated young people's ethical concerns about AI, emphasizing the urgent need for educational practices that foster critical AI literacy to prevent over-reliance and the erosion of authorial voice and independent thought [8]. This research emphasizes the necessity for revised assessment paradigms and a strong emphasis on ethical reasoning in AI-mediated writing instruction.

2.5 AI-Integrated Curriculum Design

A growing body of literature addresses the pivotal issue of pedagogical integration, exploring how to integrate AI into specific instructional frameworks and curriculum designs to maximize learning outcomes. This research focuses on creating effective, theory-driven models for AI implementation. For example, Yang Y K, Huang L Y, et al. designed a generative AI-based virtual teacher within a Co-Regulated Learning (CoRL) framework, finding it more effective than standard AI support in enhancing undergraduate writing outcomes [9]. Liu C C, Hou J R, et al. proposed a reflective thinking-promoting mechanism within an AI-supported writing environment, which successfully improved students' writing performance, self-efficacy, and self-regulated learning [10]. These studies highlight that the effective use of AI is highly dependent on sound pedagogical design, transforming the teacher's role from a knowledge transmitter to a designer of AI-enhanced learning experiences and a guide for its critical use.

3 STATUS QUO OF EFL WRITING INSTRUCTION IN CHINA

The landscape of EFL writing instruction in China is shaped by a unique set of pedagogical, cultural, and systemic factors. Despite ongoing reforms, the current paradigm is largely characterized by several interconnected challenges that hinder the development of students' authentic writing proficiency. A detailed examination reveals persistent issues in class size, pedagogical focus, teacher-student dynamics, task authenticity, assessment methods, and the critical issue of feedback timeliness.

3.1 Large Class Sizes

With classrooms often containing 50 to 60 students or more, the capacity for individualized instruction is severely limited. The sheer volume of papers to grade forces instructors to prioritize efficiency over depth, resulting in feedback that is often brief, standardized, and focused on surface-level errors. This environment makes the process of drafting and revision—a cornerstone of writing development—impractical to implement effectively, ultimately restricting the amount of sustained writing practice each student receives.

3.2 Lack of Timely Writing Feedback

Due to large class sizes that results in the overwhelming grading burden, there is typically a significant delay—often one to two weeks—between a student submitting a draft and receiving the teacher's corrections. This delay breaks the critical link between the act of writing and the learning feedback. By the time the essay is returned, the student's cognitive engagement with the specific writing task has faded, making the feedback less meaningful and less likely to be internalized and applied to future work. This feedback loop is too slow to support the formative, iterative nature of writing skill development.

3.3 The Predominance of the Product-Oriented Teaching Approach

The dominant pedagogical framework for EFL writing instruction in China is the Product-Oriented Teaching Approach. This method prioritizes the final written text, focusing on grammatical accuracy, vocabulary usage, and adherence to formulaic structures, such as the classic three-part essay. Instruction often revolves around the analysis and emulation of model essays, training students to reproduce safe, exam-ready texts. Consequently, the cognitive and strategic processes of writing—including brainstorming, outlining, drafting, and revision—are frequently neglected, stifling creativity and critical thinking.

3.4 Teacher-centered Instruction Model

In Chinese EFL writing classrooms, teachers act as the sole knowledge authority, responsible for presenting models, assigning topics, and delivering corrective feedback. Student passivity is often reinforced, with minimal opportunity for collaborative learning, peer review, or classroom dialogue about writing choices. This model fosters a dependency on the teacher for validation and correction, hindering the development of learner autonomy and self-editing skills.

3.5 Lack of Authentic Writing Situations

Writing tasks are predominantly designed as decontextualized exercises for examination preparation, such as for National College Entrance Examination (NCEE) or College English Tests (CET) in Chinese EFL writing classrooms. Prompts are often abstract and disconnected from real-world communicative needs. This absence of a genuine purpose results in writing that is mechanical and disengaged, as students are motivated by grades rather than by a desire to communicate ideas effectively.

3.6 Examination-focused Evaluation System

The evaluation system often used in Chinese EFL writing classes is examination-focused. Teacher feedback is overwhelmingly concentrated on grammar and spelling, at the expense of thesis clarity, logical flow, and argument strength. The evaluation criteria are directly tied to standardized exam rubrics, creating a powerful "washback effect" that dictates teaching content and methodology. This reinforces the focus on error avoidance and formulaic writing, further discouraging pedagogical innovation in student writing.

Therefore, the status quo of EFL writing instruction in China is a vicious cycle where large classes lead to delayed and limited feedback, which necessitates efficient but limited teaching methods, all of which are reinforced by high-stakes testing. This system, while effective in training for exam performance, often fails to cultivate confident, proficient, and autonomous learners capable of using English for genuine, meaningful communication. It is within this context that GenAI emerges as a potentially transformative tool to address these deep-rooted challenges.

4 THE INTEGRATION OF GENAI INTO EFL WRITING INSTRUCTION IN CHINA

The integration of GenAI into EFL writing instruction in China represents a paradigm shift from a traditional,

product-oriented approach to a dynamic, process-oriented, and highly personalized learning experience. Its application can be systematically examined across three critical pedagogical stages: pre-class, in-class, and post-class. This approach ensures that AI serves as a continuous scaffold, supporting both students and teachers throughout the entire writing cycle. The chapter “Development by Cause and Effect” will be taken as an example to elaborate the instruction process specifically.

4.1 Pre-Class

The pre-class stage is systematically designed for knowledge delivery through a structured four-step process. It begins with comprehensive AI training for teachers and students, proceeds to an AI-driven diagnostic analysis of students’ writing, continues with AI-assisted lesson preparation, and concludes with MOOC learning, which collectively prepares students for in-class activities.

Step 1: AI Training for Teachers and Students

The training on the application of relevant AI technologies is conducted for both teachers and students through lectures and hands-on practice, laying the solid foundation for the smooth implementation of this teaching model.

Step 2: AI-driven Learning Analysis

Teachers assign students to complete a writing task (Version 1.0) titled "Are Lies Necessary in Our Life? Why or why not?" on the MOOC platform. Using AI grading, the students' mastery of writing skills and their deficiencies are diagnosed and analyzed, providing precise data for teachers’ lesson preparation.

Step 3: AI-assisted Lesson Preparation

Teachers utilize AI models, such as ChatGPT, Deepseek, iFlytek, to help identify teaching resources suited to students’ needs, develop lesson plans, conduct instructional design, create Powerpoint, and generate necessary audio and video materials in preparation for classroom teaching.

Step 4: MOOC Learning

Students engage in self-paced learning of the "Development by cause and effect" chapter on the MOOC platform, which enables them to acquire core conceptual knowledge beforehand, thereby fostering their autonomy and preparing them for in-depth application.

4.2 In-Class

The in-class stage is dedicated to internalizing knowledge through smart classroom interaction. Teachers employ AI interactive programs within Rain Classroom and structured scaffolding to facilitate student-centered activities and exercises focused on the key dimensions of writing—structure, language, and content—thereby practicing essential and complex writing skills.

Step 1: Enabling structure

To master the structure of cause-and-effect English essays, teachers adopt a scaffolded task progression to ensure students’ advance from comprehension to application. It begins with a summary of cause-and-effect essay structures, submitted via Rain Classroom for AI and teacher review, reinforcing core concepts. Students then progress to outlining an essay using one structure, enabling them to immediately apply the summarized techniques and receive targeted feedback on their practical skills. This process reinforces their schema for essay structure and builds a practical structural scaffold for subsequent writing.

Task 1: What are the methods of development for cause and effect? And how many methods are there?

Three methods of development for structuring cause & effect： 1) the single-effect-and-multiple-cause pattern; 2) the single-cause-and-multiple-effect pattern; 3) the multiple-cause-and-multiple-effect pattern.

Task 2: Please write an outline of causes or/and effects based on one of the following pictures by using one of the methods of development.

Step 2: Enabling language

To systematically build their repertoire of cohesive devices, students first are required to use AI assistants to search for cause-and-effect transitional words and phrases. They then contribute their findings to a collective word cloud in Rain Classroom, making the vocabulary visually salient. Teachers provide immediate feedback on the results, guiding students to internalize these essential linguistic tools for crafting well-connected and logical essays.

Task: Please find out the linking expressions for cause and effect as much as possible with the help of AI assistants.

Possible answers: because, since, for, owing to, due to, thanks to, as a result of, on account of, result in, result from, lead to, attribute to, etc.

Step 3: Enabling content

To stimulate critical thinking and generate diverse perspectives for the writing task, students are randomly assigned into groups via Rain Classroom to discuss the topic "Are Lies Necessary in Life?". Each group then delivers a report, receiving a combination of AI-generated comments and immediate teacher feedback. This collaborative, technology-enhanced process effectively enriches the content and depth of their subsequent writing.

Task: Please discuss in groups, list and report the key points about the topic “Are Lies Necessary in Our Life? Why or why not? ”

Step 4: AI-generated knowledge graph

A concise summary of the key content is generated using a knowledge graph with the help of AI, providing a visual map

to help students achieve a systematic and holistic understanding of the class.

4.3 Post-Class

The post-class stage is designed to systematically expand and consolidate students' writing capabilities through a fully integrated AI-supported ecosystem. This phase enables personalized and continuous development by employing four key steps: AI-assisted knowledge expansion to deepen conceptual understanding, a multi-layered human-AI feedback mechanism for writing refinement, an AI-driven knowledge base for immediate query resolution, and an AI teaching assistant that provides companion-like learning support. These steps form a coherent digital learning environment that extends learning beyond the classroom, ensuring students systematically enhance their analytical and writing skills through resource, tool, and evaluation synergies.

Step 1: AI-assisted knowledge expansion

With the goal of deepening and expanding their grasp of cause-and-effect writing concepts, students use AI models, such as ChatGPT, Deepseek and iFlytek, to discover supplementary examples and explanations that explore diverse perspectives and contextual applications of their knowledge.

Step 2: Human-AI collaborative feedback

To holistically improve their writing, students complete the "Are Lies Necessary in Our Life? Why or why not?"(Version 2.0). They then refine their drafts through a multi-layered feedback process involving AI-assisted assessment, peer review, and teacher evaluation, before producing a final polished essay based on the insights gained.

Step 3: AI-driven knowledge base for learning support

To ensure timely learning support, students can pose post-class questions in the digital question bank, where the AI delivers immediate, knowledge-based responses, effectively acting as a learning support to consolidate understanding and address doubts as they arise.

Step 4: AI teaching assistant for learning companion

AI teaching assistant offers tailored guidance on writing difficulties and provides immediate, personalized feedback on specific writing challenges, preventing the reinforcement of errors and accelerating skill acquisition.

5 CONCLUSION

The integration of GenAI into EFL writing instruction in China represents a pivotal and timely evolution, addressing long-standing pedagogical constraints while aligning with national educational modernization goals. GenAI tools, such as ChatGPT and domestic platforms like DeepSeek, offer transformative potential by enabling a shift from a rigid, product-oriented approach to a dynamic, process-focused, and student-centered learning model. This integration not only mitigates challenges such as large class sizes, delayed feedback, and examination-centric practices but also fosters greater learner autonomy, critical thinking, and writing motivation. Through structured application across pre-class, in-class, and post-class stages, as exemplified in the chapter “Development by cause and effect”, GenAI facilitates personalized scaffolding, timely feedback, collaborative learning, and continuous skill development. GenAI serves as a catalyst for creating a more responsive, interactive, and effective EFL writing ecosystem that empowers students to become proficient, confident, and autonomous writers capable of meaningful communication in English. The future of EFL writing instruction in China lies in the strategic, reflective, and ethically informed adoption of AI technologies, guided by sound pedagogy and a commitment to holistic student development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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STUDENT NEEDS ANALYSIS FOR COLLEGE ENGLISH ELECTIVES IN AGRICULTURAL UNIVERSITIES: A QFD-HOQ-AHP APPROACH TO CURRICULUM OPTIMIZATION

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Abstract: This study addresses the misalignment between non-English-majored undergraduates' evolving needs and current College English (CE) elective curricula in Chinese higher education, where traditional Needs Analysis (NA) fails to systematically translate subjective student voices into actionable design priorities. Integrating Quality Function Deployment (QFD) Phase 1 House of Quality (HoQ) with Analytic Hierarchy Process (AHP), we quantify and prioritize student demands. Survey/interview data from Non-English-Majored students reveal top priorities: interactive teaching methods, qualified instructors (cross-cultural competence/experience), and career-aligned course types. AHP weights highlight teaching methods and teacher qualifications as critical. The HoQ maps these to curriculum actions, ranking teaching innovation and instructor training highest. Results provide a data-driven Road-map for optimizing resource allocation and course redesign, bridging NA gaps to align CE electives with student expectations for practical and personalized learning. This QFD-HoQ-AHP approach enables targeted quality improvement in higher education curricula.
Keywords: Quality Function Deployment (QFD); House of Quality (HoQ); College English electives; Curriculum development; Needs analysis

1 INTRODUCTION

1.1 The Evolving Landscape of College English in Chinese Higher Education

The role of College English(CE) in Chinese higher education has evolved in response to globalization and shifting labor market demands. Traditionally viewed as a mandatory, grammar-focused foundational course, CE is increasingly pressured to provide individualized and differentiated learning experiences, particularly within the curriculum structure. This transformation is essential given the high expectations placed upon undergraduates in a globalized economy, requiring not only linguistic proficiency but also diverse capacities to meet contemporary challenges.
However, despite several rounds of pedagogical reform, significant dissatisfaction persists among non-English majors regarding the efficacy of current English for General Purpose(EGP) courses. Students frequently report deficiencies in practical communication skills, critical thinking, and the ability to apply English in real-world scenarios or in professional contexts. This persistent disconnect between institutional offerings and student outcomes underscores an urgent need for a systematic overhaul of curriculum design.

1.2 The Imperative for Customer-Centred Quality Management in Higher Education

Higher Education(HE) institutions, particularly those coping for resources and students, must adopt quality assurance models. Quality in this service sector is defined by the degree to which the educational output (curriculum and student capabilities) meets the expectations of its stakeholders, primarily the students themselves, who function as the primary customers. Traditional Needs Analysis(NA) methods often succeed in identifying skills gaps as well generalized demands, yet they frequently fall short of providing a systematic, quantitative framework necessary to translate these subjective 'voices of customers' into concrete, prioritized design actions.
The inherent complexity in satisfying a diverse student body, which exhibits strong instrumental motivation and simultaneous demands for specialized content and authentic practice, necessitate a structure approach capable of resolving internal conflicts and optimizing limited resources. Without such a methodology, institutions risk diluting effort by attempting to moderately satisfy all needs, rather than concentrating investment where the strategic impact is greatest.

1.3 Quality Function Deployment(QFD) as a Strategic Planning Tool

Quality Function Deployment(QFD) is a robust, structured methodology that originated in the Japanese manufacturing sector but has been successfully migrated to service industries, including education. QFD serves as a holistic model for quality assurance that compounds market, social, and management dimensions, positioning it as a tool superior to many

fragmented assessment models. It core objective is to translate the implicit "Voice of the Customer"(VoC) into explicit, actionable "Technical Requirements"(Voice of the Designer).

QFD operates on the principle of preventing deficiencies by incorporating customer requirements early in the design process, thereby ensuring the final product or service aligns with user expectations. The central mechanism for this translation is the House of Quality(HoQ), which systematically correlates customer demands with organizational capabilities. The application of QFD to the CE curriculum moves the field beyond descriptive needs analysis into prescriptive quality management, providing a structured mechanism for assessing and prioritizing areas for quality improvement within existing process.

1.4 Research Objectives

This study aims to deploy the Phases 1 House of Quality (HoQ) matrix, the foundational element of the QFD framework, to systematically analyze and prioritize the curriculum needs of undergraduate students concerning general elective CE courses. The current research seeks to achieve two objectives: 1) Identify and quantify the most critical student need (the 'WHATs') regarding the CE English electives; 2) Define measurable curriculum attributes and instructional element (the 'HOWs') that address these needs; 3) Calculate the Technical Importance Scores(TIS) for each 'HOW' to provide a clear, data driven road-map for resource allocation and course restructuring, ensuring optimal institutional response to quantified student demands.

2 LITERATURE REVIEW

2.1 Theoretical Foundations of Quality Function Deployment (QFD)

Quality Function Deployment (QFD), a systematic quality management methodology, emerged in 1960s Japanese industry and was formalized by Yoji Akao in Hinshitsu Tenkai[1]. It translates customer requirements (CR)—explicit and implicit user needs—into technical quality characteristics, using the House of Quality (HOQ) to bridge stakeholder “Voices” with organizational action. This proactive, user-centered approach prioritizes integrating VOC into design, distinguishing it from reactive quality control[1].

QFD evolved into three dominant frameworks: (1) the Japanese Comprehensive Model for end-to-end life-cycle deployment[2]; (2) the American Supplier Institute's Four-Stage Model (planning, design, process planning, control)[3]; and (3) the GOAL/QPC Model in 1989 emphasizing cross-functional collaboration[4]. Complementary approaches like Enhanced QFD (EQFD) in 1991[5] and Dynamic QFD (DQFD)(1994) later addressed QFD's rigidity in dynamic markets.[6]

QFD thrived in manufacturing: Mitsubishi's Kobe Shipyard in 1970s standardized quality processes, while Toyota reduced new product costs by 61% using it[7]. By the 1980s, U.S. firms including Ford adopted it, cementing its industrial relevance[8].

