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Cultivation of Top Innovative Talent through Interdisciplinary Programs in Sino-Foreign Cooperative Education

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Abstract: *In the context of globalization, Sino-foreign cooperative education emerges as a pivotal mode of education, providing students with a broader international perspective while enhancing their knowledge structure and fostering innovation abilities. Interdisciplinary education, as a fundamental approach within this framework, effectively promotes interdisciplinary thinking and bolsters innovation capacity. By integrating and interacting with knowledge from disparate disciplines, students develop diverse ways of thinking and problem-solving, thereby strengthening their innovative prowess and comprehensive literacy. This paper meticulously analyzes the role of interdisciplinarity in nurturing top-tier innovative talents within Sino-foreign cooperative education. By examining the current system and drawing from successful cases both domestically and internationally, this study delves into the intricate mechanisms by which interdisciplinarity contributes to the training of elite innovators. Furthermore, it posits specific optimization strategies, offering solid theoretical underpinnings and practical guidance for the implementation of interdisciplinarity in Sino-foreign cooperative education in China, ultimately facilitating the comprehensive and profound development of top innovative talents.*

Keywords: Sino-Foreign Cooperative Education, Interdisciplinary, Top Innovative Talents

I. INTRODUCTION

As globalization continues to deepen, higher education in China faces unprecedented international challenges and opportunities. Sino-foreign cooperative education, as a crucial engine driving the internationalization of Chinese higher education, provides students with diverse learning options and brings rich international educational resources and concepts to Chinese universities. In this context, interdisciplinary studies, as an innovative educational model, are increasingly gaining attention and acclaim within the academic community (Zhu, W., et al., 2020). Interdisciplinary studies not only break traditional disciplinary boundaries but also offer students a broader knowledge perspective and cognitive space, thereby fostering cross-disciplinary literacy and innovative capabilities. The practice and exploration of interdisciplinary studies within Sino-foreign cooperative education programs are of paramount importance for cultivating top-tier talent with an international perspective and innovative spirit.

Interdisciplinary studies exhibit significant advantages in enhancing students' overall competence, fostering innovative thinking, and broadening international horizons. Firstly, by integrating knowledge and skills from various disciplines, interdisciplinary studies help students form a comprehensive cognitive structure, thereby improving their problem-solving abilities. Secondly, during the research and practice of interdisciplinary studies, students can stimulate their creativity and innovative potential, developing independent thinking and critical analysis skills. Furthermore, through cooperation and exchanges with foreign universities, students are exposed to educational concepts and academic achievements from different cultural backgrounds, thereby enhancing their international competitiveness and adaptability. This paper aims to analyze the dynamic impact of interdisciplinary studies on cultivating top-notch innovative talent within the framework of Sino-foreign cooperative education. We will explore how interdisciplinary studies promote knowledge integration and innovation, stimulate students' learning interests and motivation, and improve educational quality and outcomes. Additionally, we will address the challenges and issues encountered in implementing interdisciplinary studies in Sino-foreign cooperative education, such as curriculum design, faculty allocation, and evaluation systems, with the aim of providing valuable references and insights for Sino-foreign cooperative education programs in China.

II. THE REVIEW OF SINO-FOREIGN COOPERATIVE AND INTERDISCIPLINARY EDUCATION

2.1 Sino-foreign cooperative education

Sino-foreign cooperative education refers to educational institutions or projects jointly organized by Chinese and foreign educational institutions in China according to law. This cooperation model aims to introduce advanced foreign educational concepts and teaching methods, thereby improving the quality and international competitiveness of China's higher education system (Ying and Wenjing, 2023). Intersecting disciplines, which involve the integration and penetration of different fields to create new knowledge systems and research areas, are crucial in these cooperative programs. Interdisciplinary education within Sino-foreign cooperative programs facilitates the introduction of advanced foreign educational concepts and resources, fostering the development and innovation of higher education in China. In recent years, these cooperative programs have developed rapidly, becoming a significant means for the internationalization of Chinese higher education. Through partnerships with foreign universities, Chinese institutions actively explore practical experiences in the selection and training of top-tier innovative talents. These experiences provide a foundation for constructing a training system for exceptional talents and offer valuable references for Sino-foreign cooperative education (Cheng, L., et al., 2024).

