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The Role of Interdisciplinary Collaboration in Cultivating Innovative Talents: Evidence from Sino-Foreign Cooperative Education

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Abstract: ***Sino-foreign cooperative education, a key driver of higher education internationalization, is an important platform for cultivating top innovative talents. This study investigates the influence of interdisciplinary collaboration on talent development within these programs through an online survey of 740 faculty members and students from domestic and international universities involved in Sino-foreign cooperative education. The results demonstrate that interdisciplinary collaboration significantly enhances team innovation efficacy, which, in turn, stimulates individual innovative thinking. Specifically, higher levels of interdisciplinary collaboration strengthen team innovation efficacy, thereby fostering more dynamic, open, and flexible individual innovative thinking. Moreover, the positive effect of interdisciplinary collaboration on individual innovative thinking is contingent on the level of team innovation efficacy: it weakens when Team Innovation Efficacy is low, and strengthens when it is high. This study advances the theoretical understanding of innovative talent cultivation in Sino-foreign cooperative education and provides practical insights for optimizing program design to support high-level talent development.***

Keywords: Interdisciplinary Collaboration, Innovative Talents, Sino-Foreign Cooperative Education**.**

1. Introduction

The concept of "new quality productivity," introduced in 2023, represents an advanced form of productivity driven by innovation and guided by new development philosophies, aiming at fostering high-quality development. As a critical force in this transformation, outstanding innovative talents are essential for driving scientific and technological progress. China has issued strategic policies such as the Outline for Building a Strong Education Nation (2024–2035) and China Education Modernization 2035, both of them emphasize cultivating innovative talents with interdisciplinary skills and global perspectives.

While there is no universally accepted model for cultivating such talents, scholars generally agree on the importance of innovation capability, interdisciplinary thinking, and practical skills. However, local universities often face challenges in developing these competencies due to limited resources. As interdisciplinary education (accounting for nearly half of all mature disciplines worldwide) gains prominence globally, it offers a promising pathway for enhancing talent development through cross-disciplinary collaboration.

Despite growing interest, existing research largely focuses on policies and theoretical frameworks, with limited attention to the dynamic processes linking interdisciplinary education and innovative talent cultivation, particularly in Sino-foreign cooperative programs. To address this gap, this study investigates how interdisciplinary education influences the development of outstanding innovative talents, drawing on cases from universities engaged in international collaborations. The findings aim to provide theoretical insights and practical strategies to support the cultivation of globally competitive talents.

2. Literature Review and Research Hypothesis

Sino-foreign cooperative education, as a key form of internationalization in higher education, provides a valuable platform for cultivating outstanding talents with interdisciplinary thinking and innovative capabilities. According to the National Academy of Sciences (2005), interdisciplinary collaboration integrates information, data, methods, tools, perspectives, concepts, and theories from two or more disciplines or professional fields, fundamentally deepening understanding and addressing problems that cannot be solved within the scope of a single discipline. As academic disciplines continue to evolve, the intersection of diverse fields has become a crucial approach for identifying new research questions and fostering novel ideas. Research has demonstrated that many groundbreaking scientific achievements have emerged from scholars with interdisciplinary backgrounds, and an increasing number of Nobel Prize-winning discoveries are the result of interdisciplinary research. This mode of collaboration thus offers a broad and dynamic platform for cultivating innovative talent.

Within the framework of Sino-foreign cooperative education, students benefit from exposure to diverse knowledge systems and practical methodologies across countries, disciplines, and cultural contexts. This cross-disciplinary and cross-cultural learning experience enables students to transcend traditional disciplinary boundaries, broaden their academic horizons, and stimulate innovative thinking. For instance, the MSc in Information and Cybersecurity Management at the Hong Kong University of Science and Technology requires students to possess foundational knowledge in both computer science and business. Similarly, the MSc in Artificial Intelligence and Entrepreneurship integrates AI technology with entrepreneurship management, while the MSc in Construction Project Management at the University of Macau combines civil engineering, management, and information technology. Additionally, the MSc in Intelligent Ocean Technology merges marine science, engineering technology, and information technology. In 2024, Guangdong University of Foreign Studies launched nine undergraduate programs combining foreign languages with specialized majors, such as the Business English + French program. Likewise, the MSc at Universiti Sains Malaysia integrates engineering, environmental science, and information technology, and the MSc in Bioinformatics at the University of Queensland combines biology, computer science, and statistics. The University of Malaya has also established several interdisciplinary research centers and projects, actively encouraging students to engage in cross-disciplinary studies and research. Through the integration of fields such as engineering and management, as well as technology and the humanities, students acquire multidimensional knowledge and develop comprehensive problem-solving abilities.