In education, QFD aligned pedagogy with learner expectations: Huang mapped vocational training needs to curricula via HOQ[9]; Zeng optimized industrial design courses using i-course requirements to teaching processes[10]. In 2019, Yang extended QFD to online courses, using student VOC to redefine teaching characteristics (e.g., interactivity)[11]. These studies demonstrate QFD's utility in translating stakeholder needs into actionable curriculum design.

The complete QFD process involves four phases: 1) Product Planning, which establishes the customer's needs and translates them into technical requirements using the HoQ; 2) Product Design, focusing on critical part characteristics; 3) Process Planning, identifying key operations; 4) Production Planning, establishing control and maintenance plans. This study focuses on Phases One. namely, the HoQ.

The HoQ is a framework that links six matrices (Figure 1):

1) Stakeholder Requirements (WHATs): A structured list of needs, representing the 'Voice of the customers'(VoC).

2) Operation Requirements (HOWs): Measurable, solution-independent ways the institution can meet the WHATs, representing the Voice of the Designer.

3) Relationship Matrix (WHATs vs HOWs): Quantifying the correlation strength (weak, medium, strong) between each WHAT and each HOW.

4) Correlation Matrix (HOWs vs HOWs): Mapping inter-dependencies (supportive or contradictory) among the HOWs.

5) Competitive assessment (WHYs): Containing quantitative market data, including customer importance ratings and competitive benchmarking.

6) Operational Priorities (HOW MUCH): Calculating the technical priorities based on the relationships and importance weights.

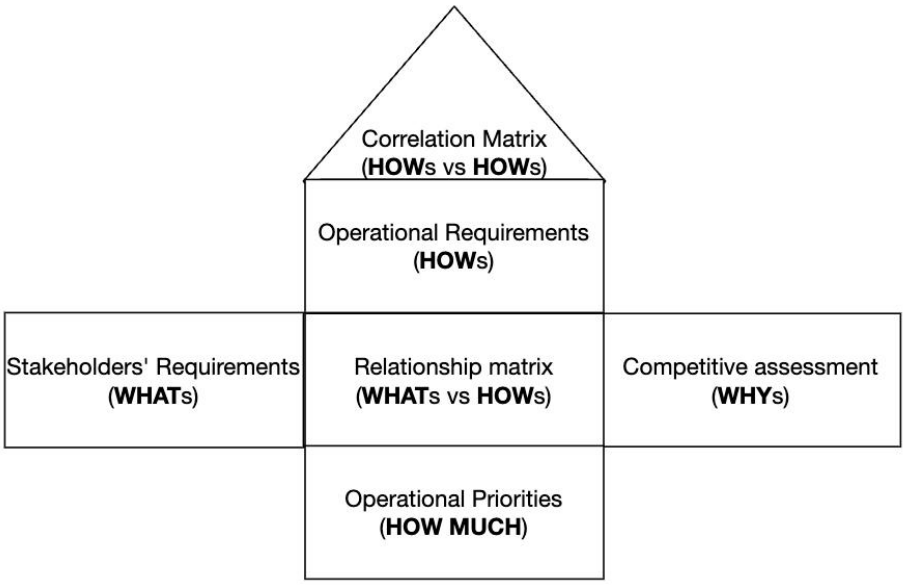

Figure 1 House of Quality

2.2 Needs Analysis (NA)

Needs Analysis (NA) is a cornerstone of English for Specific Purposes (ESP) design, originating with Richterich's communicative needs model[12]. NA systematically identifies gaps between current and desired learner capabilities, guiding contextually relevant curriculum development. Scholarship on NA advances key frameworks: Definitions distinguish product-oriented/outcome-focused and process-oriented perspectives[13-14]. Categorizations include target needs (future skills) vs. learning needs (acquisition pathways)[15]. Methods feature Munby's Target Situational Analysis (TSA) in 1978[16], Allwright's Present Situational Analysis (PSA)[17], Hutchinson & Waters' Needs-Based Framework in 1987[18], and Dudley-Evans & St. John's Integrated Model in 1998 (synthesizing context, target, and learning needs)[19]. In education, NA guides ESP design: Tsai redesigned accounting curricula using market feedback to boost employability[20]. Huang linked vocational ESP to regional industry needs in 2022[21-24]. Scholars also highlight non-intellectual factors: Zheng advocated balancing motivation with learning goals in 2006, while Wu tied student satisfaction to NA-informed design accounting for learner initiative[14-15]. These studies reinforce NA's role in creating learner-centred EGP electives.

2.3 Research Gap: From Needs Analysis to Quality Improvement

Despite progress, QFD-NA integration in agricultural college English electives remains unexplored. Most QFD studies focus on institutional quality, neglecting learners' diversity: Agricultural students' varied backgrounds (rural/urban, career goals) are rarely centered, limiting personalized instruction[11, 16]. Disciplinary specificity: English skills for agricultural contexts (e.g., scientific writing, global collaboration) lack tailored QFD-NA integration, leaving a gap in preparing globally competent professionals.

This paper fills this crucial gap by employing the HoQ to provide a quantitative, prioritized road-map for CE electives reformation. By combining QFD and NA, the study ensures that scarce resources are pinpointed precisely to the technical requirements that will yield the maximum return on student satisfaction and educational quality.

3 RESEARCH METHODOLOGY

This study adopts a mixed-methods sequential explanatory design introduced by Creswell and Clark[25], integrating quantitative surveys (to quantify patterns) with qualitative interviews. The approach was tailored to address two core objectives: mapping English learning needs among college students and evaluating satisfaction with college English electives—with a focus on grade-level variability.

3.1 Participants

The sample comprised non-English-majored undergraduates in SCAU(2020–2024 cohorts). A stratified sampling strategy ensured proportional representation across grades (freshman to senior), capturing developmental shifts in English proficiency and learning goals. Of 100 distributed questionnaires, 98 were returned (98% response rate); 19 invalid responses (inconsistent answers or incompleteness) were excluded, yielding a final valid sample of 79 students (79% post-validation rate).

3.2 Data Collection and Analysis

3.2.1 Quantitative questionnaire

A structured survey grounded in Dudley-Evans and St. John's (1998) needs analysis framework was adapted from validated tools[13]. It included four thematic dimensions:

- Demographics: 6 items (gender, grade, English certificates, study duration, career goals).
- Learning Context: 35 items assessing attitudes, challenges, and skill proficiency.
- Learning Needs: 54 items exploring elective course goals, desired skill improvements, and expectations for materials/instructors.
- Course Satisfaction: 61 items evaluating textbooks, teaching, and assessment.

A 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used, with higher scores indicating stronger agreement. Grade-level adjustments ensured relevance: freshmen/sophomores completed Sections 1-3 (no elective experience), while juniors/seniors completed all four sections.

3.2.2 Qualitative interviews

Semi-structured interviews (30-45 minutes, telephone/video conference) supplemented surveys, enabling in-depth exploration of lived experiences. Eight participants (Two per grade, purposely sampled) followed a guide aligned with questionnaire themes but tailored to grade:

- Freshmen/Sophomores: Perceived English proficiency, impacts of prior courses, and elective goals.
- Juniors/Seniors: Elective selection, goal attainment, and improvement suggestions. Interviews were recorded (consented) and transcribed verbatim for analysis.

3.3 Data Collection

Questionnaires were disseminated via wjx.cn with reminders to boost engagement. Valid data were cleaned in Excel and analyzed using descriptive statistics (frequencies, means) to summarize demographics, needs, and satisfaction.

Transcripts underwent thematic analysis[26]: initial deductive codes (from questionnaire themes) and inductive codes (emergent patterns, e.g., “desire for industry-aligned content”) were grouped into coherent categories. This ensured alignment with research objectives while capturing unanticipated insights.

Survey (quantitative patterns) and interview (qualitative depth) findings were integrated to validate conclusions. For example, low survey satisfaction with elective relevance was corroborated by interview quotes about misalignment with career aspirations—strengthening result trustworthiness. This methodology balances rigor (validated instruments, stratified sampling) with flexibility (semi-structured interviews), addressing both generalizability and context. Mixed methods mitigate single-method limitations, providing a holistic understanding of students' English learning needs and course effectiveness—critical for evidence-based program improvement.

4 RESULTS AND DISCUSSION

This section presents a data-driven analysis of student needs, learning behaviors, and satisfaction, followed by a prioritization of demands using the Analytic Hierarchy Process (AHP) and translation of these needs into curriculum actions via a House of Quality (HOQ).

4.1 Student Need Analysis for English Electives

QFD begins with capturing the Voice of the Customer(VOC)—i.e. student needs, preferences, and satisfaction. We structured this analysis around demographic profiling, learning behaviors/skill gaps, explicit needs, and post-enrollment satisfaction to build a foundation for curriculum optimization.

4.1.1 Demographic profile of participants

We collected demographic/academic data (region, gender, grade, English proficiency, employment goals) to contextualize needs.

- Region: 78% from Guangdong, China.
- Gender: Male-to-female ratio of 2:1.
- Grade: Freshmen (30.4%), Sophomores (31.6%), Juniors (19.0%), Seniors (19.0%).
- English Proficiency: Over 50% held CET-4/CET-6 certificates; 25% of freshmen had not yet taken these exams (introducing a minor bias in proficiency assessment).
- Employment Goals: 45% prioritized multinational corporations/foreign enterprises; 30% aimed for government positions.

Two cohorts emerged: (1) juniors/seniors (post-elective) with clear career goals; (2) freshmen/sophomores (pre-elective) focused on exam preparation.

4.1.2 Learning behaviors and skill gaps

To explore learning patterns, we analyzed attitudes, satisfaction, and self-rated skills (6 questions + Figure 2). Results revealed a disconnect between interest and action: 42 students (22.0%) reported high interest in English, but only 16 (8.5%) engaged regularly in extracurricular activities; 41 (22.0%) rarely did. Curriculum satisfaction was low: 23 (12.2%) positive, 25 (13.3%) neutral, 31 (16.5%) dissatisfied. Students perceived the curriculum as failing to meet needs despite subjective motivation—interest rarely translated to consistent effort.

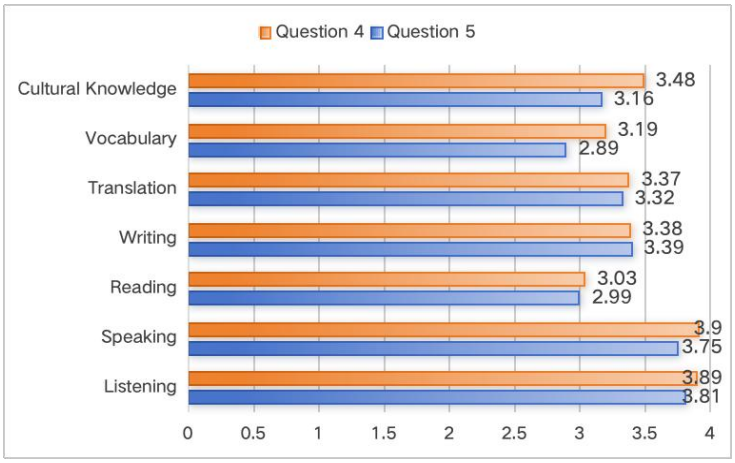

Figure 2 Line Chart Depicting Trends in Students' Self-Perceived English Learning Difficulties
Note: Question 4: I think this English skill is the most lacking in my English learning.
Question 5: I think this English skill is the most difficult to learn in my English learning

Table 1 Students' Self-Perceived Mastery of English Listening, Speaking, Reading, Writing, and Interpreting Skills

Question	Survey items	Response Percentages(%)					Mean	Most Frequent Response
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
After the current stage of College English learning, what is your mastery of English skills?	Item 01	3.80%	7.69%	36.71%	43.04%	8.86%	3.46	4
	Item 02	5.06%	26.58%	35.44%	24.05%	8.86%	3.05	3
	Item 03	15.43%	26.58%	24.07%	19.75%	0.00%	2.05	2
	Item 04	10.13%	40.74%	36.71%	26.58%	3.80%	2.91	3
	Item 05	11.39%	22.78%	49.37%	16.46%	2.53%	2.78	3
	Item 06	31.65%	20.25%	20.25%	12.66%	0.00%	2.14	2
	Item 07	7.59%	20.25%	31.65%	35.44%	5.06%	3.10	4
	Item 08	16.46%	25.04%	40.51%	18.99%	0.00%	2.62	3
	Item 09	25.32%	35.44%	27.85%	10.13%	1.27%	2.27	2
	Item 10	12.66%	21.52%	35.44%	29.11%	1.27%	2.85	3
	Item 11	16.46%	27.85%	40.51%	15.19%	0.00%	2.54	3
	Item 12	25.32%	35.44%	27.85%	10.13%	1.27%	2.27	2
	Item 13	12.66%	17.72%	31.65%	31.65%	6.33%	3.01	3
	Item 14	16.46%	29.11%	32.91%	20.25%	1.27%	2.61	3
	Item 15	30.38%	29.11%	29.11%	8.86%	2.53%	2.24	1

Note: Likert scale 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Item 1: I can understand simple listening materials related to learning, daily communication, etc.
Item 2: I can understand language communication materials with broad content and normal speed
Item 3: I can understand speeches and discussions at professional academic lectures and conferences
Item 4: I can effectively communicate orally about daily life and learning
Item 5: I can communicate naturally on a wide range of topics
Item 6: I can communicate effectively on academic and practical issues
Item 7: I can read articles with similar difficulty to English textbooks and familiar content
Item 8: I can conduct in-depth reading on a wide range of humanities, social sciences, and other content
Item 9: I can read, study, and research relevant books and literature on the original profession
Item 10: I can write short articles on general topics or common application documents
Item 11: I can write short articles with rich content and clear structure on some related topics
Item 12: I can effectively write about relevant issues in the field of professional or cross-cultural communication
Item 13: I can translate brief materials in English textbooks or related application styles

Item 14: I can translate relevant social hot issues or related professional materials
Item 15: I can translate a wide range of design cultural exchanges or professional literature with a certain difficulty

Skill Gaps: Figure 1 (self-perceived difficulty) and Table 1 (self-rated mastery) show that 1) Top deficiencies include Listening (36.7% rated "difficult") and speaking (49.4% rated "difficult").Relative strengths: Reading (mean=3.10) and vocabulary (mean=2.61), attributed to test-oriented education (prioritizing these skills) and time for reflection; 2) Contradiction: Students rated reading/vocabulary as "easy" but struggled with listening/speaking—highlighting a gap between self-perception and practical ability. Interviews deepened this: Listening suffers from test-focused vs. workplace demands; speaking is hindered by grammar-translation pedagogy (fear of error); writing/translation lag due to insufficient practice.

4.1.3 Explicit and contextualized needs: freshman vs. senior perspectives

We assessed explicit needs via 13 questions (learning purposes, course preferences, textbook/teacher demands) across grades. Learning Purposes: Table 2 shows Fulfilling credit requirements (mean=4.24) was top, followed by Passing CET-4/6 (3.70) and Preparing for employment (3.46). Desired skills (Table 3) aligned: basic skills (3.85) and practical daily communication skills (3.81) were priorities. A paradox emerged: job seeking was 3rd in purpose but 6th in skill demand—because job readiness requires holistic skills (core, communication, culture).

Table 2 Categories of Students' English Learning Purposes

Purpose	Mean	StD
Fulfilling credit requirements	4.24	0.82
Passing standardized English proficiency exams (e.g. CET-4, CET-6, IELTS, TOEFL)	3.70	1.08
Preparing for employment	3.46	1.08
Exercising critical thinking skills and enhancing general literacy	3.39	1.04
Broadening cultural awareness and understanding diverse cultures	3.29	1.04
Preparing for academic research	3.25	1.14
Preparing for postgraduate studies or international study	3.00	1.24
Preparing to promote China's global communication in English	2.99	1.08

Table 3 Ranking of Students' Expected English Language Skills to Improve in Selective Programs

Skill area	Mean	StD
Improving basic skills (listening, speaking, reading, writing and translation)	3.85	0.907
Enhance practical daily communication skills	3.81	0.988
Enhancing your humanistic competence and intercultural communication skills	3.66	0.959
Improve academic English proficiency	3.59	0.913
Enhancing job-hunting preparedness	3.56	1.047

For Course Preferences, Freshmen (pre-elective) favored exam-prep/electives (Figure 3), while sophomores (post-elective) prioritized listening/speaking and instructor quality (Figure 4).