Despite the notable achievements of Sino-foreign cooperative education in China, several challenges remain. Management and cultural integration pose significant difficulties. Differences in educational concepts and management modes between Chinese and foreign institutions require effective communication and coordination to resolve. Additionally, ensuring the quality of education in these cooperative programs is a critical challenge. The focus should be on maintaining high educational standards to meet the needs of both students and society. Nonetheless, Sino-foreign cooperative education offers substantial opportunities for Chinese higher education. By collaborating with foreign universities, Chinese institutions can adopt advanced educational concepts and teaching methods, enhancing education quality. Moreover, these cooperative programs provide students with more learning opportunities and an international learning environment, helping to cultivate their global vision and cross-cultural communication skills (Feng, K., 2024).

2.2 Interdisciplinary education

Intersecting disciplines refer to the process of mutual penetration and integration between different academic fields. This interdisciplinary approach not only fosters the synthesis and innovation of knowledge but also drives advancements in science and technology (Repko, A. F.,et al., 2019). In the era of a knowledge-based economy, a country's capacity for innovation determines its potential for scientific and technological development, economic growth, and overall national strength. Intersecting disciplines offer new perspectives and methods for solving complex scientific problems by integrating diverse knowledge and methodologies from various fields (Klaassen, 2018). The high-quality development of interdisciplinary talent training arises from the need for innovative talent within the framework of knowledge production. By optimizing teaching and research methodologies, establishing interdisciplinary organizations, and revising discipline evaluation systems, the interdisciplinary talent training model can nurture top-notch innovative talents, enhance the construction of first-class disciplines, and promote self-reliance and self-improvement in high-level science and technology.

Despite the significance of interdisciplinary education in higher education, several challenges persist. First, interdisciplinary efforts must overcome traditional disciplinary barriers, which may encounter resistance from established disciplines. Second, interdisciplinary learning demands comprehensive knowledge and skills from both teachers and students, posing higher requirements for their capabilities (Yuan and Tiejun, 2020). Additionally, the evaluation system for interdisciplinary studies needs to be refined to better accommodate the unique characteristics and demands of interdisciplinary work.

To promote the development of interdisciplinary research, colleges and universities need to implement several measures. They should optimize interdisciplinary curricula, this includes designing courses that bridge gaps between traditional disciplines and incorporate diverse perspectives and methodologies; Establish interdisciplinary research platforms, creating dedicated platforms for interdisciplinary research can provide a collaborative space for scholars from different fields to work together. These platforms can facilitate the sharing of resources, ideas, and methodologies, fostering an environment conducive to innovative research; Encourage active participation in interdisciplinary research projects by both teachers and students, this can be achieved through funding opportunities, institutional support, and recognition of interdisciplinary work in academic evaluations and career advancements; Furthermore, universities should collaborate with enterprises, research institutions, and other external organizations to facilitate the practical application of interdisciplinary studies and drive technological innovation, which can provide practical applications for interdisciplinary research, driving technological innovation and addressing real-world problems; At the same time, the current evaluation systems often favor traditional disciplinary boundaries, which can hinder interdisciplinary work.

Revising these systems to recognize and reward interdisciplinary research and education is crucial for fostering a culture that values and supports interdisciplinary efforts. By implementing these measures, higher education institutions can enhance their interdisciplinary talent training, contributing to the development of top-tier innovative talents. This, in turn, will bolster the institution's ability to construct first-class disciplines and advance national self-reliance in science and technology (Bear and Skorton, 2019).