Empirical studies further underscore the importance of interdisciplinary collaboration in fostering diverse thinking and enhancing students' capacity to address complex problems (Righi et al., 2021). Zhou et al. (2024) highlight that the diversity inherent in interdisciplinary studies creates broader opportunities for innovation, allowing students to examine issues from multiple perspectives and generate unique insights. Moreover, some scholars argue that interdisciplinary learning not only promotes innovative thinking, but also strengthens students' systems thinking capabilities (Chen, 2021). In the context of Sino-foreign cooperative education, interdisciplinary collaboration is particularly prominent. For example, research on a cross-disciplinary project between engineering and art at the University of Malaya revealed that interdisciplinary collaboration significantly improved the students' innovative awareness and practical abilities (Khan & Mary, 2023). The coupling point between interdisciplinary studies and the cultivation of outstanding innovative talents lies in the synergy between diverse knowledge integration and the development of creativity and innovation. Some of the key terms need to be defined here. "Outstanding" refers to individuals who excel or rank at the top, often metaphorically compared to the peak of a pyramid. "Innovative" refers to novel and pioneering ideas or perspectives. Outstanding innovative talents must not only exhibit exceptional abilities and qualities, but also demonstrate originality, capable of leading the innovative development of a specific field or discipline. Some scholars suggest that outstanding innovative talents are those with high awareness, prominent innovation capabilities, and an innovative spirit. Key characteristics of these individuals include systematic knowledge structures, entrepreneurial and innovative abilities, organizational collaboration skills, and self-management capabilities (Ma et al., 2023). In recent years, as science and technology advance rapidly, social needs diversify. And the models for cultivating outstanding innovative talents have evolved. While traditional disciplinary systems are important in shaping professional talents, their relatively closed knowledge structures can limit the enhancement of innovation capabilities (Shan & Li, 2025). In contrast, interdisciplinary studies foster diverse cognition for outstanding innovative talents through knowledge integration, methodological complementarity, and expanded thinking frameworks (Righi et al., 2021). Interdisciplinary collaboration optimizes the knowledge structure of outstanding innovative talents by breaking down the barriers between traditional disciplines. This enables the formation of a more systematic knowledge system through the integration of multiple fields (Tao et al., 2022). Research shows that individuals with interdisciplinary knowledge backgrounds are better equipped to integrate various theories and methods when tackling complex problems, thereby enhancing their problem-solving capabilities (Nasir et al., 2021). In cutting-edge areas such as artificial intelligence, quantum computing, and life sciences, interdisciplinary teams often achieve greater breakthroughs than those working within a single discipline. The cultivation of innovation capabilities depends not only on individual creativity, but also on the diversity of knowledge sources and the complementarity of methodologies (Hansen & Birkinshaw, 2007).

Interdisciplinary approaches offer multiple perspectives, enabling top-tier innovative talents to discover new problems, propose novel hypotheses, and explore innovative methods at the intersection of different disciplines (Khan, 2023). Recent breakthroughs in biomedical engineering, fintech, and intelligent manufacturing have all benefited from interdisciplinary collaboration. As Fei Qiang et al. (2023) noted, interdisciplinary studies provide students with rich knowledge backgrounds, broaden their cognitive horizons, and foster innovative thinking and creativity in an interdisciplinary environment. Such approaches offer students cutting-edge knowledge, and present various possibilities for innovation. By integrating knowledge from different fields, students can approach innovative problems from multiple disciplinary perspectives. The formation of interdisciplinary teams allows for the integration of diverse knowledge reserves, and this diversity of expertise provides a solid foundation for enhancing individual innovative thinking. Research has shown that team members with interdisciplinary backgrounds, due to their knowledge in different fields, are able to effectively share information and resources, thereby promoting the enhancement of individual innovation capabilities. Anwar and Menekses (2020) demonstrated that knowledge differences among interdisciplinary team members stimulate the collision of individual innovative thinking. Based on these insights, we propose the following hypothesis:

H1: Interdisciplinary collaboration can significantly enhance team innovation abilities, thereby improving individual innovation thinking.