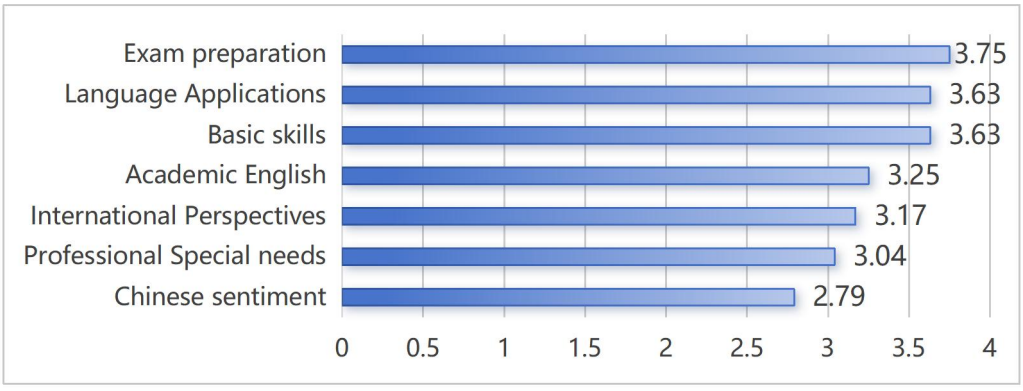

Figure 3 Elective Course Types Freshmen Expect to Take

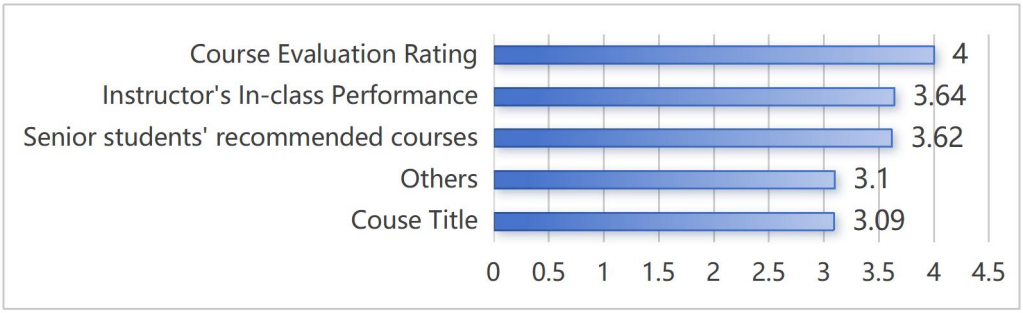

Figure 4 Motivations for Sophomore Students' Elective Course Choices

For Textbook/Teacher Needs(Table 4), Freshmen preferred foreign-authored textbooks (mean=3.55) and teachers who focused on key points (mean=3.39). Seniors (post-elective) shifted to Chinese textbooks (mean=3.46).

Table 4 Students' Perceived Textbook Needs: First- vs. Second-Year

Category	Items	Mean	Std
Preferred Textbook Sources	Original textbooks authored by foreign experts	3.55	0.980
	Textbooks authored by Chinese scholars	3.39	0.885
	Textbooks compiled by school teachers	3.06	1.144
Preferred Textbook Usage	Teachers cover the entire textbook with detailed instruction	3.18	1.014
	Teachers focus on key difficult points, with the rest for self-study	3.39	0.931
	Primarily self-study, with teachers addressing questions	3.20	1.000
	Teacher minimize textbook time and supplement with extracurricular content	3.33	1.008

For teachers, seniors valued humor (mean=4.22) and cross-cultural knowledge (mean=4.06). This aligns with freshmen but differing in textbook use. Students favor English-major teachers, then general college English/foreign instructors, prioritizing humor, cross-cultural knowledge, and experience. Interviews link classroom atmosphere to efficiency—low interaction harms motivation. Most current instructors are general; few foreign/major teachers. Suggest training. Freshmen/sophomores similarly prefer English-professional integrated content, driven by career uncertainty or major focus (Table 5).

Table 5 First- and Second-Year Students' Needs Regarding Teachers

Category	Item	Mean	StD
Preferred Teacher Types	English-major teacher	3.9	0.963
	College English teacher	3.76	0.947
	Teachers with subject-matter expertise	3.29	1.080
	Native English-speaking teachers	3.78	1.066
Preferred Teacher Qualifications	Engaging and humorous teaching style	4.22	0.823
	Extensive intercultural knowledge	4.06	0.988
	Extensive experience in English language teaching	3.98	0.946
	Overseas teaching experience	3.53	1.157

For the Teaching Modes(Table 6), Blended (online+classroom, Mean=3.92) tops teaching mode preferences, followed by traditional lectures (3.59) and special-topic ones (3.43). It meets students' need for flexibility-expanding resources, enabling self-paced learning, and balancing traditional interaction with online autonomy—boosting practical English skills.

Table 6 First- and Second-Year Students' Needs for Teaching Modes

Category	Item	Mean.	StD
Preferred Teaching Modes	Blended learning(Combination of classroom lectures and online self-study)	3.92	0.886
	In-person classroom lectures	3.59	0.934
	Specialized topic lectures	3.43	1.155

For the Course Evaluation Methods (Table 7), students overwhelmingly prefer open-book exams. Interviews link assessment criteria to course choice—they seek alignment with goals and less anxiety. Freshmen/sophomores, fresh

from rigid General English, favor open-book/peer assessment to avoid high pressure. Course papers are least desired due to time and writing worries.

Table 7 First- and Second-Year Students' Needs for Course Evaluation Methods

Category	Evaluation Methods	Mean	StD
Preferred Methods	Closed-book examinations	2.96	1.384
	Open-book examinations	3.76	1.164
	Course-based Dissertations	2.8	1.323
	Peer Assessment	3.06	1.42
	Portfolio Assessment	2.82	1.219

4.1.4 Post-enrollment satisfaction: upperclassmen feedback

To identify gaps in current curriculum, we surveyed juniors and seniors who had completed their electives. Overall, 56.7% were "relatively satisfied," 3.33% neutral, and 6.7% dissatisfied (Figure 5).

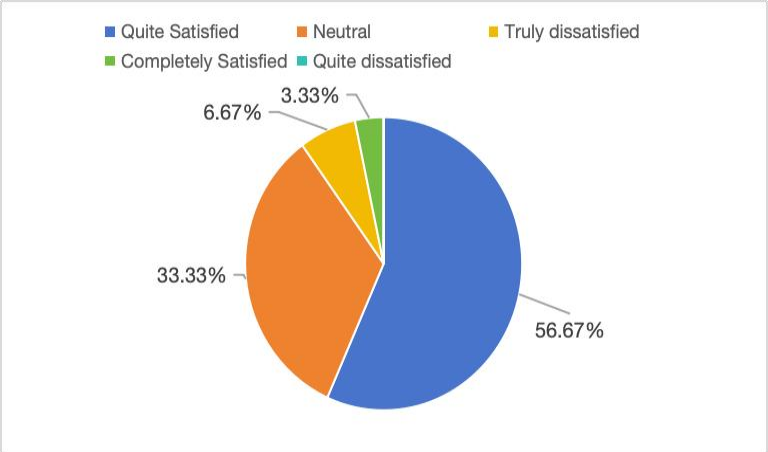

Figure 5 Third- and Fourth-Year Students' Overall Satisfaction with College English Elective Courses

Mean satisfaction scores across six dimensions (teachers, assessment, scheduling, types, modes, materials) revealed a clear hierarchy: teachers (3.83) > assessment (3.77) > scheduling (3.70) > types (3.63) > modes (3.53) > materials (3.37) (Figure 6).

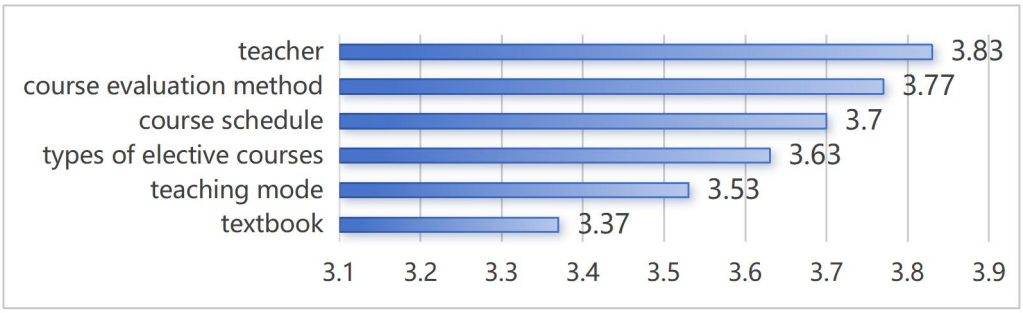

Figure 6 Third- and Fourth-Year Students' Satisfaction with Elective Course Dimensions

Textbook issues dominated complaints: "lack of practicality" was the top critique(Table 8), with third and forth-year students preferring Chinese texts and supplementary content(Table 9).

Table 8 Third- and Fourth-Year Students' Feedback on Textbook Use

Feedback Theme	Mean	StD
Lack of practical relevance	3.69	0.85
Overly specialized content	2.85	0.99
High linguistics complexity	3.08	0.86
Insufficient interactive exercises	3.54	1.05

Table 9 Third- and Fourth-Year Students' Textbook Needs

Category	Item	Mean	StD
Preferred textbook Sources	Original textbooks authored by foreigner experts	3.31	0.751
	Textbooks authored by Chinese scholars	3.46	0.811
	Textbooks compiled by school teachers	2.54	0.66
Preferred Textbook Integration	Teachers cover the entire textbook with detailed instruction	2.69	1.032
	Teacher focus on key difficult points, with the rest for self-study	2.62	0.961
	Primarily self-study, with teachers addressing questions	2.46	1.127
	Teachers minimize textbook time and supplement with extracurricular content	3.38	1.121

Lower-Year/Upper-Year students show significant satisfaction gaps in teacher-related areas(Figure 7)—highest for qualifications, then attitudes/interaction/methods (descending), with Methods scoring lowest (Figure 8).

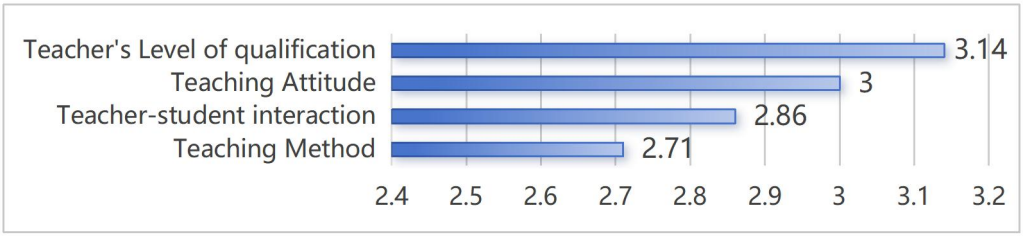

Figure 7 Satisfaction Levels of Lower-Year and Upper-Year Students with Electives Instructors Across Multiple Dimensions

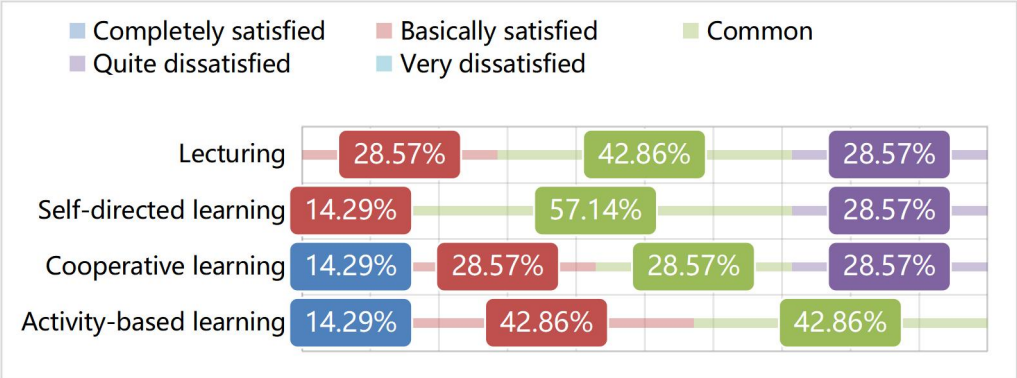

Figure 8 Demand for Elective Course Teaching Methods Among Lower-Year and Upper-Year Students
Notes: Lecturing: Teacher-centered oral delivery of content.
Self-directed Learning: Students independently learn using resources and prompts.
Cooperative Learning: Small-group learning via mutual support, collaboration, and competition.
Activity-based Learning: Uses activities (e.g., group discussions, role-playing) for active knowledge acquisition.

Students prioritized elective teaching methods: Activity-based > Cooperative Learning > Self-directed > Lecture. While activity/cooperative methods boosted engagement, dissatisfaction arose from teacher-dominated lectures (poor interaction) or rapid, slide-reliant delivery (hindered note-taking). Preferred interactions: Role-playing > Q&A > Group Discussion > Games (role-playing enhanced creativity; Q&A stressed weaker speakers). Teachers received favorable evaluations for multimedia proficiency, clear explanations, and accessible e-materials, aligning with underclassmen views favoring English-major/foreign instructors. Notably, juniors/seniors diverged from freshmen/sophomores in course satisfaction (types, teaching, assessment), driven by career focus. They sought courses integrating professional/humanistic skills (basic skills, language application, "Chinese sentiments"), prioritizing job readiness: foreign firms valued English proficiency; governments required ideological grounding. Teaching modes: Juniors/seniors preferred in-person lectures over online/hybrid, citing efficiency and reduced laziness. Assessments: Seniors favored papers (enhancing research/course reflection) and open-book exams (emphasizing application over memorization). Grade-level differences (exam prep vs. career focus) shaped preferences. All sought basic English/communication skills; freshmen prioritized CET-4/6 preparation; seniors advocated Chinese sentiment courses for government roles.Course designers should guide goals, diversify outcomes, and adapt content/methods to student needs.

4.2 Prioritization of Students' Demands

Based on the needs analysis, we categorized student course needs into five dimensions: course management, teaching materials, instructors, teaching modes, and assessment methods. This yielded a hierarchical framework of student

demand indicators for college English electives (Table 10). Specific needs produced a discipline-specific analysis table of student requirements for college English electives in this major.

Table 10 Hierarchical Framework of Student Need Indicators in College English Elective Courses

Main Category	Demand Classification	Demands Indicators
Student Needs Indicators for Course Design	Course Management	Types of Courses
		Course Scheduling
	Teaching Material	Textbook Content
		Textbook Utilization
	Teacher quality	Teacher Qualifications
		Teaching Attitude
		Teaching Method
		Classroom Atmosphere
	Teaching Modes	Diverse Learning Modes
	Course Assessment	Academic Evaluation Method
		Comprehensive Evaluation Method

Table 11 Analysis of Student Needs for College English Elective Courses

Need Domain	Demand Classification	Demands Indicators	Specific Student Need
Total Course Design Needs	Course Management	Types of Course	Offer electives aligned with distinct thematic modules
		Course Scheduling	Integrate English language skills with professional knowledge and humanistic education
	Teaching Material	Textbook Content	Use language appropriate for target learners
			Include basic English skill training and cultural knowledge
		Textbook Utilization	Ensure effective textbook integration into instruction
	Teacher quality	Teacher Qualifications	Possess extensive cross-cultural knowledge and English teaching experience
			Humorous and interesting teaching style
			High-quality instructors: English-majored teachers or native English-speaking experts
		Teaching Attitude	Prepare thoroughly for classes
			Pay attention to students during class
			Actively tutor students after class
		Teaching Methods	Prioritize student engagement and in-class interaction
	Teaching Modes	Classroom Atmosphere	Foster interactive dynamics to boost learning motivation
		Diverse Learning Formats	Blend online-autonomous-learning with in-class instruction
	Course Assessment	Academic Assessment	Use open-book examinations and course-based dissertations
		Holistic Evaluation	Combine course participation and final grades for comprehensive assessment

Building on the demand indicator hierarchy table, we employ the Analytic Hierarchy Process (AHP) to scientifically evaluate indicators and determine their relative importance.

4.2.1 Prioritization of demands via Analytic Hierarchy Process (AHP)

Thomas L. Saaty, a leading U.S. operations research scholar, pioneered the Analytic Hierarchy Process (AHP) in the early 1970s. AHP, integrating qualitative and quantitative analysis, decomposes complex decisions into hierarchical levels (objectives, criteria, alternatives). Using pairwise comparisons, judgment matrix construction, and weight/consistency ratio calculations, it enables objective evaluation and selection of alternatives. In Quality Function Deployment (QFD), AHP excels: it fragments QFD issues into manageable sub-components, streamlining the decision process. It also structures the quantification of subjective judgments for prioritizing customer needs, enhancing objectivity. By mitigating subjectivity-induced inconsistencies between predicted and actual weights, AHP improves result scientificity, decision quality, and process manageability/comprehensibility.

4.2.2 Establishment of the evaluation

We decomposed and recombined student needs to establish a recursive hierarchy. Drawing on the hierarchical structure table of student demand indicators for college English elective courses, we defined core model elements, structuring

them into: (1) *a target layer* (overall student curriculum demands); (2) *a criterion layer* (six sub-needs, e.g., course types, scheduling, derived from total demand classification); and (3) *a third layer* (specific demands under each sub-need category). Figure 9 visualizes this framework.