2.3 Comprehensive review

Sino-foreign cooperative education and interdisciplinary education represent two significant trends in the realm of higher education. These approaches not only offer students a broader vision and increased learning opportunities but also provide innovative solutions for addressing complex global issues (Li and Yan, 2023). Sino-foreign cooperative education has facilitated the reform and development of China's higher education system by introducing high-quality educational resources and advanced pedagogical methods from abroad. Similarly, interdisciplinary education promotes the synthesis and innovation of knowledge by integrating diverse disciplinary perspectives and methodologies.

Despite their potential and advantages, both Sino-foreign cooperative education and interdisciplinary education face numerous challenges in practical implementation. For instance, the construction of effective mechanisms for Sino-foreign cooperative institutions encounters practical difficulties in areas such as quality assurance and achieving balanced regional development. Additionally, while interdisciplinary research holds great promise, it requires further deepening, particularly in developing effective measures to assess and promote the extent of interdisciplinary collaboration.

To address these challenges, higher education institutions must focus on optimizing administrative structures, enhancing quality control measures, and ensuring equitable resource distribution across regions. Furthermore, there is a need to refine evaluation systems for interdisciplinary research to accurately capture its impact and foster a supportive environment for interdisciplinary initiatives. By overcoming these hurdles, Sino-foreign cooperative education and interdisciplinary education can more effectively contribute to the advancement of higher education and the resolution of global challenges.

III. THE INTERDISCIPLINARY PRACTICE IN SINO-FOREIGN COOPERATIVE EDUCATION

The implementation and effectiveness of Sino-foreign cooperative school-running mode in different countries show diversity and complexity. In China, this model has become an important part of the internationalization of higher education. Especially under the "Belt and Road" initiative, the cooperation with countries along the Belt and Road has been significantly promoted. China has established more than 2,000 Chinese-foreign cooperatively-run schools, of which there are about 460,000 students and more than 1.6 million graduates (Wang, 2019). This cooperation not only introduces high-quality educational resources from abroad, but also promotes the reform of education management system and accelerates the integration of education with international standards.

Taking the University of Nottingham Ningbo as an example, this new mechanism of Sino-foreign cooperative education has rapidly improved the level and level of education by substantially introducing high-quality foreign educational resources. China University of Geo-sciences (Beijing) and Jiangsu University of Science and Technology, have also explored new forms of cooperative education and the construction of practical teaching system through cooperation with foreign universities. More cases of interdisciplinary practices in Sino-foreign cooperative education, like "Data Science and Artificial Intelligence" Program, joint Peking University and Stanford University, this program combines knowledge from computer science, data science, and artificial intelligence, offering interdisciplinary courses and research opportunities. The curriculum includes data analysis, machine learning, and AI algorithms, aimed at cultivating innovative talents with a multi-disciplinary background. Students in this program apply data science and AI techniques in practical scenarios to address complex technical and business challenges (Xiao and Zhong, 2020).

Another successful interdisciplinary practices in Sino-foreign cooperative education is the "Environment and Sustainable Development" program, the partner institutions are Shanghai Transport University and the University of Oxford, with the features integrates environmental science, engineering, and economics, focusing on strategies for environmental protection and sustainable development. Students participate in interdisciplinary research and practical activities, such as the development of green technologies and analysis of environmental policies, which enhanced students' comprehensive understanding of environmental issues, and promoted innovation in green technologies and policy-making.

Recent years, china has cooperate with Australia, Germany and France, with the program of "Biomedical Engineering and Health Management" Master's Program, "Smart Manufacturing and Industrial Design" Course Program and "Innovation and Entrepreneurship with Technology Management" Program. The interdisciplinary practice in Sino-foreign cooperative education between Fudan University and the University of Sydney combines courses from biomedical engineering, public health, and health management, aiming to train advanced professionals with integrated medical and engineering knowledge. The curriculum includes the design of biomedical devices, health data analysis, and public health strategies. Students design and manage advanced biomedical equipment, analyze health data, and improve the efficiency of public health systems. Interdisciplinary Course program between Tsinghua University and the Technical University of Munich integrates smart manufacturing technologies and industrial design theories, developing students' abilities in designing and optimizing smart manufacturing systems. The curriculum covers smart manufacturing technologies, industrial design methods, and innovation management. Students innovate in the smart manufacturing field, enhancing production efficiency and product quality. The "Innovation and Entrepreneurship with Technology Management" Program, with the partner institutions Zhejiang University and the University of Paris, program combines knowledge of innovation, entrepreneurship, and technology management, providing interdisciplinary training in technology entrepreneurship, innovation management, and market analysis. Students have opportunities to participate in international entrepreneurial projects and technology management practices. Students engage in innovative entrepreneurial activities in a global context, advancing the development and internationalization of technology enterprises (Li and Yan, 2023).