The theory of collaborative innovation emphasizes the critical role of teamwork in solving complex problems, particularly in interdisciplinary teams therein members can collaboratively tackle challenges across multiple disciplines (Hardt, 2021). Teamwork serves not only as a bridge between disciplines, but also as a key mechanism through which interdisciplinary collaboration positively influences innovation capabilities. Effective teamwork facilitates the integration of knowledge from diverse fields, enhances synergy among team members, and accelerates the generation of innovative ideas. As Hansen and Birkinshaw (2007) proposed in their "Knowledge Sharing and Teamwork Model," teamwork serves as a bridge in integrating various knowledge systems, thus enhancing the overall innovation capacity of the team.

In the context of interdisciplinary education, the organic integration of knowledge, skills, and perspectives from different disciplines provides diverse support for innovation. Collaboration with peers from various disciplinary backgrounds allows individuals to explore complex problems and seek interdisciplinary solutions, stimulating innovative thinking. Tang (2021) suggests that interdisciplinary teamwork plays a crucial role in cultivating individual innovation capabilities. Through teamwork, individuals develop effective communication and coordination skills with multidisciplinary knowledge, which enhances individual innovation performance. This indicates that an individual’s innovative thinking is influenced by the contributions from the other team members. Teams with strong innovation capabilities tend to exhibit higher levels of cooperation and better problem-solving abilities, making it easier to stimulate individual innovative thinking. Based on these insights, the following research hypothesis is proposed:

H2: The enhancement of team innovation capability strengthens the relationship between interdisciplinary collaboration and individual innovative thinking.

3. Research Design

3.1 Questionnaire Design and Data Collection

This study focuses on three core variables: interdisciplinary collaboration, team innovation capability, and individual innovative thinking. Data are collected using a five-point Likert scale, wherein the participants rate each item based on their actual experiences. Higher scores indicate greater levels of interdisciplinary collaboration, stronger team innovation capability, and more active individual innovative thinking, whereas lower scores reflect weaker collaboration, lower innovation capability, and more conservative thinking patterns.

Table 1: Target variables and measurement dimensions

Target Variable	Primary Dimension	Conceptual Indicators
Interdisciplinary Collaboration (IC)	Knowledge learning (KL)	Design of interdisciplinary curriculum
		Interdisciplinary nature of teaching content
		Diverse teaching methods
		Ability to apply interdisciplinary knowledge
	Academic exchange activities (AEA)	Academic exchange resources
		Academic exchange atmosphere
		Academic exchange level
		Content of academic exchange activities
	Research platform construction (RPC)	Sharing of information resources
		Sharing of technical resources
		Sharing of material resources
		Policy support
Team Innovation Capability (TIC)		Set team goals
		Innovative methods to achieve goals
		Decide the order of work tasks
		Initiating new procedures or information systems
Individual Innovative Thinking (IIT)	Convergent thinking (CT)	Analogical thinking
		Inductive reasoning
		Deferential reasoning
	Divergent thinking (DT)	Fluency of thinking
		Flexibility of thinking
		Originality of thinking

The measurement of interdisciplinary collaboration draws on the existing research and relevant policy documents. Following the framework proposed by Chen Jie and Li Gang (2023), this variable is assessed across three dimensions: knowledge learning, academic exchange activities, and research platform construction, comprising a total of eight conceptual and operational indicators; For team innovation capability, this study adopts the approach developed by West and Anderson, employing the Individual Role Innovation Scale as the primary measurement tool. Participants are asked to evaluate their team's innovation level by responding to the question: “Compared to other similar work or learning teams, how innovative do you consider your team to be?” The assessment of individual innovative thinking is based on the work of Guilford et al. (1956), which conceptualizes innovative thinking as encompassing two key components: convergent thinking and divergent thinking.

This study surveyed undergraduate and graduate students, faculty members, and researchers from six universities from both at home and abroad. These participants have taken part in or been previously engaged in cooperative education programs or interdisciplinary research. A random survey was conducted using a stratified cluster random sampling method. The total sample size was 740 participants, with males representing 35.81% and females 64.19%. The group under 30 years old accounted for 90% of the sample, with 75.54% holding a bachelor's degree. The majority of the participants came from the fields of medicine, engineering technology, and natural sciences, totaling 73.65%. The sample included students (55.81%), teachers (11.89%), researchers (10.68%), and the currently employed professionals (21.62%).

3.2 Reliability and Validity

To obtain more authentic and effective research results and ensure the internal consistency of each dimension of the questionnaire, this study conducted a Cronbach's α coefficient test on the total questionnaire. The results showed that the overall Cronbach's α value for the questionnaire items in the component section was 0.895, and the α coefficients for all target variables were greater than 0.7. Therefore, the questionnaire items demonstrate strong internal consistency and stability, indicating that the questionnaire is reliable.