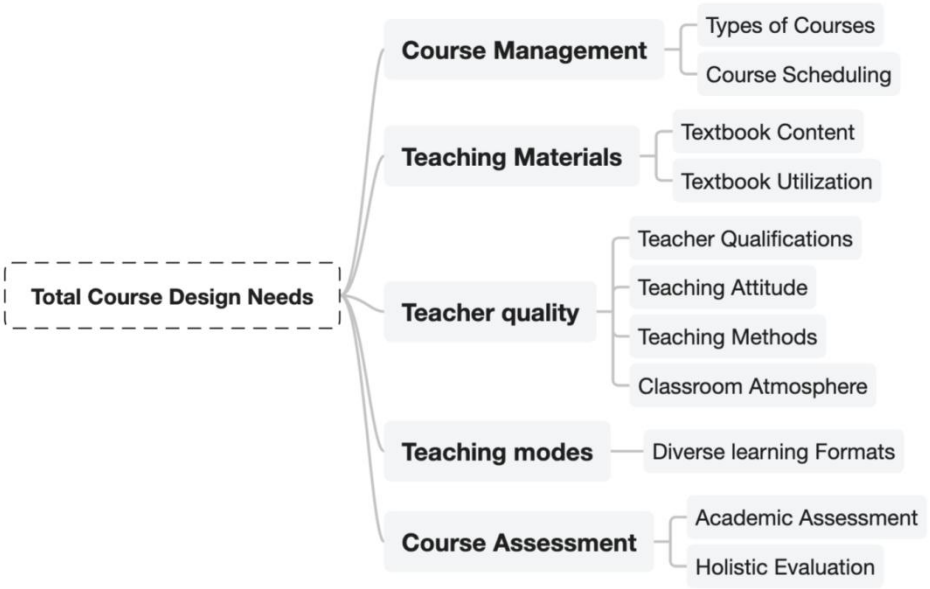

Figure 9 Hierarchical Structure of Students' Needs Indicators for College English Electives

4.2.3 Constructing the comparative judgment matrix

Within this evaluation framework, elements at each hierarchical level are compared against those from the preceding level (evaluation criteria). To simplify the process, pairwise comparisons are typically used: when a higher-level factor serves as the criterion, the relative importance of the i^{th} and j^{th} elements in a level is quantified by a pairwise comparison value (a_{ij}). By convention, a_{ij} takes positive integers (1-9) or their reciprocals, forming a pairwise comparison judgment matrix. Here, 1 denotes equal importance; 9 indicates one criterion is substantially more important than the other. If criterion i outranks j, then $a_{ij} > 1$ and $a_{ji} = 1/a_{ij}$, reflecting the scale's reciprocal nature.

4.2.4 Weight calculation and consistency testing

In AHP, constructing a judgment matrix requires pairwise comparisons of elements and assignment of relative importance scores. Given inherent subjectivity in human judgment, consistency testing is critical: inconsistent matrices indicate logical contradictions in pairwise evaluations, necessitating score readjustment. Factor weights derive from the matrix's maximum eigenvalue (λ_{max}) and corresponding eigenvectors. Consistency is validated using the Consistency Index(CI) and Ratio(CR); a CR<0.1 indicates acceptable consistency. The calculation formula is:

$$CR=\frac{CI}{RI} \tag{1}$$

$$CI=\frac{\lambda_{max}-n}{n-1} \tag{2}$$

Here, λ_{max} denotes the maximum eigenvalue and n is the judgment matrix order (number of criteria or alternatives). The matrix satisfied consistency testing, with results summarized in Table 12.

Table 12 Student Needs Classification and Their Importance Ratings for College English Elective Courses

Primary Need Categories	Primary Category Weight	Secondary Need Indicators	Secondary Indicator Weight	Composite Weight (Primary*Secondary)
Course Management	0.23	Types of Course	0.83	0.1909
		Course Scheduling	0.17	0.0391
Teaching Materials	0.05	Textbook Content	0.75	0.0375
		Textbook Utilization	0.25	0.0125
Teacher quality	0.54	Teacher Qualifications	0.23	0.1242
		Teaching Attitude	0.12	0.0648

		Teaching Method	0.60	0.3240
		Classroom Atmosphere	0.06	0.0324
Teaching Modes	0.12	Diversity Learning Mode	0.12	0.1200
		Academic Assessment	0.50	0.0250
Course Assessment	0.05			
		Holistic Evaluation	0.50	0.0250

Table 13 shows that teaching methods, level qualifications, course types, and teaching modes are top priorities for students' university English elective choices--conflicting with participants' initial assumptions about these needs. Today, students' demands stem from both subjective learning initiative and objective school-related factors (e.g., teacher quality, course design), which they explicitly prioritize as essential for elective selection.

4.3 Constructing the House of Quality (HOQ)

Building on classified needs and their importance, we developed a correlation matrix linking student needs to specific measures. HOQ translates student needs into actionable curriculum quality measures, categorized into: course management, teaching materials, faculty, teaching modes, and assessment.

Specific measures / Students' Needs and priorities			Course Management		Teaching Materials			Teacher Quality								Teaching Modes	Course Assessment	
			Types of Courses	Course Scheduling	Textbook Content		Textbook Utilization	Teacher Qualifications			Teaching Attitude			Teaching Methods	Classroom Atmosphere	Diverse Learning Formats	Academic Assessment	Holistic Evaluation
			Offer electives aligned with distinct thematic modules	Integrate English language skills with professional knowledge and humanistic education	Include basic English skill training and cultural knowledge	Use language appropriate for target learners	Ensure effective textbook integration into instruction	Possess extensive cross-cultural knowledge and English teaching experience	Humorous and interesting teaching style	High-quality instructors: English-majored teachers or native English-speaking experts	Prepare thoroughly for classes	Pay attention to students during class	Actively tutor students after class	Prioritize student engagement and in-class interaction	Foster interactive dynamics to boost learning motivation	Blend online-autonomous-learning with in-class instruction	Use open-book examinations and course-based dissertations	Combination of course performance and final grade
Course Management	Types of Courses	0.1909	9	7				3		5				3		3		
	Course Scheduling	0.0391	7	9	5		3	1		1						1	1	
Teaching Materials	Textbook Content	0.0375		5	9	9	7	1		1	1			1	1	5	5	3
	Textbook Utilization	0.0125		3	5	3	9	5	1	7	1	3	1	1	1	3	1	1
Teacherquality	Teacher Qualifications	0.1242	5		3	5	7	9	7	9	5	5	5	5	5	3	1	3
	Teaching Attitude	0.0648					3	5	3	1	9	9	9	3	3	1	1	3
	Teaching Methods	0.324	3		3	1	3	5	7	7	3	5	3	9	3	5	1	3
	Teaching Style	0.0324			1		3	3	7	3	1	7	1	7	9	1		
Teaching Modes	Diversity Learning Method	0.12	3		3	1	5	5			1	1	1	5	1	9	1	1
Course Assessment	Academic Assessment	0.025			5	3	1	3		3			1	1		1	9	7
	Hlistic Evaluation	0.025			3	3	1	5		3		5	5	3	5	1	7	9
Index of Absolute Importance			3.94	2.43	2.53	1.59	3.28	4.67	3.57	4.82	2.38	3.33	2.49	5.28	2.4	4.06	1.27	2.18
Index of Relative Importance			7.85%	4.84%	5.04%	3.17%	6.52%	9.30%	7.11%	9.59%	4.74%	6.64%	4.96%	10.51%	4.78%	8.08%	2.53%	4.35%

Table 13 House of Quality of Student Needs Analysis and curriculum-specific measures

Table 13 highlights top curriculum improvement priorities: teaching methods (10.51%, ranked 1st), followed by teacher qualifications—specifically professional/foreign instructors (9.59%, 2nd) and cross-cultural/teaching experience (9.30%, 3rd). Teaching mode, course type, and style are second-tier, while academic evaluation and textbook sources are least important.

Student needs conflict with the current state of English electives. To enhance learning outcomes, the school and the instructors should refine curriculum design and boost student satisfaction. Critical actions include: (1) prioritizing

teachers (their performance directly impacts learning); (2) involving students in teaching; and (3) diversifying elective modules per course type with qualified instructors to expand choice.

5 MAJOR FINDINGS, LIMITATIONS AND DISCUSSION

This study, centered on Non-English-majored undergraduates at SCAU, employed questionnaires and QFD methodology to investigate their needs and satisfaction with university English-electives. Key findings reveal grade-specific demands: freshmen/sophomores prioritize holistic development (basic English + humanistic skills), while juniors/seniors focus on job-oriented practical abilities, with listening/speaking consistently identified as the most challenging skills. Seniors expressed higher satisfaction with teaching staff but lower satisfaction with course materials. Core drivers for course selection—teaching methods, teacher qualifications, course types, and modes—directly correlated with prioritized needs, underscoring the efficacy of flexible, qualified instruction and diverse, blended learning models. Implications emphasize dynamic curriculum updates, enhanced material practicality, faculty training (cross-cultural competence, blended pedagogy), and holistic assessment (formative+summative). Limitations include a small sample size, incomplete needs categorization, and minor QFD application inconsistencies. Future research could expand sampling, refine demand analysis, and optimize QFD integration to strengthen generalizability. This work provides actionable insights for aligning elective courses with student needs, fostering improved learning outcomes.

COMPETING INTERESTS

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TEACHING ENGLISH LITERATURE IN THE AI ERA

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Abstract: This study explores the urgent need for the digital-intelligent transformation of English literature teaching in the age of artificial intelligence (AI). Although AI offers convenience and innovation to literature teaching, it also gives rise to crises such as the weakening of in-depth reading experiences and the deconstruction of authority in textual interpretation. In response to these challenges, this study investigates the following questions: What constitutes a comprehensive reconstruction pathway for literature teaching? How can teaching objectives, content, teacher/student roles, teaching/learning modes, and evaluation mechanisms be redesigned to exploit AI effectively while mitigating its risks? The proposed framework shifts the core teaching objective from knowledge transmission to human-AI collaborative knowledge processing/creation, and proposes specific digital-intelligent teaching and learning methods, such as human-machine dialogue, comparative analysis of human and AI-generated critiques, and personalized learning pathways for each individual student. It also warns of potential risks, such as the erosion of humanistic spirit and marginalization of emotional education, that may result from excessive dependence on AI technology. The significant value of the framework lies in its balanced blueprint for integrating technology, emphasizing that while this teaching transformation is necessary, it must consciously guard the essence of humanistic education to achieve the holistic development of students.
Keywords: AI; English literature teaching; Digital-intelligent transformation; Humanistic education

1 INTRODUCTION

We find ourselves in an era increasingly approaching a technological "singularity", with AI developing rapidly [1]. Large language models, represented by ChatGPT, not only extend human intelligence as tools but also profoundly influence various fields of society as a new "Other", and the field of education is no exception. In the era of AI, education is no longer confined to traditional classroom teaching and paper textbooks; instead, leveraging technologies like big data and AI, it has achieved digitalization, intellectualization, and personalization.

As a crucial component of humanistic education at universities, English literature bears the important mission of cultivating students' literary appreciation ability, cross-cultural communication skills, and humanistic literacy. Against the backdrop of the digital-intelligent era, AI technology has opened an unprecedented window of convenience for English literature teaching. However, this convenience also harbors profound crises. When the "artistic features" or "thematic ideas" of a literary work can be accurately "extracted and summarized" by AI within seconds, where does the value lie in students' carefully invested slow reading experience? What is the irreplaceable core value of English literature teaching itself? Can traditional literature teaching modes and methods still meet the diverse and personalized learning needs of students?

Previous research has primarily focused on technological applications, such as automated feedback or student-data analytics, whereas investigations into the systematic transformation of teaching and cognitive paradigms, and the evolving roles of teachers and students, remain comparatively underdeveloped [2-4]. This study argues that English literature teaching in the AI era should not be a simple application of technology or passive defense against it, but rather a proactive and profound transformation and reconstruction. The core of this reconstruction is the shift from the paradigm centered on "knowledge transmission" to a paradigm centered on "intellectual navigation" and "meaning negotiation". Therefore, this paper will elaborate on the discussion from three aspects: "challenges and crises", "transformation and reconstruction" as well as "risk reflection and countermeasures".

2 CHALLENGES AND CRISES FACING TRADITIONAL ENGLISH LITERATURE TEACHING

Traditional English literature classes have long been structured around teacher authority, text-centrism and linear interpretation. This stability, however, is now being systematically dismantled by the rapid advancement of AI, whose capabilities in information processing, text generation and multimodal interaction directly undermine the foundational assumptions of traditional teaching. AI technology first disrupts the classroom's balance by flooding it with unprecedentedly abundant resources and convenience—advantages that erode the purpose of traditional instruction. Students can instantly access background knowledge, plot summaries, and mainstream critiques about any writer, work, school of thought or trend. They can also receive intelligent learning assistance anytime, anywhere. This convenience eliminates the "knowledge gap" that once justified teachers' role as information gatekeepers, leaving traditional lectures focused on factual transmission feeling redundant [4,5].

AI's text generation and dialogue capabilities then shatter the traditional view of texts as closed and stable entities. For generations, literary teaching has revolved around the idea of a "revered classic", a work whose meaning, while open to

interpretation, was rooted in its original context and fixed textual form. AI, however, transforms these classics into "data material" that can be arbitrarily deconstructed, reassembled, parodied and dialogued with. This poses a fundamental challenge to the traditional mode of literary interpretation, long established on the basis of stable texts [6].

Beyond destabilizing the classroom's structure, AI technology also threatens the very essence of literature teaching: guiding students to encounter words and emotions through focused slow reading, thereby cultivating deep, personal engagement with texts and gaining personal, private aesthetic experiences and emotional resonance. This "slow reading" is a form of in-depth reading, key to cultivating understanding, imagination, empathy, and critical thinking. However, the AI-driven mode of information acquisition is inherently "instantaneous", focusing on the rapid extraction of main points and conclusions rather than an immersive process of savoring the text. Over time, students' patience and capacity for in-depth reading may be weakened. Literary reading could degenerate from a spiritual practice that enriches life into a mere information retrieval task, significantly diminishing its core functions of aesthetic and emotional education [4].

3 THE DIGITAL-INTELLIGENT TRANSFORMATION OF ENGLISH LITERATURE TEACHING IN THE AI ERA

The aforementioned challenges and crises demand a fundamental rethinking of what it means to teach and learn English literature when AI technology is no longer a peripheral tool, but a central force reshaping the classroom. English literary education should, on the basis of upholding the core value of humanistic spirit, actively explore pathways for deep integration with AI technology [7]. It should attempt to carry out digital-intelligent transformation in aspects such as teaching objectives, teaching content, teacher/student roles, teaching/learning modes as well as evaluation mechanisms, thereby bringing new opportunities and vitality to English literature teaching and achieving innovation and optimization of teaching.

3.1 Shift in Teaching Objectives

Within the framework of digital-intelligent English literature teaching, a fundamental shift in teaching objectives is imperative: moving away from the one-way transmission of literary "knowledge", such as rote memorization of literary historical timelines, fixed interpretations of classic works or rigid application of critical theories, to fostering students' competence in processing, critiquing, and creating "knowledge" with AI assistance. This paradigm shift redefines the core focus of literature teaching: it no longer prioritizes the mechanical retention of discrete facts or the passive absorption of established critical frameworks. Instead, the emphasis shifts to equipping students with practical, AI literacy skills: for instance, training them to formulate precise, context-aware prompts for AI rather than vague queries that yield superficial results; guiding them to iteratively optimize these prompts based on AI's initial outputs—adjusting keywords, adding contextual constraints or correcting misinterpretations—to elicit more accurate and nuanced responses; and cultivating their ability to critically evaluate and insightfully dissect AI-generated content [8,9].

This evaluation process involves verifying the accuracy of AI's claims against authoritative literary sources, identifying biases or oversimplifications in AI's reasoning, and detecting gaps in AI's understanding of contextual or emotional nuances. Building on this critical assessment, students are then encouraged to transcend AI's limitations by posing more probing, original questions—questions that AI might not answer through preprogrammed data. These questions not only demonstrate students' independent thinking but also push them to synthesize insights from both human expertise (their own textual analysis, class discussions, and scholarly research) and AI's analytical strengths (its capacity to process large datasets, identify patterns across multiple works, or summarize diverse critical perspectives).

3.2 Change of Teaching Content

In terms of teaching content, English literature teaching involves literary works from different periods, schools, and authors, resulting in a vast and complex knowledge system. Digital-intelligent teaching, supported by digital resource databases and AI technology, can provide students with comprehensive and convenient learning resources and basic information. This can liberate classroom time from knowledge transmission for more in-depth seminars. For example, students can conduct independent analyses of a text while AI also analyzes it, or instructors can guide students to use AI to generate different or even opposing interpretations of the same text [10,11]. Classroom discussions can then be organized to compare the differences in perspective, emotion, and depth between human and AI analyses, to identify flaws or biases in AI interpretations, and to analyze how different AI-generated interpretations enrich the hermeneutic possibilities of the text. In doing so, students learn to integrate the complementary advantages of human and machine intelligence: leveraging AI to handle tedious, data-intensive tasks so they can focus on higher-order cognitive work—interpreting emotional subtext, debating ethical implications, and constructing original arguments—ultimately forming deeper, more nuanced judgments about literary works that reflect both rigor and humanistic insight, and cultivating close reading ability and critical spirit.

Intelligent media-enhanced immersive experience of classic literary scenes constitutes another component of the English literature classroom. Leveraging AI's image generation and description capabilities, classic scenes from literary works, such as the foggy London depicted by Charles Dickens and the villages and manors described by Jane Austen, can be reconstructed through multimodal interaction. This enables students to gain intuitive sensory impressions and strengthens their perception of the artistic conception in the text. Additionally, AI voice synthesis can be utilized to let students listen to English voices from different eras, allowing them to perceive the historical evolution of the language.

Furthermore, tasks can be designed to enable students to conduct in-depth interviews with AI-simulated literary characters, such as Jane Eyre and Heathcliff, by asking questions about the characters' motivations, choices, and inner conflicts. This process can greatly deepen students' understanding of human nature and human complexity.

3.3 Reshaping of Teacher/Student Roles

Digital-intelligent English literature teaching first demands a profound reorientation of teachers' core role in the instructional process. In traditional classrooms, teachers often centered their work on preparing structured lecture content and transmitting this knowledge to passive students. The teacher's core task now shifts to designing learning tasks and projects that leverage AI to deepen, rather than replace, human engagement with literature. Beyond task design, teachers also take on the role of "AI literacy mentors", responsible for demonstrating how to engage in high-quality critical dialogue with AI. Teachers further guide students in rationally comparing differences between human and AI interpretations. This comparative exercise not only deepens students' textual understanding but also sparks intellectual debate and emotional resonance—outcomes that AI alone cannot foster.