Above cases illustrate how Sino-foreign cooperative education leverages interdisciplinary courses and projects to enhance educational quality, develop well-rounded talents, and address practical issues. Through the integration of different disciplines, these programs enrich students' learning experiences and provide new perspectives and solutions for related fields.It is worth to say, more and more countries followed Chinese successful cases to conduct the the interdisciplinary practice in Sino-foreign cooperative education. At the international level, the United Kingdom and Malaysia, as exporters and importers of global education resources, have made remarkable achievements in transnational higher education (cooperation in running schools), and their experience can provide reference for other countries. This shows that the successful implementation of the Sino-foreign cooperative mode in running schools needs the policy guarantee of the government, the internal management of colleges and universities and the assistance and supervision of all parties in society. A pilot project sponsored by the Royal Society of Engineering integrates the principles of sustainability into the education of engineers and scientists through an interdisciplinary curriculum unit. This systematic and student-centered approach helps to foster the ability of future professionals to solve complex problems in the world (Zhuang and Guo, 2024). Many universities such as Texas a and m university, Ohio state university, through the establishment of interdisciplinary supervision institutions and innovation center plan, promote the interdisciplinary integration, these institutions and plans has played an important role in the international development, help solve the including education, health, agriculture and other fields of global problems. The Strategic Dialogue on Innovative Higher Education (DIES) project initiated by Germany is a successful example. It establishes a new model of multilateral cooperation through transnational and cross-regional collaboration and dialogue, seeking a new model of international higher education and localization strategies. This model has promoted the development of higher education in developing countries and formed an international cooperative brand with certain influence.

IV. OPTIMIZATION STRATEGIES AND SUGGESTIONS

4.1 Enhance the Design and Management of Interdisciplinary Courses

In the implementation of Sino-foreign cooperative education projects, it is crucial to prioritize the construction and management of interdisciplinary curricula, as this is a key factor in ensuring educational quality. To achieve this goal, institutions should invest sufficient resources and effort into the careful design and scientific management of interdisciplinary courses (Self, J. A., et al., 2019). This involves conducting in-depth research and analysis of the courses to ensure they genuinely meet students' needs and enhance their overall quality. Institutions need to focus not only on the design and management of the courses but also on encouraging and motivating teachers to actively participate in the design and teaching of interdisciplinary courses. This can be achieved by providing training, incentives, and professional development opportunities. Through these practices, teachers can enhance their professional skills and teaching abilities, thereby improving the quality and effectiveness of instruction.

Sino-foreign cooperative education projects must emphasize the construction and management of interdisciplinary curricula, as this is essential for ensuring educational quality. By investing sufficient resources and effort, carefully designing and managing interdisciplinary courses, and encouraging active teacher participation, we can ensure that students truly benefit, improving their overall quality and enhancing the effectiveness of instruction.

4.2 Expand International Exchange and Collaboration

Sino-foreign cooperative education projects should actively strengthen in-depth exchanges and cooperation with internationally renowned universities and research institutions (Wen and Li, 2024). This is a vital approach to enhancing the internationalization of China's education system. By collaborating with prestigious international institutions, we can introduce high-quality educational resources from abroad, including advanced teaching philosophies, rich teaching experiences, and excellent faculty. This, in turn, can significantly improve the quality of education in our country. Additionally, we can learn from and absorb foreign educational management experiences to elevate our educational administration standards.