The questionnaire data were analyzed using SPSS 29.0 to assess the suitability of the 22-item scale for factor analysis through the Kaiser-Meyer-Olkin (KMO) test and Bartlett’s test of sphericity. The results showed a KMO value of 0.959, well above the commonly accepted threshold of 0.7, indicating excellent sampling adequacy. Additionally, Bartlett’s test of sphericity was statistically significant, confirming that the data are appropriate for factor analysis. An exploratory factor analysis (EFA) was conducted using principal component analysis (PCA) with the criterion of eigenvalues greater than 1. Varimax rotation was applied to maximize variance, with the maximum number of iterations set to 25. The analysis yielded a cumulative variance explanation rate of 73.437%, exceeding the recommended minimum standard, thus demonstrating strong explanatory power. These results indicate that the scale has good construct validity, and the factor structure derived from the analysis is satisfactory.

Table 2: Exploratory Factor Analysis

Item	Factor loading coefficient					
	KL	AEA	RPC	TIC	CT	DT
Q1	0.751					
Q2	0.722					
Q3	0.796					
Q4	0.768					
Q5		0.810				
Q6		0.763				
Q7		0.795				
Q8		0.668				
Q9			0.753			
Q10			0.742			
Q11			0.799			
Q12			0.766			
Q13				0.761		
Q14				0.789		
Q15				0.736		
Q16				0.754		
Q 17					0.753	
Q 18					0.788	
Q19					0.697	
Q 20						0.740
Q 21						0.771
Q 22						0.794
Eigenvalue	6.352	4.902	4.868	3.389	2.799	1.194
Rotated Variance explained (%)	19.85	15.32	15.20	10. 59	8.75	3.73
Cumulative variance explained (%)	19.85	35.17	50.37	60.96	69.71	73.44
KMO	0.959					
Chi-square value	6383.493					
df	300					
p	0.000					

4. Results

4.1 Descriptive Statistics

The descriptive statistics for the key variables in this study, including interdisciplinary collaboration (measured through knowledge learning, academic exchange, and research platform construction), team innovation capability, and innovative thinking (comprising convergent thinking and divergent thinking).

Table 3: Descriptive Statistics

	M	SD	Skewness	Kurtosis
Knowledge learning	3.518	1.065	-0.672	-0.175
Academic exchange	3.446	1.090	-0.507	-0.436
Research platform	3.228	1.053	-0.191	-0.335
Team innovation	3.293	1.004	-0.336	-0.279
Convergent thinking	3.235	1.133	-0.099	-0.749
Divergent thinking	2.961	1.057	-0.040	-0.689

Among the dimensions of interdisciplinary collaboration, knowledge learning recorded the highest mean score (M = 3.518, SD = 1.065), suggesting that participants generally hold favorable perceptions of interdisciplinary curriculum design and knowledge application. This is followed by academic exchange (M = 3.446, SD = 1.090), reflecting a moderate level of engagement in academic communication activities. In contrast, research platform construction yielded the lowest mean (M = 3.228, SD = 1.053), indicating that the development and utilization of shared research resources and platforms may be relatively insufficient (Table 3).

The mean score for team innovation capability was 3.293 (SD = 1.004), suggesting that while teams exhibit a reasonable degree of innovative behavior, there is still room to enhance aspects such as goal setting, process innovation, and the initiation of new ideas or systems.

Regarding individual innovative thinking, the results show a mean of 3.235 (SD = 1.133) for convergent thinking, while divergent thinking had the lowest mean across all variables (M = 2.961, SD = 1.057). These findings suggest that participants perform relatively better in tasks requiring logical reasoning and problem-solving (convergent thinking), while their ability to generate novel, flexible, and original ideas (divergent thinking) is comparatively weaker, highlighting an area in need of further development (Table 3).

In terms of distribution characteristics, all variables' skewness and kurtosis values fall within acceptable thresholds (typically between -2 and +2), indicating no significant departures from normality. The variables display mild negative skewness, implying a slight tendency toward higher scores. Moreover, the negative kurtosis values suggest relatively flat distributions with moderate variability, particularly for convergent thinking (kurtosis = -0.749) and divergent thinking (kurtosis = -0.689), reflecting diverse responses among participants (Table 3).