As teachers' roles evolve, students' roles undergo a simultaneous and complementary transformation [11], moving from passive recipients of pre-packaged knowledge to active and critical participants in the learning process—namely, active questioners and meaning builders. In the digital-intelligent classroom, they learn to take ownership of their inquiry by posing key questions that both stimulate AI's deep thinking and guide the direction of their own learning. Students also develop critical information literacy skills, learning to trace the sources of AI-provided information, cross-verify claims across multiple platforms and critically examine AI's potential biases. Finally, students engage in multi-dimensional interactions—with AI, with teachers and with peers—to integrate resources and information from various parties. In this way, students move beyond absorbing others' ideas to building their own unique literary interpretations and worlds of meaning—an outcome that lies at the heart of humanistic literary education.

3.4 Reform of Teaching/Learning Modes

The traditional teaching and learning mode—long characterized by "one-size-fits-all" instruction, where teachers deliver standardized content to entire classes regardless of individual differences in learning pace, interests or proficiency—will undergo fundamental changes in the AI era. This transformation is driven primarily by AI's unique capacity to bridge the gap between generalized teaching and personalized learning: unlike traditional models, which rely on teachers' limited ability to track each student's progress, AI technology can accurately analyze students' learning characteristics and evolving needs by leveraging real-time learning data, and then dynamically formulate personalized learning plans and pathways tailored to each individual [4].

The cornerstone of this personalized transformation lies in intelligent learning platforms, which integrate advanced AI algorithms (such as machine learning and predictive analytics) to move beyond simple data collection toward systematic and in-depth data mining of the diverse information generated throughout students' learning journeys. The scope of this data is comprehensive, encompassing both measurable indicators like students' baseline learning ability, daily study time allocation, learning frequency, historical learning pace and answer accuracy rates, and nuanced preferences such as students' reading preferences and engagement patterns.

By subjecting this multi-dimensional data to algorithmic analysis, the platform can accurately decode each student's unique learning style and pinpoint gaps in knowledge mastery. This insight enables the platform to precisely construct a dynamic student "digital profile" [12]—a living snapshot of each learner's strengths, weaknesses, and preferences that updates in real time as new data is generated. Armed with this digital profile, the platform can deliver personalized learning content recommendations that directly address individual needs. This targeted approach marks a radical departure from the traditional "uniform indoctrination" mode, where all students receive the same worksheets, readings and assignments regardless of their progress. Instead, it achieves a teaching transformation toward "targeted drip-feeding"—a mode where learning content is delivered in small, precise increments aligned with each student's current ability and interests.

3.5 Intelligence and Diversification of Evaluation Mechanism

Finally, teaching evaluation will also undergo a shift towards intelligence and diversification, no longer relying solely on paper-and-pencil tests. Using AI to collect and analyze data of students' learning process enables process evaluation concerning learning attitude, participation and depth. Based on big data, it is possible to assess students' participation, level of thinking activity, and the depth and innovativeness of their viewpoints in the learning process, and to analyze as well their performance in assignments and quizzes, including response time, accuracy rate, error types. Furthermore, intelligent evaluation is built on a large number of data samples and scientific algorithms, so the scientific nature of its evaluation criteria is guaranteed. Its efficiency is also unparalleled compared to that of traditional manual evaluation. And this efficiency does not come at the cost of quality; instead, it allows evaluation to be more timely, targeted, and responsive to student needs [13,14].

This shift toward an intelligent and diversified evaluation mechanism is not just a technical upgrade to assessment; it is a necessary complement to the broader transformation of teaching objectives, content, and roles in AI-era English literature teaching. By leveraging AI to capture process-based insights and expanding evaluation to cover critical, creative and collaborative skills, this mechanism ensures that assessment truly reflects the values of humanistic literary

teaching: fostering deep engagement with texts, critical thinking about technology and the construction of meaningful, personal interpretations.

4 POTENTIAL RISKS AND COUNTERMEASURES

It is essential to accept and embrace AI technology, as it is impossible to live apart from it in our present time [15]. But simultaneously, we must maintain a clear and prudent critical awareness to address its potential problems and risks.

Firstly, the digital-intelligent transformation of English literature teaching faces some technical issues. Technical stability is paramount. If technical failures such as lagging or crashing occur during the operation of the digital-intelligent teaching system, they will inevitably disrupt the normal progress of teaching. If AI algorithms contain biases, it may lead to inaccurate recommendations of learning resources or unfair learning evaluations, which may misguide students' learning directions and fail to achieve the goal of personalized learning. Data security is also an issue that cannot be ignored. If students' learning data and personal information are leaked, it could seriously harm their privacy and rights. Therefore, we must find ways to solve technical challenges in teaching applications, such as continuously strengthening the technical support from computer experts, and promptly identifying and patching system vulnerabilities. This is crucial for promoting the digital-intelligent teaching of English literature [4].

Secondly, digital-intelligent teaching also risks the weakening of humanistic spirit cultivation and the marginalization of emotional education. Literary reading is an immersive activity that requires readers to engage deeply in mental processing, cultural experience, and emotional resonance [16]. If we over-rely on AI technology and lack in-depth reading experiences of works as well as personal emotional insights, the rich humanistic spirit contained within English literary works will fail to be passed on to students, which is not conducive to their holistic development. Therefore, digital-intelligent teaching of English literature must focus on balancing the application of technology and the cultivation of humanistic spirit, and uphold the original purpose of humanistic education. Teachers should give full play to their guiding role: design mandatory in-depth reading and reflection sessions without AI assistance in learning tasks, preserve and create more space for direct emotional and intellectual exchanges among students in classes, so as to cultivate students' ability to learn and think effectively without relying on technology. In addition, clear policies of classroom AI use should be formulated to clearly define what constitutes reasonable use and what constitutes AI plagiarism. Emphasis should also be placed on process-oriented learning assessment to make students' learning processes truly visible [13,14,17].

5 CONCLUSION

In the era of AI, the digital-intelligent transformation of English literature teaching is an inevitable trend in the development of literary education. The future class of English literature will be a dynamic symbiotic ecosystem, where human wisdom, the life experiences of teachers and students, and the powerful computing power of AI will inspire and calibrate each other. Therefore, we should fully recognize the importance of integrating AI technology with humanistic education, continuously explore and refine the development pathway of digital-intelligent teaching of English literature, and propose and refine optimization strategies and solutions for the challenges and risks that arise during this process. While utilizing AI technology to enhance teaching efficiency and quality, it is even more crucial to adhere to the essence of literary education, focus on cultivating students' humanistic literacy and sound personality, and achieve the comprehensive development of students.

COMPETING INTERESTS

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THE DUAL-TEACHER BLENDED TEACHING MODEL FOR MOOC-BASED COLLEGE ENGLISH

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Abstract: This study addresses core challenges in College English teaching: insufficient teacher blended teaching competence and limited school-based curriculum adaptability. It constructs a MOOC-based Dual-Teacher Blended Teaching Model, integrating online MOOC instructors and offline teachers into a collaborative community. Implementation involves four approaches: optimizing teaching processes, enhancing information technology application, redefining teacher-student roles, and adopting diversified evaluations. Empirical results show the model significantly improves teachers' competence and curriculum adaptability, stimulates students' learning interest, and boosts their autonomous learning ability. Future development of this model will focus on deepening technology integration, diversifying teaching forms, and refining evaluation systems, expected to provide a new paradigm for College English teaching reform.
Keywords: MOOCs; Dual-teacher blended teaching; College English; Teaching model innovation

1 INTRODUCTION

Massive Open Online Courses, or MOOCs，a term first coined by Dave Cormier and Bryan Alexander, emerged in 2008, and swiftly gained global momentum, spreading across higher education institutions, attracting millions of learners worldwide, and evolving from niche online offerings to a mainstream educational resource. Top universities such as Stanford University, Harvard University, and the Massachusetts Institute of Technology took the lead in launching influential MOOC platforms, including Coursera, Udacity, and Edx, providing a wealth of high-quality free or low-cost course resources for learners worldwide. In China, MOOCs have also developed rapidly, with major universities and educational institutions launching their own MOOC platforms such as China University MOOC and Xuetang Online, which have infusing new vitality into college English teaching and advancing the digital transformation of traditional teaching models.

Boasting openness, flexibility, and abundant resources, MOOCs offer notable advantages in college English teaching. For one, they break time and space constraints, enabling students to learn anytime, anywhere while enhancing learning convenience and efficiency. For another, MOOCs provide a vast array of high-quality English teaching resources, such as video lectures, online quizzes, and interactive discussions, which help spark students' learning interest and motivation. Additionally, leveraging technical tools like data analytics, they provide personalized learning path recommendations, thereby supporting the delivery of individualized instruction. However, the effectiveness of MOOCs in enhancing student academic performance and engagement remains a key challenge, compounded by high dropout rates and low retention [1].

2 CURRENT STATUS AND CHALLENGES OF MOOC-BASED BLENDED TEACHING IN COLLEGE ENGLISH

College English Teaching Guidelines (2020 Edition) emphasizes that universities nationwide should fully leverage rapidly advancing digital information technology to deepen reforms of teaching concepts and models. Specifically, they need to incorporate online courses into curriculum design and prioritize developing high-quality offerings—including open online courses, offline courses, and online-offline blended courses. As the integration of information technology with college English teaching enters a new stage, blended teaching reform is gradually shifting from extensive development to refined practice. This shift places higher demands on university teachers' blended teaching competence, with key bottlenecks such as inadequate teacher capabilities and limited school-based adaptability of curriculum resources restricting the reform's further advancement.

2.1 Gaps in Teachers' Blended Teaching Competence

As the primary implementers of blended teaching, teachers confront multiple challenges. Technical difficulties, obstacles in integrating technology with courses, and heavy time and workload pressures have contributed to a slightly negative attitude to conduct blended teaching[2]. Meanwhile, pre-service teacher education curricula often lack training in online and blended teaching, leaving most teachers only equipped with the knowledge and skills for traditional classroom instruction. They lack a solid grasp of the theoretical frameworks and pedagogical principles underlying online and blended teaching, with particular gaps in pedagogical preparation [3]. According to relevant teaching quality

reports, only a small proportion of college English teachers have received systematic blended teaching training, and most report struggling to effectively integrate online resources with offline classroom practices.

2.2 Inadequate Alignment of School-Based Curricula with Current Teaching Requirements

Current college English teaching relies heavily on multimedia courseware, yet most universities use materials uniformly supplied by publishers. While such resources offer universal applicability, they fail to accurately align with the unique institutional characteristics of different universities or the personalized needs of students. For example, an agricultural university still employs general business English courseware for its English classes, disconnected from students' demands for agricultural-specific English proficiency. Similarly, English teaching in art colleges lacks targeted design for cross-cultural artistic communication scenarios, which significantly undermines the practical value of the courses.

2.3 Deficits in the Adaptability of MOOC-Based Blended Teaching to School-Specific Needs

MOOCs have to some extent enabled personalization in both students' learning and teachers' teaching. However, in MOOC-based blended teaching, many educators tend to adopt a modular design by typically alternating between face-to-face instruction and online courses on a weekly basis, which fragments students' learning experiences both spatially and temporally. The absence of "teaching presence" hinders effective learning [4]. Defined as the immersive learning environment fostered by teachers through well-structured instructional activities, active facilitation of interaction, and targeted guidance, teaching presence serves as a key prerequisite for meaningful learning outcomes. This research argues that MOOC learning should not be confined to independent online study; rather, it must be deeply integrated with offline classroom instruction to truly materialize a student-centered, teacher-led pedagogical model.

Therefore, to highlight universities' distinctive characteristics and implement the student-centered educational philosophy, it is essential to encourage offline teachers to creatively utilize high-quality MOOC resources. To this end, this project aims to establish a dual-teacher blended teaching framework, which features collaboration between on-campus offline teachers and MOOC online instructors. Through in-depth cooperation, both parties will jointly design teaching formats tailored to their institution's student profile, thereby identifying the optimal balance and integration model between online MOOC learning and traditional face-to-face instruction.

3 DESIGN OF A DUAL-TEACHER BLENDED TEACHING MODEL FOR COLLEGE ENGLISH BASED ON MOOCS

3.1 Dual-teacher Blended Teaching Model

The dual-teacher teaching model is a type of co-teaching (also known as collaborative teaching or team teaching). Simply put, co-teaching involves two or more teachers working together through the entire teaching process, from designing lesson plans and preparing teaching resources to organizing in-class activities and evaluating learning outcomes [5]. Dual-teacher classrooms are most commonly used in basic education, with a core structure of "remote lecturing teacher + local tutoring teacher". The remote teacher delivers key knowledge via live streaming, while the local teacher handles on-the-ground tasks: maintaining classroom order, answering students' questions and grading assignments. The ultimate goal is to reduce the imbalance in teacher resources across regions and schools, fostering more equitable distribution of educational resources and greater educational equity [6].

The strength of this model lies in its division of labor: online teachers focus on explaining core course content, and offline teachers manage real-time interactions with students. By combining their efforts, the model effectively addresses common drawbacks of online courses, such as lack of meaningful teacher-student engagement [7].

Beyond basic education, the "dual-teacher teaching model" is also widely used in vocational education—full-time vocational college teachers and part-time enterprise teachers co-teach a single course, with their complementary knowledge and skills driving desired teaching outcomes [8]. Dual-teacher model is rarely applied in college English. However, Fudan University's English team has adopted interdisciplinary collaborative teaching for ESP(English for Specific Purposes) courses. They designed an Academic English (Medical) course for basic medical science students and proposed a framework for this co-teaching model [9].

Overall, the dual-teacher teaching model is still in the exploratory phase of application in higher education, with relatively few systematic studies focusing on its use in college English teaching specifically. Drawing on the disciplinary characteristics of college English teaching and the talent training goals of universities, this study proposes a dual-teacher blended teaching model tailored to college English instruction in university settings. The core value of this model lies in fully unlocking the teaching potential of high-quality MOOC resources while leveraging on-campus offline teachers' ability to accurately understand students' learning progress and needs.

Teachers are not isolated teaching individuals but collaborative subjects within a specific educational ecosystem.By sharing knowledge, exchanging experiences, and engaging in joint practice, they can form a teaching community bound by professional cohesion. This community helps break through the limitations of individual teaching capacities, supports teachers' professional growth, and empowers them to enhance teaching competence, expand their knowledge base, broaden their horizons, and boost innovation [10]. The dual-teacher blended teaching model developed in this study fosters a stable teaching community between online and offline teachers through regular collaboration mechanisms. These include periodic teaching and research meetings, joint student learning analysis sessions, and

co-creation workshops for teaching plans. Online teachers can gain insights into students' key learning challenges via offline teachers, allowing them to optimize MOOC content in a targeted way. In turn, offline teachers can draw on online teachers' expertise in technology application and innovative teaching approaches to break free from the constraints of traditional teaching mindsets.

3.2 MOOC-based Dual-teacher Blended Teaching Model

MOOCs, defined as large-scale, open online academic courses featuring flexibility, efficiency, high quality, and advanced technology, have become an imperative driver for teaching reform. Both online courses and offline face-to-face instruction rely on the flexible application of information technology, and the dual-teacher blended teaching model further integrates three core approaches: MOOC-based online learning, offline instruction, and mobile learning. As a student centred model, it prioritizes improving learning completion rates, tracking individual learning progress, and fostering effective interaction and communication among peers.

The core feature of this model is its collaborative teaching mechanism: online MOOC instructors deliver knowledge and demonstrations virtually, with the key responsibility of providing standardized, high-quality resources. On-campus offline teachers take charge of classroom organization, interaction facilitation, and personalized guidance, leading the adaptation to students' learning needs and the implementation of teaching activities. Through full-cycle collaboration, including pre-class teaching research, in-class coordination, and post-class feedback, the two parties jointly design teaching plans, forming a closed-loop system. The specific division of labor is shown in the table 1 below.

Table 1 Division of Responsibilities for Dual-Teacher Roles

Teaching Stages	Responsibilities of Online MOOC Instructors	Responsibilities of On-Campus Offline Teachers
Pre-class	Provide MOOC resource lists, set basic teaching objectives, and design pre-test questions	Conduct student learning situation surveys, analyze students' deficiency
In-class (40 minutes)	Present microlectures, assign real-time tests, and provide feedback on learning data	Organize interactive activities, answer personalized questions, and adjust teaching pace
Post-class	Assign personalized exercises, update MOOC resources, and participate in teaching effect evaluation	Grade assignments, conduct one-on-one tutoring, and collect student feedback

4 IMPLEMENTATION APPROACHES AND EFFECT ANALYSIS

4.1 Implementation Approaches

The implementation approaches of the MOOC-based dual-teacher blended teaching model for college English mainly include the following aspects.

4.1.1 Optimize classroom processes and emphasize teacher collaboration

In the pre-class stage, online and offline teachers complete the school-based integration of MOOC resources and the collaborative design of teaching plans through regular research meetings. They screen and reorganize MOOC content based on the needs of students from different majors, and supplement school-specific modules. For example, a special topic on "Agricultural English Terminology" is added for students of agricultural majors, while cases on "Cross-cultural Art Communication" are designed for art students.

During the class, a blended process is adopted. In the first 20 minutes, online teachers present microlectures through the MOOC system, assign real-time quizzes, and provide feedback on learning data. In the subsequent 20 minutes, offline teachers organize interactive activities such as group discussions, and presentations. They deliver collective clarifications on students' common questions and individualized guidance tailored to their specific learning needs. Concurrently, real-time access to students' MOOC learning trajectories via the smart classroom system enables dynamic adjustments to the teaching rhythm.