To better utilize international educational resources, we should encourage students to actively participate in international academic conferences and competitions. This not only broadens their international perspective and competitiveness but also helps them better adapt to the trends of globalization. Participation in international academic conferences and competitions allows students to encounter the latest research findings and cutting-edge academic ideas, expanding their academic horizons and enhancing their scholarly qualities. Moreover, this fosters students' cross-cultural communication skills, teamwork abilities, and innovative spirit.

In the process of international exchanges and cooperation, we should also focus on cultivating students' international thinking and global vision. Through collaborations with international universities and research institutions, we can invite renowned scholars to China for academic exchanges and lectures, providing students with the opportunity to interact with world-class academics and learn from their scholarly ethos and research methodologies. Furthermore, organizing short-term exchanges or internships abroad enables students to experience different educational environments and academic atmospheres firsthand, thereby fostering their international thinking and global perspective (Bear and Skorton, 2019).

To sum up, Sino-foreign cooperative education projects should actively enhance exchanges and cooperation with international universities and research institutions, introducing high-quality educational resources from abroad to improve the internationalization of education. At the same time, we must focus on cultivating students' international thinking and global vision, encouraging them to actively participate in international academic conferences and competitions to enhance their international competitiveness. By doing so, our education system will be better positioned to adapt to global development trends, and we will be able to nurture more outstanding talents with international competitiveness for our country's development..

4.3 Develop an Interdisciplinary Research Platform

Sino-foreign cooperative education projects should vigorously establish interdisciplinary research platforms. This is not only a key step in promoting the integration of disciplines but also an effective means of stimulating innovative vitality. By creating such platforms, we can bring together teachers and students from diverse academic backgrounds, encouraging them to transcend professional boundaries and collaborate on scientific research. This interdisciplinary approach broadens the perspectives of both teachers and students, fostering intellectual exchanges that spark innovation. These platforms not only advance the deep development of disciplines but also cultivate talents with interdisciplinary thinking and innovative abilities, providing valuable innovative forces for society (Self et al., 2019).

4.4 Refine the Student Evaluation System

In Sino-foreign cooperative education projects, optimizing the student evaluation system is of paramount importance. Traditional single-dimensional evaluation methods no longer meet the current needs of educational development. Therefore, we need to establish a diversified and comprehensive evaluation system. This system should not only assess students' academic performance but also evaluate their practical abilities, innovative capabilities, teamwork skills, and more. Additionally, we should encourage self-evaluation and peer evaluation, enabling students to actively engage in their own growth and development (Van den beemt et al., 2020). By optimizing the student evaluation system, we can gain a more comprehensive understanding of students' learning status and development needs, thereby providing more precise educational support and guidance. Such an evaluation system helps stimulate students' interest in learning and enhance their enthusiasm, promoting their all-around development. Moreover, it cultivates students' self-directed learning abilities and teamwork spirit, better preparing them to meet societal demands.

To construct a diversified evaluation system, efforts should be made in the following areas. Comprehensive academic evaluation, focus on a holistic assessment of students' academic performance, encompassing both theoretical knowledge and practical skills. Evaluation of practical and innovative abilities, which need to emphasize the assessment of students' practical and innovative skills, encouraging active participation in practical activities to foster innovative thinking. Assessment of teamwork skills, strengthen the evaluation of students' teamwork abilities, enabling them to leverage their strengths within a team and enhance their collaborative skills. Encouragement of self-evaluation and peer

evaluation, promote self-assessment and peer reviews to develop students' self-awareness and communication skills (Self and Baek, 2017).

Overall, optimizing the student evaluation system in Sino-foreign cooperative education projects contributes to the comprehensive development of students and enhances their overall quality. This approach aligns with the needs of educational development and helps cultivate talents that can adapt to societal changes. We should actively explore and implement improvements to the evaluation system, continually refining it to better support students' growth.