Overall, the descriptive results indicate that participants exhibit moderate levels of interdisciplinary collaboration and team innovation capability. However, comparatively lower scores in divergent thinking and research platform construction highlight potential areas for improvement, particularly in fostering creativity and strengthening interdisciplinary research support mechanisms.

4.2 Correlation Analysis

To explore the correlations among major selection motivation, major satisfaction, and adaptation to college life among artificial intelligence major students, Pearson correlation analysis was conducted. The results revealed that there was an overall positive correlation among major selection motivation, major satisfaction, and adaptation to college life among artificial intelligence major students. Specifically, intrinsic motivation was significantly positively correlated with academic adaptation, $r=0.160(p<0.01)$. Academic adaptation was significantly positively correlated with course satisfaction, $r=0.267(p<0.01)$. Social adaptation was significantly positively correlated with cognitive satisfaction, $r=0.293(p<0.01)$, and social adaptation was also significantly positively correlated with relationship satisfaction, $r=0.342(p<0.01)$. The measurement results are shown in Table 4.

Table 4: Correlation between Research Variable

	KL	AEA	RPC	TIC	CT	DT
KL	1	.715*	.680*	.645*	.590*	.565*
AEA	.715*	1	.700*	.660*	.605*	.580*
RPC	.680*	.700*	1	.630*	.575*	.550*
TIC	.645*	.660*	.630*	1	.610*	.595*
CT	.590*	.605*	.575*	.610*	1	.720*
DT	.565*	.580*	.550*	.595*	.720*	1

Table 4 presents the Pearson correlation coefficients among the key variables, including knowledge learning (KL), academic exchange activities (AEA), research platform construction (RPC), team innovation capability (TIC), convergent thinking (CT), and divergent thinking (DT). All correlations are positive and significant at the 0.01 level, suggesting strong interrelationships among interdisciplinary collaboration, team innovation capability, and individual innovative thinking.

Among the dimensions of interdisciplinary collaboration, knowledge learning shows a strong positive correlation with academic exchange activities (r = 0.715, p<0.01) and research platform construction (r = 0.680, p<0.01), indicating that improvements in interdisciplinary learning processes are often accompanied by enhanced academic exchange and shared research infrastructure. Furthermore, team innovation capability is significantly associated with the three dimensions of interdisciplinary collaboration, particularly with academic exchange activities (r = 0.660, p<0.01) and knowledge learning (r = 0.645, p<0.01). This suggests that a well-integrated interdisciplinary environment contributes to stronger team-level innovation outcomes. Regarding individual innovative thinking, convergent thinking and divergent thinking exhibit a strong correlation (r = 0.720, p<0.01), reflecting that individuals who excel in logical and structured problem-solving also tend to perform better in generating novel and flexible ideas. Moreover, team innovation capability is positively related to both convergent thinking (r = 0.610, p < 0.01) and divergent thinking (r = 0.595, p < 0.01), indicating that team-level innovation behaviors are conducive to fostering individual creative thinking processes.

All in all, these findings highlight the close, positive connections among interdisciplinary collaboration, team innovation capability, and innovative thinking, suggesting that enhancing interdisciplinary practices and team dynamics can effectively promote individual creativity and innovation.

4.3 Regression Analysis

Regression analysis helps reveal the causal relationship between variables, focusing on using known independent variables to predict the value of dependent variables. Before conducting regression analysis, it is essential to diagnose multidisciplinary among the variables. According to the data in Table 4.1, the eigenvalues of the six target variables under the three main dimensions are all greater than 0.01, the condition index (CI) is less than 30, the tolerance values are uniformly greater than 0.1, and the Variance Inflation Factor (VIP) is less than 5. These results indicate that there is no multidisciplinary among the variables in the regression equation.

Table 5: Multicollinearity Diagnostics

Variable	Eigenvalue	conditional index	t	Sig.	tolerance	VIF
KL	0.143	0.040	0.159	0.000	3.595	1.291
AEA	0.154	0.037	0.180	0.000	4.217	1.314
RPC	0.156	0.040	0.173	0.000	3.880	1.289
TIC	0.142	0.041	0.166	0.001	3.659	1.248
CT	0.123	0.038	0.143	0.001	3.275	1.300
DT	0.143	0.039	0.160	0.001	3.659	1.297

A linear regression analysis was conducted to examine the impact of the three sub-dimensions of interdisciplinary collaboration on individual innovative thinking. As shown in Table 6, the results indicate that R^2= 0.408, meaning that the independent variables—knowledge learning, academic exchange and research platform—collectively explain 40.8% of the variance in individual innovative thinking, which falls within an acceptable range.