After the class, based on learning data analysis, online instructors provide students with personalized review resources and extended exercises. Offline instructors grade assignments, and answer questions via the learning platform. To drive continuous improvement, two parties hold regular debrief sessions to identify teaching challenges and refine subsequent plans.

4.1.2 Innovate teaching concepts and upgrade IT application in classrooms

Technology empowerment is the core backbone of the dual-teacher model. By integrating computers, smartphones, tablets and other devices, we build a multi-dimensional interactive system: teachers use instant feedback systems for real-time in-class quiz statistics, student submission features to gather classroom presentation materials, and online collaboration tools to facilitate interactive group learning. Additionally, AI speech assessment technology is integrated to provide real-time scoring and targeted error correction for students' oral expressions, boosting language output accuracy.

To foster critical thinking abilities, we design activities following the "problem-driven – inquiry-based collaboration – outcome innovation" framework. First, open-ended questions are posed (e.g., "How to effectively conduct cross-cultural business negotiations in English"). Students then collaborate on solutions via online research and offline group

discussions, before showcasing results through English reports, situational simulations, and other formats. This process comprehensively enhances their critical thinking and innovation capabilities.

4.1.3 Reposition teacher-student relationship and enhance teaching quality

In the dual-teacher blended teaching model, the teacher-student relationship has undergone a fundamental restructuring: MOOC teachers act as knowledge providers, delivering a systematic knowledge framework; offline teachers serve as learning guides, overseeing the learning process and offering personalized support; students take on the role of active learners in the classroom, steering their own learning journey.

In the dual-teacher blended teaching model, offline teachers play a central role in academic guidance. On the one hand, they dynamically monitor students' learning status, identify learning challenges through regular interactive communication, and promptly optimize teaching strategies. On the other hand, they prioritize students' psychological support: specifically, to alleviate anxiety potentially stemming from online learning, they organize targeted activities, such as group ice-breaking sessions and learning experience exchange seminars. Empirical data from a local undergraduate university show that under this model, the incidence of students' learning anxiety has dropped significantly, while their classroom participation has increased substantially.

4.1.4 Adopt diversified evaluations to comprehensively assess effectiveness

A holistic assessment is adopted to comprehensively evaluate the course's teaching effectiveness, integrating multi-dimensional content, diverse forms, pluralistic subjects, varied methods, and multi-perspective functions. Key elements include students' academic performance and classroom behavior, combined with regular, process-based, and final assessments; dual-subject participation by teachers and students; and assessment functions oriented toward promoting learning, teaching, and examinations, supported by online tools provided by MOOC platforms.

4.2 Effect Analysis

Empirical research conducted by a university in South China has underscored the significant advantages of the MOOC-based dual-teacher blended teaching model in college English instruction, particularly in three core dimensions: enhancing students' learning engagement, cultivating autonomous learning abilities, and optimizing teaching quality. The university implemented the model in a college English course (covering 6 classes and 323 students) over two academic semesters, complemented by questionnaire surveys (valid response rate: 89.3%) and in-depth interviews (10 students and 6 teachers selected via purposive sampling).

The research findings showed that in terms of students, 84.9% of respondents expressed approval of the teaching model, with 78.5% reporting "significantly increased learning interest due to enhanced classroom interactivity" and 75.3% noting that "personalized practice and targeted guidance effectively addressed long-standing language weaknesses". Additionally, 80.8% of students indicated improvements in their autonomous learning planning and collaborative discussion abilities.

All participating teachers (100%) confirmed that "dual-teacher collaboration significantly reduced routine teaching workload (e.g., knowledge explanation) and improved teaching precision by focusing on personalized guidance." Meanwhile, 83.3% of teachers reported that "systematic collaborative exchanges with MOOC instructors and peer offline teachers substantially enhanced their own blended teaching design and implementation capabilities."

Furthermore, the model effectively strengthened teacher-student interaction, with in-class interactive participation rate increased by 40%, directly contributing to the overall improvement of teaching quality.

5 CONCLUSIONS

This study focuses on the application of MOOCs in college English teaching by constructing a MOOC-based dual-teacher blended model. It clarifies the collaborative division of labor and provides practical guidance for offline teachers to transition into compound roles. Notably, the model effectively addresses three key challenges in college English teaching: enhancing teachers' blended teaching competencies, improving curriculum adaptability, and optimizing the fairness of evaluation. It also demonstrates significant advantages in boosting students' learning interest, strengthening their autonomous learning abilities, and elevating overall teaching quality.

Despite achieving certain results, this model still has room for improvement. For one thing, some teachers' information literacy remains inadequate to support in-depth collaboration. For another, the integrated application of information technology is still in the exploratory phase.

The future development of the MOOC-based dual-teacher blended teaching model in college English will focus on three core dimensions. First, the model will deepen technology integration and innovation. An intelligent recommendation system will be built by leveraging artificial intelligence, big data and other technologies to deliver personalized learning paths for students, while precise teaching feedback will be generated for teachers through learning behavior data analysis, continuously enhancing MOOC teaching adaptability. Second, the model will advance the diversification of teaching formats. Based on the traditional online-offline integration model, immersive teaching approaches such as virtual reality (VR) and augmented reality (AR) will be actively explored to enrich learning experiences and optimize learning outcomes. Third, the model will refine the learning evaluation system. Multi-dimensional indicators covering both learning processes and outcomes will be established, and academic integrity supervision will be strengthened to ensure the fairness and accuracy of evaluation results.

COMPETING INTERESTS

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REFORM OF THE "VISUALIZATION, CUSTOMIZATION, AND INTELLIGENT APPLICATION" TEACHING CURRICULUM IN ADVANCED MATHEMATICS

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Abstract: Advanced Mathematics is a compulsory and crucial foundational course for science, engineering, and some liberal arts majors, providing essential mathematical knowledge for subsequent mathematics and specialized courses. Due to the extensive and complex nature of the topics covered, Advanced Mathematics is widely recognized by students as a challenging and abstract subject. To enhance the applicability of its knowledge in cutting-edge technology, address its abstract nature, and achieve tailored teaching, this paper proposes a teaching model for Advanced Mathematics characterized by "visualization, customization, and intelligent application(VCI)." Practical implementation has demonstrated satisfactory teaching outcomes.
Keywords: Advanced mathematics; Curriculum reform; VCI teaching model

1 INTRODUCTION

As a highly important foundational course in higher education, Advanced Mathematics encompasses a wide range of topics and rich content, demanding and cultivating students' logical thinking, analytical generalization, and deductive reasoning abilities. In recent years, China has placed increasing emphasis on the education of fundamental disciplines. As the cornerstone of engineering, mathematics holds an undeniably critical position[1]. With the advent of the information age, the rapid development of fields such as data science and artificial intelligence has led to a growing demand for talents with solid mathematical foundations. How to effectively leverage digital tools to cultivate talents that meet contemporary needs, steering them toward innovation and application, has undoubtedly become a key issue in higher education today[2].

Innovation in technology is rooted in theoretical and foundational logical innovation. A robust theoretical base is a prerequisite for applied innovation. As technology evolves at an unprecedented pace, the significance of mathematics, as the mother of engineering, becomes increasingly prominent. In line with ongoing technological advancements, the teaching and learning models of mathematics should no longer be confined to monotonous lecturing, passive listening, and mechanical calculation. Instead, they must adapt to the trends of the times by integrating new methods and approaches into mathematics instruction. Emphasizing tailored teaching and practical application, Advanced Mathematics education should continuously explore reforms and innovations based on these principles[3-5].

To enhance the applicability of Advanced Mathematics knowledge in cutting-edge technologies, facilitate student learning, address its abstract nature, and achieve tailored instruction, the teaching team has explored and implemented innovations in the course pedagogy. A teaching model characterized by "visualization, customization, and intelligent application (VCI)" has been established. Specifically, this approach provides customized learning paths adapted to individual students' learning habits, employs visualization techniques to intuitively present abstract mathematical concepts in the classroom, and connects knowledge from Advanced Mathematics with the field of artificial intelligence to strengthen practical applicability.

2 CHALLENGES IN ADVANCED MATHEMATICS EDUCATION

(1) Many concepts in Advanced Mathematics are inherently abstract, requiring in-depth analysis and comprehension to master. However, during lectures and independent study, students are prone to distraction and mental fatigue, often leading them to prioritize memorizing conclusions and procedures over genuine understanding. Moreover, the diverse academic backgrounds, learning habits, and cognitive abilities among students are not adequately addressed in large-class teaching settings, where individualized instruction remains impractical. Over time, these issues result in uneven knowledge acquisition, stifle logical innovation, and diminish the motivation to engage with challenging content. Consequently, learning transforms into a burdensome task that students instinctively resist, reducing them to dispassionate "calculation machines" — a outcome fundamentally misaligned with the competencies essential for scientific inquiry.

The highly theoretical and abstract character of Advanced Mathematics constitutes the primary obstacle. Concepts such as limits, derivatives, and integrals are difficult to visualize and comprehend intuitively. When instructors focus heavily on theoretical proofs and formulaic deductions in class, students often struggle to grasp the underlying logic and practical significance. This leads to cognitive overload, mental fatigue, and a tendency towards rote memorization of

procedures and conclusions, rather than genuine understanding. Consequently, many students lose interest and motivation, finding themselves unable to connect the abstract knowledge to real-world applications or their future professional fields.

(2) As a foundational course, Advanced Mathematics is highly theoretical, covers extensive knowledge points, and poses significant difficulty. Particularly during the explanation of theorem proofs, students often exhibit considerable learning anxiety and diminished motivation. Meanwhile, the teaching of Advanced Mathematics tends to underemphasize the practical application of knowledge, making it challenging to stimulate students' interest through real-world examples. This frequently results in learning that remains at a superficial level.

The prevalent large-class teaching model makes it difficult to implement individualized instruction. Students enter university with vastly different levels of mathematical preparedness, learning habits, and cognitive abilities. However, the "one-size-fits-all" approach, with its uniform pace and content, fails to address these disparities. Students with weaker foundations quickly fall behind and cannot keep up, while those with stronger backgrounds may find the pace too slow, leading to wasted potential and classroom disengagement for both groups[6-9]. This lack of personalization results in uneven knowledge acquisition and fails to cultivate each student's unique strengths.

(3) During the teaching process, the focus tends to be skewed towards knowledge transmission, with insufficient emphasis on holistic student development. Advanced Mathematics inherently contains abundant elements conducive to ideological and education; however, these elements remain underexplored and inadequately integrated with the subject matter, making it challenging to achieve an organic fusion of knowledge delivery and value cultivation.

The teaching content often remains isolated from cutting-edge technological developments, particularly in fields like artificial intelligence and data science. For instance, while gradients are fundamental to neural network training, this connection is rarely highlighted in class. This disconnection makes it hard for students to appreciate the modern relevance and power of mathematical tools, reducing their learning motivation to merely passing exams. Furthermore, while Advanced Mathematics is rich in elements of cultural, philosophical, and aesthetic value (e.g., the beauty of mathematical logic, the dialectical relationship between change and constancy in calculus), these are often underexplored. The missed opportunity to integrate such elements means the course falls short in fulfilling its potential for holistic student development, including fostering scientific spirit and innovative thinking.

(4) The assessment methods for Advanced Mathematics remain relatively uniform. While they effectively evaluate students' comprehension and mastery of key concepts, they lack innovative approaches. Learning is fundamentally a process of cumulative development—without sufficient quantitative accumulation, qualitative transformation can hardly occur. Similarly, without a solid foundation in underlying logic, the development of higher-order thinking remains elusive[10].

The assessment system predominantly relies on standardized final exams that heavily emphasize calculational procedures and formula application. This approach effectively tests memorization and routine problem-solving but largely neglects the evaluation of deeper comprehension, logical reasoning skills, and innovative application abilities. It inadvertently guides students towards superficial learning strategies and discourages exploratory and critical engagement with the material.

3 INNOVATIVE INITIATIVES IN ADVANCED MATHEMATICS TEACHING

Based on the requirements for cultivating innovative talents in the new era and in response to the challenges encountered in the teaching process, a tripartite teaching model characterized by "visualization, customization, and intelligent application (VCI)" has been established. This approach entails providing customized learning paths tailored to individual students' learning habits, employing visualization techniques to intuitively present abstract mathematical concepts in the classroom, and establishing connections between Advanced Mathematics knowledge and the field of artificial intelligence to enhance practical applicability, see Figure 1.

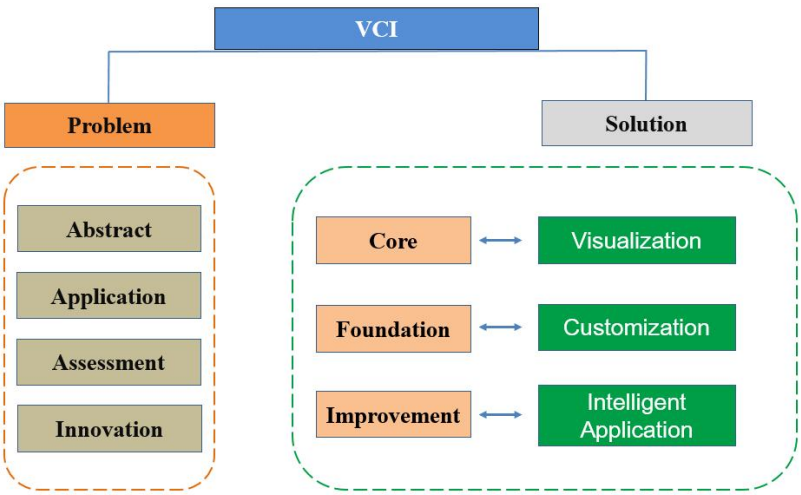

Figure 1 Framework for Teaching Innovation

3.1 Visualization-Based Teaching

The pedagogical restructuring of the Advanced Mathematics curriculum involves a deliberate simplification and refinement of content, scaffolded by an integrated lecture-practice model. Abstract knowledge components are deconstructed and delivered via multimodal visualization—encompassing whiteboards, PPT, and video—to enable intuitive comprehension. This methodology reduces the perceived difficulty and abstraction of the subject, simultaneously advancing students' capacities in logical reasoning and spatial visualization. Learners thereby acquire the skill to synthesize and convert between algebraic and geometric conceptual frameworks, promoting a multifaceted approach to problem-solving.

3.2 Customized Teaching

Students exhibit varied learning habits and foundational knowledge in mathematics, which consequently leads to differences in their ability to absorb and comprehend new concepts. Some students demonstrate strong mathematical aptitude and a solid grasp of fundamentals, enabling them to master new topics rapidly, while others, with relatively weaker preparedness, require more time to fully grasp the material. To address this divergence, a "customized instruction" strategy has been implemented. This approach involves administering diagnostic questionnaires to profile individual learning characteristics. Based on the collected data, personalized learning plans are developed and delivered, aligning teaching methods with each student's specific needs. This tailored framework aims to leverage students' strengths, address their weaknesses, stimulate intellectual curiosity, and build academic confidence – ultimately embodying the principle of teaching students according to their aptitude.

3.3 Teaching with Intelligent Applications

With the continuous advancement of technology, artificial intelligence has grown increasingly powerful and widely applicable. Today, a growing number of higher education institutions are incorporating AI as a general education course, empowering talent cultivation across fields such as engineering, agriculture, humanities, sciences, and medicine, thereby enabling all university students to engage with AI. As one of the most essential foundational courses, Advanced Mathematics must integrate its key concepts with artificial intelligence, applying them in AI contexts to stimulate students' interest in learning and exploration. Examples include gradient descent and the least squares method.

The gradient descent algorithm is a classic and widely applied method in AI. The concept of gradient, a crucial topic in Advanced Mathematics, can be effectively taught by introducing the gradient descent algorithm through visual aids such as videos. This connection between mathematical principles and AI applications significantly enhances student engagement.

While the least squares method is often an optional topic in Advanced Mathematics, it serves as a common mathematical tool in AI for building data models and making predictions. Therefore, in teaching Advanced Mathematics, the least squares method is introduced with theoretical analysis and explanation. Students are assigned an interesting task: using historical midterm and final exam scores as data, they apply the least squares method to predict results in subsequent examinations.