4.5 Strengthen the Development of the Teaching Faculty

The successful implementation of Sino-foreign cooperative education programs relies on a high-quality, professional teaching team. To build such a team, we must take a series of measures. First, we need to actively recruit and cultivate outstanding teachers with an international perspective and interdisciplinary backgrounds. This means we should search globally for educators who possess solid professional knowledge and broad horizons, providing them with a conducive working environment and conditions where they can fully utilize their talents.

Second, we must enhance training and further education for teachers. Only through continuous learning and improvement can teachers keep pace with the times and better meet the needs of students. Therefore, we should offer ample opportunities for training and professional development, enabling teachers to continuously enhance their professional skills and teaching abilities.

Furthermore, we need to establish and improve mechanisms for teacher motivation. Only by stimulating teachers' enthusiasm and creativity can they better engage in their teaching work, thus ensuring the smooth implementation of Sino-foreign cooperative education programs. Therefore, we must employ various methods, such as offering competitive salaries, comprehensive welfare policies, and promising career advancement opportunities, to inspire teachers' enthusiasm and creativity (Zhang, M. D., 2023).

4.6 Focus on Cultivating Students' Practical Skills

In Sino-foreign cooperative education programs, the cultivation of students' practical skills should be a focal point, as it is a core measure to enhance students' overall quality and boost their competitiveness in the job market (Lai and Jung, 2024). To achieve this goal, we need to meticulously design and implement a series of practical activities, such as laboratory courses, internships, and community practice, aimed at deepening students' learning through hands-on experiences and accumulating practical knowledge.

Moreover, we should actively seek close collaboration with enterprises and industry sectors to create more practical opportunities and employment pathways for students. By emphasizing this practical-oriented teaching model, we can better align students with the evolving demands of society, thereby enhancing their employ ability and laying a solid foundation for their successful career development.

V. CONCLUSION

The evolution of the Sino-foreign collaborative educational model, particularly within the realm of interdisciplinary studies, has served as a pivotal force in fostering the cultivation of preeminent innovative talents. This collaborative approach not only imparts a wealth of educational resources but also fosters favorable environments for the holistic development of students through the intersection and integration of diverse disciplinary perspectives. To harness the full potential of interdisciplinary training in talent development, a concerted set of strategic measures must be implemented to enhance and refine this process.

Firstly, it is imperative to reinforce the systematic arrangement and administration of interdisciplinary courses. This necessitates a deliberate transgression of the conventional disciplinary boundaries in the curriculum design, thereby integrating diverse disciplinary knowledge and skills into the curricula and formulating novel teaching content. Concurrently, rigorous evaluation and oversight of the quality and efficacy of these courses are essential to guarantee that students derive genuine benefit from the interdisciplinary courses. Secondly, augmenting international exchanges and collaborations holds paramount significance in fostering interdisciplinary cooperation. By collaborating with renowned foreign universities and research institutions, we can introduce cutting-edge teaching ideologies and methodologies, and furthermore, offer students invaluable opportunities to pursue studies and research abroad. Such bidirectional exchanges are not only conducive to broadening students' international perspectives but also promote mutual understanding and respect among diverse cultures. Thirdly, the establishment of an interdisciplinary research platform is critical to advancing the cultivation of innovative talents. Such a platform can serve as a hub, bringing together researchers from diverse academic backgrounds to collaboratively delve into cutting-edge topics. In this heterogeneous milieu, researchers can inspire each other, leading to the emergence of novel research ideas and solutions. This is instrumental in enhancing research quality and fostering innovative researchers.

In prospecting the forthcoming era, the Sino-foreign collaborative initiative in educational institutions must persist

in delving deeper into and implementing the interdisciplinary educational paradigm. This pursuit not only poses a formidable challenge to and a significant breakthrough from the traditional educational framework, but also serves as a potent catalyst for the innovation and advancement of higher education in China. Leveraging the platform of Sino-foreign cooperation, we can more effectively assimilate and incorporate international cutting-edge educational resources and perspectives, fostering an array of high-caliber talents endowed with a global perspective and innovative prowess. Ultimately, this endeavor will provide steadfast talent support for China to secure a favorable standing in the increasingly intense international arena.

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