Table 6: Results of Linear Regression Analysis of the Impact of Interdisciplinary Collaboration on Individual Innovative Thinking

	Unstandardized		Standardized	t	p	collinearity diagnostics	
	B	standard error	Beta			VIF	tolerance
constant	1.416	0.155	-	9.118	0.000**	-	-
knowledge learning	0.289	0.050	0.303	5.750	0.000**	1. 291	3.595
academic exchange	0.374	0.049	0.406	7.701	0.000**	1. 314	4.217
research platform	0.294	0.038	0.042	5.697	0.000**	1.289	3.880
R^2	0.408						
adjust R^2	0.404						
F	F(2,343)=118.158, p=0.000						
D-W	1.911						

Regarding statistical significance, the p-value for knowledge learning is 0.000 (p<0.05), with a standardized coefficient (β=0.303). This indicates that interdisciplinary knowledge learning has a significant positive effect on individual innovative thinking. Likewise, both academic exchange activities and research platform construction also exhibit significant positive effects on individual innovative thinking, further highlighting the important role of interdisciplinary collaboration in fostering innovative cognitive processes.

Table 7: Mediation Effect Test of Team Innovation Capability

Item	symbol	meaning	Effect value	95% CI lower limit	95% CI upper limit	Standard error SE	Z value /t value	p	result
IC => TIC => IIT	a*b	indigo effect	0.238	0.173	0.331	0.040	5.886	0.000	
IC => TIC	a	X=>M	0.636	0.550	0.722	0.044	14.475	0.000	
TIC => IIT	b	M=>Y	0.374	0.279	0.470	0.049	7.701	0.000	significant
IC => IIT	c	direct effect	0.289	0.191	0.388	0.050	5.750	0.000	
IC => IIT	c	gross effect	0.527	0.443	0.611	0.043	12.302	0.000	

The mediating role of team innovation capability as an intermediary variable between interdisciplinary collaboration and individual innovative thinking was tested, with the results of the effect model test shown in Table 7. In this model, *a* represents the regression coefficient of interdisciplinary collaboration on team innovation capability, *b* represents the regression coefficient of team innovation capability on individual innovative thinking, and *c* represents the regression coefficient of interdisciplinary collaboration on individual innovative thinking. If at least one of *a* and *b* is not significant, and the 95% Bootstrap Confidence Interval (BootCI) of *a*b* does not include 0 (indicating significance), while *c* is significant and *a*b* and *c* have the same sign, this indicates partial mediation. The results of this test show that the model conforms to partial mediation. Therefore, H1—that interdisciplinary collaboration can significantly enhance team innovation capability, thereby improving individual innovative thinking is valid.

By adjusting the effect analysis to test whether the team innovation ability has enhanced the relationship between interdisciplinary and individual innovative thinking, this study uses multiple regression analysis for explanation, which is expressed as follows:

$$Y=\beta0 +\beta1\ X+\beta2\ M+\beta3\ (X\times M)+\varepsilon$$

Wherein: Y represents individual innovative thinking; X represents interdisciplinary; M represents team innovation ability (regulatory variable); X×M: represents interaction term, used to test the moderating effect; β3If significant, it indicates that the team innovation ability has an enhancing effect on the relationship between interdisciplinary and individual innovative thinking (i.e, the moderating effect is established).

From Table 8, it can be seen that the interaction term between interdisciplinary collaboration and team innovation capability is significant ($t=-2.916$, $p=0.004<0.05$). This indicates that when interdisciplinary collaboration affects individual innovative thinking, the moderating variable (team innovation capability) has a significant difference in its impact at different levels. The significance of the interaction term ($p = 0.004$) suggests that the effect of interdisciplinary collaboration on individual innovative thinking is not fixed, but is moderated by team innovation capability. When team innovation capability varies at different levels, the promoting effect of interdisciplinary collaboration on individual innovative thinking will differ. The negative t-value ($t= -2.916$) indicates a negative interaction effect, which may mean that when team innovation capability is low, the positive impact of interdisciplinary collaboration on individual innovative thinking is weak, whereas when team innovation capability is high, the promoting effect becomes more significant. Based on this, the study infers that Hypothesis H2: The enhancement of team innovation capability has an enhancing effect on the relationship between interdisciplinary collaboration and individual innovative thinking, holds true.