4 CONCLUSION

The Advanced Mathematics curriculum has been restructured to streamline content, integrate explanation with practice, and present abstract concepts intuitively through a triple-layer visualization approach—comprising blackboard diagrams, PPT animations, and instructional videos. Tailored to individual aptitudes, customized learning plans are designed to support students in mastering the course while integrating ideological elements from mathematical culture, philosophical principles, and aesthetic aspects into knowledge points or case studies, guiding them to establish sound worldviews and values. Furthermore, course content is connected with artificial intelligence by introducing smart application scenarios and cutting-edge scientific knowledge, emphasizing practical application alongside theoretical learning. This approach ensures alignment with contemporary advancements and fosters continuous knowledge renewal. Through practical implementation, a notable improvement in students' classroom engagement has been observed. They have demonstrated keen interest in the visualized teaching approach, leading to deeper comprehension and mastery of knowledge points. Beyond merely solving exercises, students are now able to apply knowledge to their specific professional domains and real-world scenarios, showing greater emphasis on cultivating their logical thinking, cognitive skills, and innovative capabilities. Leveraging AI-enabled higher education, a fully intelligent teaching model has been established. By collecting, analyzing, and utilizing comprehensive teaching process data, the system evaluates individual learning progress and habits to deliver customized education. This includes tailoring learning models and curating personalized resource recommendations for different students, supplemented by AI-generated adaptive question banks. This transformation shifts traditional experience-based instruction toward intelligent education centered on data interaction and information assessment.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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TALENT CULTIVATION PATHS OF HIGHER VOCATIONAL EDUCATION SERVING REGIONAL INDUSTRIAL CLUSTERS: FROM THE PERSPECTIVE OF UNIVERSITY-ENTERPRISE COMMUNITY OF SHARED FUTURE

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Abstract: Against the backdrop of China's policy-driven integration of production and education, industrial cluster upgrading, and insufficient adaptability of higher vocational education (HVE) talent cultivation, this study explores the alignment between HVE and regional industrial clusters from the innovative perspective of the University-Enterprise Community of Shared Future. Employing literature research, case analysis (Zhuhai Semiconductor and Integrated Circuit Cluster), and comparative research, it analyzes practical effects (preliminary talent adaptability improvement, initial resource integration) and core dilemmas (loose community connections, talent-demand mismatch, inadequate collaborative mechanisms, weak double-qualified teams) of current HVE talent cultivation. It then constructs a four-dimensional path: concept innovation, mechanism construction (interest linkage, collaborative governance, demand feedback), model innovation (modular curriculum, dual training, customized cultivation), and support strengthening (teacher development, quality evaluation, policy guarantees). The Zhuhai case verifies that the University-Enterprise Community of Shared Future bridges talent supply and industrial demand. The proposed path effectively promotes precise matching between HVE and regional industrial clusters, realizing a win-win for education, industry, and regional development.
Keywords: Higher vocational education; Regional industrial clusters; University-enterprise community of shared future; Talent cultivation paths

1 INTRODUCTION

1.1 Research Background

1.1.1 Policy background

China's national government has established a vocational education policy system featuring "top-level design guidance and implementation detailed rules support". Core policies such as the Action Plan for Improving Quality and Cultivating Excellence in Vocational Education (2020-2023) and the Guidelines for the Construction of Modern Industrial Colleges explicitly take the integration of production and education as the core development orientation. They require breaking down university-enterprise cooperation barriers and building a collaborative talent cultivation model of "joint talent training, resource sharing, and joint responsibility assumption", providing solid policy guarantees for fostering the University-Enterprise Community of Shared Future. Such policies drive higher vocational colleges to break traditional school-running inertia, proactively align with regional industrial development rhythms, and achieve precise alignment between educational supply and industrial demand.

1.1.2 Industrial background

China's regional industrial clusters are accelerating upgrades toward high-end, intelligent, and green development. Key manufacturing clusters—such as equipment manufacturing in the Yangtze River Delta and electronic information in the Pearl River Delta—have extensively promoted "machine replacement" and intelligent transformation. Service clusters like cross-border e-commerce and modern logistics focus on enhancing digital service capabilities. Demand for compound skilled talents with both professional skills and comprehensive literacy has shifted from "quantity supplement" to "quality adaptation". However, talents trained under HVE's traditional model often face a single skill structure and disconnection between core competencies and new technology applications, failing to meet industrial clusters' upgrading needs. This objectively requires reconstructing a talent cultivation system adapted to cluster development.

1.1.3 Educational background

As the core carrier serving regional industrial development, HVE faces prominent challenges of insufficient talent cultivation adaptability. Specifically, curriculum updates lag behind industrial technological iteration, training scenarios are disconnected from actual enterprise production, and the professional competence of "double-qualified" teaching teams is weak. More critically, most university-enterprise cooperation remains superficial—limited to "student internship placement" or "enterprise naming sponsorship". Some "order classes" even become hollow, with "only naming rights but no substantive education". The "joint talent training, risk sharing, and benefit sharing" model emphasized by Ge Xiaobo [1] remains unestablished, leading to inadequate alignment between talent cultivation and industrial demand.

1.2 Research Significance

1.2.1 Theoretical significance

Current academic research on the University-Enterprise Community of Shared Future mostly focuses on binary university-enterprise cooperation, lacking in-depth exploration of its integration with the key scenario of "regional industrial clusters". This study deeply integrates regional industrial clusters' core characteristics with community construction, innovatively developing a three-dimensional theoretical model of "cluster demand identification - community collaborative operation - adaptive talent output". This enriches the theory's application connotation and practical boundaries in regional industrial service fields. Addressing the "macro emphasis over micro paths" gap in HVE adaptability research, it systematically analyzes internal optimization logic from stakeholder and collaborative governance theory perspectives, integrating modular teaching and customized cultivation to refine theoretical cores and improve the full-chain theoretical system of "demand identification - cultivation implementation - quality evaluation - dynamic optimization".

1.2.2 Practical significance

For higher vocational colleges, the proposed "cluster-adaptive" talent cultivation system provides direct guidance for optimizing training programs, adjusting curricula, and innovating training models, effectively resolving core issues like curriculum-industry disconnection and low training quality. For cluster enterprises, stable adaptive talent supply fills skill gaps from technological upgrades, reducing internal training costs and post adaptation cycles. For regional development, precise talent matching accelerates industrial cluster upgrading, forming a virtuous cycle of "talent cultivation empowering enterprise development and enterprise growth driving cluster expansion". It also provides empirical basis for governments to improve production-education integration policies, ultimately achieving a win-win pattern for education, industry, and regions.

1.3 Research Status at Home and Abroad

1.3.1 Domestic research

Domestic studies focus on university-enterprise cooperation model innovation (e.g., Zheng Yiqi's [2] in-depth industry cooperation, Liu Yang's [3] customized cultivation), production-education integration mechanism reform (e.g., Geng Xuanzhen's [4] modular teaching system), industrial college governance paths (e.g., Wang Yan's [5] "co-construction to symbiosis" mechanism), and community construction logic (e.g., Ge Xiaobo [1], Zhu Jinfeng [6]). However, most studies address single cooperation dimensions or specific practices, lacking closed-loop research on "regional industrial cluster demand - community operation - HVE talent cultivation" and failing to reveal internal collaborative mechanisms.

1.3.2 Foreign research

Mature vocational education-industry coordination models exist abroad, such as Germany's dual system and Australia's TAFE system, which achieve precise talent-industry alignment through deep enterprise participation in teaching. Japan's Toyota "enterprise-run school" model even builds an internal closed loop of "talent cultivation - technological R&D - industrial application". However, these market-driven models lack integration with localized connotations like benefit sharing and risk sharing in China's "community of shared future", making direct adaptation to policy-driven regional industrial clusters difficult. Their localization requires further exploration.

1.3.3 Research review

Existing studies provide a solid theoretical and practical foundation for HVE-industry coordination but have obvious gaps. Domestic research is limited to binary university-enterprise interaction, lacking closed-loop "demand-operation-cultivation" frameworks and differentiated adaptation analysis across cluster types. Foreign models lack compatibility with China's policy environment and industrial characteristics, with unclear localization paths. These gaps hinder effective guidance for HVE to meet regional industrial cluster upgrading needs, highlighting the urgency of deepening research on community-talent cultivation correlations centered on regional industrial clusters.

1.4 Research Ideas and Methods

1.4.1 Research ideas

Taking the University-Enterprise Community of Shared Future as the core link, this study constructs a three-dimensional research framework of "HVE supply - regional industrial cluster demand - talent matching". First, relying on industrial cluster theory and literature research, combined with field surveys of typical clusters (e.g., Yangtze River Delta equipment manufacturing, Pearl River Delta electronic information), it systematically analyzes talent demand characteristics and enterprise differentiated needs. Second, through in-depth analysis of 6 typical cases (including McDonald's-Zhejiang Oriental Vocational and Technical College cooperation, "Ruipai" Pet Medical Industrial College), it explores core practical experience, dilemmas, and root causes of HVE serving cluster talent cultivation. Finally, supported by stakeholder, industrial cluster, and collaborative governance theories, it constructs an adaptability improvement path from concept innovation, mechanism construction, model innovation, and support strengthening dimensions, integrating modular teaching to optimize details and form a complete research closed loop of "demand identification - problem diagnosis - path construction - practical verification".

1.4.2 Research methods

Literature Research: Systematically reviewing core literatures and domestic-foreign studies to extract community

theoretical achievements, practical models, and research frontiers, tracing the application origin of stakeholder theory.
Case Analysis: Selecting 6 typical university-enterprise cooperation samples across manufacturing and service clusters, analyzing practical experience and dilemmas through on-site interviews and data collation.
Comparative Research: Comparing international mature models (e.g., Germany's dual system, Australia's TAFE) with China's regional practices to extract localized adaptation core points.

2 DEFINITION OF CORE CONCEPTS AND THEORETICAL BASIS

2.1 Definition of Core Concepts

2.1.1 University-enterprise community of shared future

A collaborative education ecosystem constructed by higher vocational colleges, regional industrial cluster enterprises, industry associations, and government departments based on strategic consensus. Breaking the traditional "separated supply-demand, one-way interaction" cooperation paradigm, it takes "joint talent training, resource sharing, mutual benefit, and risk sharing" as the core link. Its core characteristics include interest symbiosis (organic alignment of multi-party demands), joint responsibility (reasonable division of training obligations), and development coordination (synchronization with cluster upgrading). It effectively promotes the transformation of university-enterprise cooperation from superficial interaction to in-depth integration, ensuring precise talent-industry matching.

2.1.2 Regional industrial cluster

An industrial ecological aggregate formed by gathering upstream-downstream enterprises, R&D institutions, industry associations, and financial institutions in a specific geographical space, with a leading industry as the core, featuring division of labor, resource sharing, and coordinated development. Its core characteristics are geographical agglomeration (reducing cooperation costs), industrial relevance (forming common skill demands), and dynamic growth (upgrading with technological iteration). Its talent demand structure evolves with cluster development stages, providing precise direction for HVE talent cultivation.

2.1.3 HVE Talent cultivation serving regional industrial clusters

Whole-chain adaptive cultivation activities conducted by higher vocational colleges based on the "regional service" core positioning, taking cluster technological upgrading directions and post capability changes as the fundamental orientation—covering talent specification positioning, training program design, teaching implementation, and quality evaluation. Its core logic is not simply "talent supply on demand" but building a closed-loop operation mechanism of "precise demand identification - cultivation system reconstruction - dynamic quality feedback - program continuous optimization". It captures enterprise differentiated needs through the University-Enterprise Community of Shared Future, reconstructs cultivation systems by integrating practical experience, and ensures quality with enterprise-industry evaluation as the core.

2.2 Theoretical Basis

2.2.1 Stakeholder theory

Proposed by Freeman, its core lies in identifying core demands and responsibility boundaries of various stakeholders in organizational development, achieving multi-party demand balance and win-win through mechanism design—providing core logical support for community construction. In this study, it clarifies differentiated rights and responsibilities of higher vocational colleges (core demands: improved talent quality, scientific research transformation), cluster enterprises (core demands: precise talent supply, technological upgrading support), government departments (core demands: cluster upgrading, employment stability), and students (core demands: high-quality employment, career development). It resolves the traditional dilemma of "passive enterprise participation and one-way school output", laying a logical foundation for the community's "joint talent training and risk sharing" operation model.

2.2.2 Industrial cluster theory

With Porter's "Diamond Model" as the core support, it focuses on synergy effects and development laws of industrial agglomeration, providing methodological guidance for precise HVE talent positioning. Cluster geographical agglomeration shortens university-enterprise spatial distance, reducing information communication and resource integration costs. Industrial relevance forms common skill demands among cluster enterprises, providing a basis for modular curriculum construction. Dynamic growth requires talent cultivation systems to establish flexible adjustment mechanisms, adapting to cluster technological iteration and industrial upgrading in a timely manner, ensuring synchronization between talent cultivation directions and cluster development processes.

2.2.3 Collaborative governance theory

Originating from public management, it emphasizes that multi-stakeholders achieve common goals through equal consultation, resource integration, and joint responsibility—providing key theoretical support for community operation mechanism design. In teaching implementation, it supports the construction of the "university-enterprise double tutor" system and curriculum co-construction mechanism. In training practice, it facilitates the collaborative development of the "school-in-factory + factory-in-school" dual training platform. In quality evaluation, it promotes the formation of a three-dimensional system of "school evaluation + enterprise evaluation + industry evaluation", effectively resolving issues like insufficient collaborative mechanisms and vague responsibility division, improving overall talent cultivation efficiency.

3 ANALYSIS OF THE CURRENT SITUATION OF HVE TALENT CULTIVATION SERVING REGIONAL INDUSTRIAL CLUSTERS FROM THE COMMUNITY PERSPECTIVE

3.1 Practical Effects

3.1.1 Preliminary improvement of talent cultivation adaptability

The practical value of the university-enterprise collaborative training model has initially emerged. For example, Zhejiang Oriental Vocational and Technical College and McDonald's jointly built a "422 flexible semester system", aligning teaching cycles with enterprise operation rhythms. Students' post adaptability significantly improved after practical training. The customized cultivation model implemented in equipment manufacturing majors greatly enhanced the compatibility between graduates' professional quality and enterprise post demands by reconstructing curricula and training standards. Cluster enterprises' recognition and retention willingness of graduates increased notably, fully confirming the core role of university-enterprise collaboration in improving talent adaptability.

3.1.2 Initial results in university-enterprise resource integration

A two-way resource flow mechanism between universities and enterprises has gradually taken shape. For example, a mechanical major in a higher vocational college co-built a provincial training center with regional leading enterprises, integrating high-quality equipment and technical resources, and decomposing training modules according to cluster core post capability requirements—effectively expanding the depth and breadth of students' practical training. The "Ruipai" Pet Medical Industrial College in Zhu Jinfeng's [6] research achieved in-depth resource integration: enterprises invested core diagnosis and treatment equipment and clinical case resources, while the school provided venues and teaching management services to co-build training bases and teacher training centers, conducting regular practical training. This effectively resolved the dual dilemmas of insufficient HVE training resources and poor enterprise technical inheritance.

3.1.3 Gradual enhancement of industrial service capabilities

A symbiotic development relationship between higher vocational colleges and regional industrial clusters has initially formed. For example, the Industrial College of Chongqing Water Resources and Electric Engineering Vocational College, investigated by Wang Yan [5], deepened from initial training base co-construction to symbiotic cooperation in technological research and development and employee training, continuously providing technical solutions and skill improvement services for regional water conservancy enterprises. "Ruipai" Pet Medical Industrial College not only transported a large number of professional talents for the regional pet medical industry but also formed a technical service team of university-enterprise experts, providing technical guidance and standardized operation consulting for small and medium-sized pet diagnosis and treatment institutions—effectively promoting the overall improvement of industry service levels and verifying the feasibility of university-enterprise collaboration in strengthening HVE industrial service capabilities.

3.2 Existing Dilemmas

3.2.1 Loose community connection

Most university-enterprise cooperation features "short-term utilitarian orientation". Cluster enterprises mostly focus on filling temporary labor gaps, showing low enthusiasm for participating in in-depth cooperation links such as curriculum reconstruction, training standard formulation, and teacher team building. Most cooperation remains at the superficial level of "student internship placement". Some "order classes" implemented by colleges even become hollow, with "only naming rights but no substantive education"—enterprises provide nominal support without participating in teaching, and the collaborative education pattern of deep interest binding and joint responsibility has not been formed[7].

3.2.2 Talent cultivation-cluster demand mismatch

An obvious "time lag" exists between the talent cultivation system and cluster technological iteration. HVE curricula still take traditional disciplinary knowledge as the core framework, with core skill modules adapting to cluster upgrading (e.g., digitalization, intelligence) being either missing or insufficient. Taking manufacturing clusters as an example, while technologies like industrial robot operation and intelligent production line maintenance have been widely popularized, some higher vocational colleges still focus on basic skill training such as traditional machine tool operation—resulting in a "supply-demand mismatch" between talent output and cluster needs.

3.2.3 Lack of collaborative governance mechanisms

The division of rights and responsibilities between universities and enterprises lacks clear norms. Key cooperation links such as training equipment maintenance, student internship safety guarantees, and teaching quality evaluation standards are vaguely defined. Interest distribution and risk sharing mechanisms are unsound: enterprises' investment in equipment, technology, and teachers is difficult to obtain reasonable returns, while higher vocational colleges are unwilling to bear potential risks of talent cultivation model reform due to insufficient special compensation funds. In addition, the "free-rider" phenomenon is prominent among small and medium-sized enterprises in clusters—they enjoy talent dividends relying on leading enterprises' cooperation resources but do not participate in talent cultivation investment, further restricting collaborative efficiency.

3.2.4 Insufficient "double-qualified" teaching teams

The construction of "double-qualified" teaching teams faces a two-way bottleneck: "school teachers lack practice, enterprise teachers lack teaching skills". HVE professional teachers have solid theoretical teaching capabilities but most lack frontline industrial practical experience, making it difficult to accurately impart post practical skills and cutting-

edge technologies. Cluster enterprise technical backbones have rich practical experience but lack systematic teaching method training, unable to transform technical key points into teaching content suitable for HVE students' cognitive laws. The construction of cross-domain teacher sharing platforms lags behind, and normalized mechanisms such as university-enterprise mutual employment and job rotation have not been formed—leading to a "last mile" disconnection between teaching content and industrial practice.