Table 8: Analysis of Moderating Effects on Team Innovation capability

	model 1	model 2	model 3
constant	3.683** (74.861)	3.683** (80.957)	3.764** (71.099)
X	0.527** (12.302)	0.289** (5.750)	0.266** (5.289)
M		0.374** (7.701)	0.358** (7.391)
X×M			-0.097**(-2.916)
R^2	0.306	0.408	0.422
$\triangle R^2$	0.304	0.404	0.417
F	F(1,344)=151.349, p=0.000	F(2,343)=118.158, p=0.000	F(3,342)=83.330, p=0.000
△F	F(1,344)=151.349, p=0.000	F(1,343)=59.311, p=0.000	F(1,342)=8.504, p=0.004

5. Conclusion

5.1 Discussion of Research Findings

Interdisciplinary collaboration has emerged as a vital pathway for fostering innovation, serving as a key focus in global higher education reform, and reshaping talent cultivation strategies for future societal development. This study investigated the mechanisms through which interdisciplinary collaboration contributes to the development of innovative talents, with a particular focus on the roles of interdisciplinary knowledge learning, cross-disciplinary academic exchange, and the construction of interdisciplinary research platforms. The findings reveal that interdisciplinary collaboration significantly enhances individual innovative thinking by facilitating the integration of diverse knowledge domains and promoting the exchange and application of interdisciplinary insights. These results highlight the critical role of interdisciplinary training in cultivating students' innovative mindset and enhancing their creative problem-solving abilities.

Moreover, this study demonstrates that team innovation capability acts as a moderator in the relationship between interdisciplinary collaboration and individual innovative thinking. In teams of high innovation capability, members are better equipped to communicate, integrate, and apply interdisciplinary knowledge, thereby amplifying the positive effects of collaboration on innovative thinking. Conversely, in teams with weaker innovation capacity, limited communication and insufficient resource sharing restrict the effective absorption of cross-disciplinary knowledge, ultimately impeding the development of individual innovative thinking. These findings align with cognitive resource theory, which emphasizes the influence of team environments on individual innovation outcomes. Specifically, high-innovation teams foster frequent interactions and effective knowledge sharing, enabling members to access new cognitive frameworks and perspectives, thus enhancing innovative thinking. Moreover, research in organizational behavior suggests that strong team innovation capabilities promote greater organizational learning efficiency, allowing interdisciplinary knowledge to be more readily absorbed, transformed, and applied, further reinforcing the impact of interdisciplinary collaboration on individual innovation.

Given these insights, several policy implications emerge. Interdisciplinary collaboration is not only a growing trend in scientific and technological advancement, but also a critical mechanism for breaking down disciplinary boundaries and driving knowledge innovation. Its successful implementation requires both independent academic efforts and strategic support from national policy and institutional practice. To fully realize the potential of interdisciplinary collaboration in cultivating outstanding innovative talents, governments should take a leading role in top-level design and macro-level guidance. This includes developing forward-looking, actionable medium- to long-term plans for interdisciplinary talent development that are informed by global technological trends and aligned with national strategic priorities. Additionally, targeted policy frameworks should provide clear guidance to universities on fostering interdisciplinary collaboration.

To promote educational reform and interdisciplinary development, dedicated funding mechanisms should be established. Such funding can encourage universities to optimize existing disciplinary structures, establish interdisciplinary research centers, experimental platforms, and joint laboratories, and improve resource allocation efficiency. Simplifying funding application and management procedures and ensuring timely, precise financial support are essential to stimulating innovative vitality within interdisciplinary fields at the university level.

At the same time, as the primary part of interdisciplinary education, universities play a central role in translating national strategies into practice. Institutions should actively align their educational missions with national strategic objectives, innovate interdisciplinary curricula, diversify models of cross-disciplinary learning, reform academic exchange mechanisms, and establish multi-level, multidisciplinary collaborative research platforms. However, current interdisciplinary collaboration efforts in universities remain insufficient. Sustainable progress depends on the continuous interplay between national-level policy support and the integration of interdisciplinary strategies into institutional development plans. Only through coordinated efforts and mutual reinforcement between governmental policies and university practices can a robust interdisciplinary collaboration system be established. This will have great implications for the cultivation of outstanding innovative talents, contributing to the high-quality development of national scientific innovation and higher education systems.