3.3 Causes of Dilemmas

3.3.1 Insufficient interest drive

Enterprises face significant "cost-benefit" imbalance in participating in talent cultivation. They need to invest explicit costs such as equipment procurement, technical backbone time, and training venue transformation, while bearing implicit risks like long talent cultivation cycles and uncertain graduate retention rates. However, cooperative benefits are mostly reflected in long-term talent supply, with no obvious short-term direct economic returns. Meanwhile, relevant policy incentives have implementation deviations: existing tax reductions, subsidies, and other policies are mostly inclined to leading enterprises, making it difficult for small and medium-sized enterprises to enjoy equal support. The subsidy scope is narrow, focusing more on hardware investment such as training base construction, with insufficient support for soft investment such as curriculum development and teacher training—directly leading to insufficient depth and sustainability of enterprise participation.

3.3.2 Poor demand transmission

A three-level normalized demand feedback mechanism of "industrial cluster - core enterprise - higher vocational college" is lacking. At the cluster level, there is no unified talent demand research and information release platform, the bridge role of industry associations is not fully played, and differentiated demands of leading and small and medium-sized enterprises are difficult to integrate effectively. At the enterprise level, demand feedback mostly relies on the human resources department, with core post demands (e.g., technical, production departments) not effectively transmitted. Higher vocational colleges lack full-time docking teams, and there is no rapid transformation channel after receiving demand information. Adjustments to curriculum content and training standards lag behind cluster technological iteration, further exacerbating the talent-industry mismatch.

3.3.3 Single evaluation system

The "school-oriented" evaluation orientation is obviously disconnected from actual industrial demands. The existing evaluation system still takes theoretical knowledge examinations and on-campus training assessments as core indicators, with enterprise evaluation only as an additional item—mostly a formality completed through simple methods like stamping internship appraisal forms. Core dimensions highly concerned by enterprises, such as practical proficiency, problem-solving ability, and professional quality, are not included in the evaluation core. More critically, evaluation results are not effectively connected with cluster skill certification systems. Graduates' skill levels lack authoritative enterprise endorsement; even those with excellent on-campus performance require secondary enterprise training after employment, highlighting the evaluation system's insufficient adaptability to industrial demands.

4 CONSTRUCTION OF HVE TALENT CULTIVATION PATHS SERVING REGIONAL INDUSTRIAL CLUSTERS FROM THE COMMUNITY PERSPECTIVE

4.1 Concept Innovation: Establishing the "Cluster-Oriented + Symbiosis and Common Prosperity" Cultivation Concept

4.1.1 Higher vocational colleges

Completely abandon the traditional "discipline-oriented" school-running concept, establishing a service orientation of "taking cluster demands as the core and collaborative education as the support". Jointly establish a dynamic cluster development research mechanism with regional industry associations, regularly tracking cluster technological upgrading directions and post capability changes, and fully integrating core skill objectives and professional quality requirements into talent training programs. Reserve room for dynamic adjustment in top-level designs such as professional settings and curriculum development, breaking fixed teaching plans to achieve the core goal of "HVE precisely cultivating talents needed by industrial clusters".

4.1.2 Enterprises

Break through the short-sighted "short-term employment-oriented" utilitarian thinking that overemphasizes immediate talent output, establishing a long-term symbiotic development concept of "talent cultivation as strategic investment" for mutual growth. Leading cluster enterprises should fully play their leading and driving role, proactively incorporating talent cultivation into their medium and long-term development strategies, deeply participating in core links such as talent specification formulation, curriculum system development, and practical training guidance, and effectively transforming enterprise technical standards and post operation specifications into specific, operable teaching content. Small and medium-sized enterprises should abandon the passive "free-rider" mentality, actively participating in university-enterprise cooperation through industry associations to share high-quality training resources and complementary teacher forces. They should fully recognize that university-enterprise collaboration not only secures highly adaptive talents to meet production needs but also leverages the scientific research strength of higher vocational education (HVE) institutions to solve practical technical problems, forming a virtuous cognition and interactive mechanism of "talent cultivation supporting enterprise upgrading and enterprise growth feeding back cultivation

optimization".

4.2 Mechanism Construction: Improving the Community Operation Guarantee System

4.2.1 Interest linkage mechanism

Construct a benefit balance system of "diversified benefit sharing + reasonable risk sharing", establishing a multi-dimensional benefit sharing model including talent transportation rewards, technological R&D dividends, and training service income. Provide incentives such as tax reductions and policy inclinations for enterprises deeply participating in curriculum development and teacher training, proportional to their investment. For small and medium-sized enterprises with insufficient investment capacity, industry associations should coordinate resources, sharing cooperation costs and talent dividends according to enterprise employment scale and demand proportion. Meanwhile, set up a risk reserve fund co-funded by the government, schools, and enterprises in a certain ratio to cover potential risks such as training equipment loss, student internship safety accidents, and cooperation project adjustments—ensuring stable community operation.

4.2.2 Collaborative governance mechanism

Build a four-party collaborative governance structure of "school-enterprise-government-industry", establishing a council composed of HVE presidents, leading cluster enterprise chairmen, government department heads, and industry association secretaries-general as the core decision-making body. Hold quarterly demand docking meetings to coordinate core matters such as talent training plans and training base construction. Set up three special working groups (teaching reform, resource integration, quality evaluation) responsible for implementing specific cooperation tasks. Establish a closed-loop "decision-making - execution - supervision - optimization" mechanism: industry associations lead cooperation satisfaction evaluations, regularly feedback multi-party demands, adjust cooperation plans, and clarify responsibility boundaries to resolve the "free-rider" problem.

4.2.3 Demand feedback mechanism

Build an "intelligent platform for regional industrial cluster talent demands" relying on digital technology. Enterprises can upload core information such as post demands and technological upgrading directions in real time. Industry associations integrate multi-enterprise demands to form the White Paper on Cluster Talent Demands, released regularly. Higher vocational colleges set up full-time docking teams, completing demand analysis within 72 hours and feeding back to teaching management departments. Establish a "monthly dynamic update + quarterly thematic discussion" demand transformation mechanism, adjusting curriculum modules and training content in response to cluster technological iteration—effectively solving the problem of lagging demand transmission.

4.3 Model Innovation: Constructing a "Cluster-Adaptive" Talent Cultivation System

4.3.1 Modular curriculum system

Based on cluster core post capability analysis, construct a three-level curriculum system of "general literacy module + professional core module + cluster characteristic module". The general literacy module focuses on vocational general abilities and basic theories; the professional core module aligns with key skills of cluster leading industries; the cluster characteristic module precisely meets industrial upgrading directions (e.g., intelligent operation modules for manufacturing clusters, digital service modules for service clusters). Establish a curriculum development team composed of university-enterprise backbone teachers, transforming enterprise technical standards and post operation specifications into teaching content to achieve dynamic curriculum-cluster alignment.

4.3.2 "Dual-cooperation" training model

Build a dual-carrier training platform of "school-in-factory + factory-in-school". The "school-in-factory" introduces core enterprise production equipment and real projects, enabling students to participate in practical training on campus. The "factory-in-school" sets up teaching points in enterprise production sites, implementing an integrated "teaching - training - production" cultivation model. Drawing on the cooperation experience between Zhejiang Oriental Vocational and Technical College and McDonald's, arrange students to take turns in practical work during enterprise peak operation periods—with enterprise technical backbones responsible for practical guidance and school teachers conducting synchronous theoretical teaching, effectively resolving the disconnection between traditional training and actual production.

4.3.3 Customized cultivation upgrading

Construct a "hierarchical and classified" customized cultivation system. For leading enterprises' specialized technology and refined post needs, set up "leading enterprise order classes"—with deep enterprise participation in the full cultivation process to achieve precise talent-post matching. For small and medium-sized enterprises' common skill demands, establish "cluster general skill classes" focusing on universally applicable core skills, balancing post adaptability and career mobility. For example, in iron and steel industry cluster cultivation, special metallurgical skill courses are customized for leading enterprises, while general equipment operation and maintenance courses are offered for small and medium-sized enterprises—realizing precise coverage of differentiated demands.

4.4 Support Strengthening: Consolidating the Foundation for Cultivation Implementation

4.4.1 Cross-domain teaching team construction

Establish a "two-way exchange, mutual employment, and co-cultivation" teacher development mechanism. Clearly

require HVE professional teachers to practice in cluster enterprises for a certain period each year, participating in technological research and development or production management to systematically master cutting-edge industrial technologies and post practical requirements. Select outstanding cluster technical backbones, incorporating them into the school's part-time teacher database after special teaching ability training to undertake training courses and skill guidance. Rely on industrial colleges to form university-enterprise joint teaching and research teams, jointly carrying out curriculum development and teaching reform. Directly link enterprise practical experience and university-enterprise cooperation achievements with teacher title evaluation and performance assessment, stimulating enthusiasm for collaborative education and building a high-quality "double-qualified" teacher pool.

4.4.2 Quality evaluation system optimization

Construct a three-dimensional linkage evaluation system of "school evaluation + enterprise evaluation + industry evaluation", breaking the single "school-oriented" pattern. Schools mainly evaluate students' theoretical foundation and learning ability; enterprises, as the core evaluation subject, focus on assessing practical skill proficiency, post adaptability, and professional quality through internship performance evaluation and post skill tests; industry associations organize third-party skill certification and industry literacy assessment based on professional standards to ensure alignment with industrial demands. Establish a closed-loop evaluation result feedback mechanism, directly using evaluation data to optimize curriculum content, improve teaching methods, and enhance teacher capabilities—giving full play to evaluation's "baton" role[8].

4.4.3 Policy and resource guarantee

Build a multi-dimensional guarantee system of "government guidance, university-enterprise co-construction, and industry coordination". Proactively secure special government funds for production-education integration, focusing on core areas such as university-enterprise co-built training bases, cross-domain teacher training, and curriculum development. Promote the implementation of enterprise school-running incentive policies, providing tax reductions and honorary recognition for enterprises deeply participating in talent cultivation, increasing support for small and medium-sized enterprises, and reducing their participation costs through subsidies and rewards. Universities and enterprises integrate high-quality resources: enterprises invest core equipment, technology, and project resources; schools provide venues, teaching management, and teacher resources to co-build and share training platforms and scientific research carriers. Industry associations play a coordinating role, optimizing resource allocation and providing services such as standard docking and information consulting—consolidating the resource foundation for community operation.

5 CASE ANALYSIS - TAKING ZHUHAI SEMICONDUCTOR AND INTEGRATED CIRCUIT INDUSTRIAL CLUSTER AS AN EXAMPLE

5.1 Case Background

Zhuhai Semiconductor and Integrated Circuit Industrial Cluster is a core carrier of strategic emerging industries in the Guangdong-Hong Kong-Macao Greater Bay Area, forming a complete industrial chain pattern of "Emphasize design, cultivate packaging and testing, and value innovation". It holds leading technological advantages in subdivided fields such as automotive-grade MCU and RISC-V architecture. The Zhuhai-Macao Collaborative Innovation Platform has gathered abundant innovative resources and enterprises, becoming an important engine for regional industrial upgrading. Cluster talent demand features distinct characteristics: ability structure emphasizing the compound nature of professional skills (e.g., chip design, packaging testing) and comprehensive abilities (e.g., data analysis, problem-solving); experience requirements prioritizing real project experience and industry certificates; technical adaptability requiring synchronization with chip technology iteration. As the first local HVE focusing on this field, Zhuhai City Polytechnic initially faced problems such as curriculum lagging behind industrial technology, lack of high-end training equipment, and insufficient "double-qualified" teacher professional capabilities—resulting in obvious talent-cluster demand mismatch. It therefore co-built a University-Enterprise Community of Shared Future with government departments, industry associations, and leading cluster enterprises to carry out targeted talent cultivation practices.

5.2 Practical Measures

5.2.1 Constructing a "government-industry-enterprise-school" collaborative governance system

Under the guidance of relevant Zhuhai government departments, Zhuhai City Polytechnic took the lead in forming a collaborative education council with leading cluster enterprises (e.g., Ninesstar, Allwinner Technology) and the Zhuhai Semiconductor Industry Association. Quarterly demand docking meetings are held to coordinate talent training plans and skill standards. The government promotes cooperation implementation through carriers such as the Jinwan Intelligent Manufacturing Industrial College, setting up special support funds for training base construction and technological R&D projects, and providing tax reductions and policy inclinations for enterprises deeply participating in curriculum development and teacher training—stimulating multi-party participation enthusiasm.

5.2.2 Full-chain embedding of enterprise demands into cultivation

Universities and enterprises jointly established a professional teaching committee. Enterprise technical experts and school teachers co-refined talent training programs, transforming real enterprise R&D projects and technical standards into teaching cases and training materials. Technical experts from institutions such as the Southern Integrated Circuit Design Service Center regularly participate in classroom teaching and training guidance. Enterprises open advanced production lines and equipment (e.g., wafer testing, finished product packaging). Leading local packaging and testing

enterprises in Zhuhai provide dedicated real production workstations, arranging students to participate in on-the-job internships in core links (e.g., chip design, testing) after special skill training—achieving deep integration of teaching and production.

5.2.3 Precise reconstruction of the cultivation system by the school

Breaking traditional professional setting frameworks, it subdivided cluster-adaptive professional directions such as RISC-V chip design, integrated circuit layout design, and automotive-grade chip testing. Built a three-level training system of "simulation - virtual training - real operation", reproducing high-end packaging process scenarios through VR technology—reducing training costs while ensuring core skill mastery. Established a special teacher enterprise practice mechanism, organizing professional teachers to participate in enterprise technological R&D, forming teaching and research teams with enterprise technical backbones to co-develop cluster-adaptive textbooks—continuously improving "double-qualified" teacher quality.

5.3 Implementation Effects

5.3.1 Significantly improved talent cultivation adaptability

Graduates' skill structures achieved precise matching with cluster post demands. Local counterpart employment rates and enterprise recognition increased substantially, with shortened post adaptation cycles—effectively reducing enterprise subsequent training costs. Graduates have become core talent reserves in shortage areas such as advanced packaging and chip testing, gaining high recognition from leading enterprises like Ninestar and Allwinner Technology.

5.3.2 Continuously enhanced industrial service capabilities

The joint university-enterprise technical service team successfully solved multiple technical problems in chip testing, providing customized employee skill training for small and medium-sized cluster enterprises—helping improve their technical team professional levels and effectively supporting cluster "chain strengthening and supplementing".

5.3.3 Prominent model replication value

Formed a replicable cultivation model of "government-industry-enterprise-school collaborative governance + subdivided direction customized cultivation + three-level training system guarantee". Through university-enterprise resource integration, it avoided redundant construction of high-end school equipment. Relevant practical experience has been adopted by multiple HVEs in western Guangdong, providing a mature model for talent cultivation in similar industrial clusters and realizing deep coupling of the education chain and industrial chain.

6 CONCLUSIONS AND PROSPECTS

6.1 Research Conclusions

Taking the University-Enterprise Community of Shared Future as the core perspective, relying on stakeholder, industrial cluster, and collaborative governance theories, this study systematically explores the talent supply-demand adaptation problem of HVE serving regional industrial clusters. Core conclusions are as follows: First, the University-Enterprise Community of Shared Future is the key link to resolving insufficient HVE-cluster demand adaptability. Its core characteristics of "interest symbiosis, joint responsibility, and development coordination" effectively break traditional university-enterprise cooperation barriers of "superficial docking and one-way output". The Zhuhai Semiconductor and Integrated Circuit Cluster case confirms that community construction gathers multi-party efforts (schools, enterprises, governments, industries) to form a collaborative education pattern. Second, current HVE talent cultivation serving regional industrial clusters faces four core dilemmas: loose community connections, talent-demand mismatch, insufficient collaborative mechanisms, and weak "double-qualified" teams—rooted in three constraints: insufficient interest drive, poor demand transmission, and a single evaluation system. Third, constructing a four-dimensional linkage path system of "concept innovation - mechanism construction - model innovation - support strengthening" effectively resolves these dilemmas: concept innovation establishes "cluster-oriented + symbiosis and common prosperity" cognition; mechanism construction improves three guarantee mechanisms (interest linkage, collaborative governance, demand feedback); model innovation creates three core systems (modular curriculum, dual training, customized cultivation); support strengthening consolidates three implementation foundations (teachers, evaluation, resources)—forming a complete talent cultivation optimization closed loop. The Zhuhai case further verifies the path's feasibility and adaptability.

6.2 Future Prospects

Future research can be deepened and expanded in four aspects: First, focusing on the digital transformation background, explore application paths of artificial intelligence and big data in dynamic cluster talent demand prediction, real-time modular curriculum updates, and virtual training scenario reconstruction—resolving the core contradiction between rapid industrial technological iteration and relatively fixed talent cultivation cycles. Second, expand research sample coverage, selecting different types and development stages of industrial clusters (e.g., Yangtze River Delta equipment manufacturing, Pearl River Delta cross-border e-commerce) for comparative analysis of talent demand characteristics and community construction differentiated laws, extracting classified adaptive talent cultivation models. Third, deepen research on long-term community operation mechanisms, exploring construction paths of differentiated policy incentive systems and cross-regional collaborative governance mechanisms to address practical issues such as insufficient small

and medium-sized enterprise participation motivation and cross-regional cluster collaborative education barriers. Fourth, conduct cross-regional comparative research, systematically sorting core characteristics of international models (e.g., Germany's dual system, Australia's TAFE), exploring localization adaptation points combined with China's regional industrial cluster development reality, comparing production-education integration model differences between the Guangdong-Hong Kong-Macao Greater Bay Area and the Yangtze River Delta—providing more universal theoretical and practical support for improving regional production-education integration ecosystems.

COMPETING INTERESTS

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