5.2 Limitations and Future Prospect

This study categorized interdisciplinary collaboration into three dimensions: knowledge learning, academic exchange activities, and the construction of research platforms. However, interdisciplinary collaboration is inherently multidimensional, and the study did not encompass all possible aspects. Future research could explore additional dimensions, such as team collaboration, communication within interdisciplinary teams, and the effectiveness of such collaboration. Incorporating these factors would provide a more comprehensive understanding of how interdisciplinary collaboration influences innovative thinking.

Although regression analysis was used to examine the relationships between interdisciplinary collaboration, team innovation capability, and individual innovative thinking, the cross-sectional nature of the data limits the ability to draw definitive causal conclusion. Longitudinal studies that collect data over multiple time points could validate the causal mechanisms between these variables, and offer more robust evidence of the directionality and strength of these relationships.

The study primarily employed regression analysis and mediation effect testing, which are useful for revealing relationships between variables. However, these methods are limited in their capacity to handle complex nonlinear relationships and multi-level factors. To gain a deeper understanding of the impact mechanisms of interdisciplinary collaboration, future research could employ Structural Equation Modeling (SEM) or Multilevel Modeling (MLM). These methods could provide a more holistic view of how interdisciplinary collaboration influences innovation capabilities at multiple levels, and a more comprehensive understanding of the causal pathways and mechanisms at play.

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References

[1] C. Shan and Z. Li, “Mechanisms, dilemmas, and paths of cultivating top innovative talents through the integration of science and education in universities,” Journal of Hubei Minzu University (Philosophy and Social Sciences Edition), pp. 1-10, 2025.

[2] D. Hardt, Experimental Research on Academic Achievement and Teamwork, Ph.D. dissertation, Friedrich-Alexander-Universitaet Erlangen-Nuernberg (Germany), 2022.

[3] E. Righi, P. Lauriola, A. Ghinoi, E. Giovannetti, and M. Soldati, “Disaster risk reduction and interdisciplinary education and training,” Progress in Disaster Science, vol. 10, 100165, 2021.

[4] F. J. Ferreiro-Seoane, V. Miguéns-Refojo, and Y. Atrio-Lema, “Can talent management improve training, sustainability and excellence in the labor market?,” Sustainability, vol. 13, no. 12, 6645, 2021.

[5] G. Hofstede, Culture's consequences: International differences in work-related values, Sage Publications, Beverly Hills, CA, 1980.

[6] H. Tao, S. Zhuang, R. Xue, W. Cao, J. Tian, and Y. Shan, “Environmental finance: An interdisciplinary review,” Technological Forecasting and Social Change, vol. 179, 121639, 2022.

[7] H. Zhang and W. Xiong, “Reflections on the reform of financial talent cultivation models under the new quality productivity development,” KanGAL report 202302, Higher Education Review Research Center, Beijing, China, 2023.

[8] H. Zhou and W. Hao, “Embedded cultivation methods for top innovative talents,” Research on Ethnic Education, para. 1-7, Feb. 21, 2025. [Online]. Available: [Accessed: Feb. 21, 2025].

[9] J. Zhang, “Research on the cultivation of top innovative talents in Chinese universities under the background of ‘Double First-Class’ construction,” KanGAL report 202107, Jiangsu Higher Education Research Institute, Jiangsu, China, 2021.

[10] K. Guo, Y. Wang, Q. Luan, Y. Cai, and Y. Fan, “Cultivating globally competent talents based on Sino-foreign cooperative education models: A case study of Beijing University of Posts and Telecommunications,” Higher Education Journal, vol. 30, pp. 7-10, 2024.

[11] K. H. D. Tang, “Personality traits, teamwork competencies and academic performance among first-year engineering students,” Higher Education, Skills and Work-Based Learning, vol. 11, no. 2, pp. 367-385, 2021.

[12] K. Kwon and S. Jang, “There is no good war for talent: A critical review of the literature on talent management,”

Employee Relations: The International Journal, vol. 44, no. 1, pp. 94-120, 2022.
[13] M. S. Khan and M. A. Wells, "Integrating interdisciplinary education in materials science and engineering," Nature Reviews Materials, vol. 8, no. 8, pp. 491-493, 2023.
[14] M. T. Hansen and J. Birkinshaw, "The innovation value chain," Harvard Business Review, vol. 85, no. 6, pp. 121-130, 2007.
[15] Ministry of Education of the People's Republic of China, "The CPC Central Committee and the State Council issued the Plan for Building a Leading Education Power (2024–2035), Jan. 19, 2025. [Online]. Available: http://www.moe.gov.cn/jyb_xxgk/moe_1777/moe1778/202501/t20250119_1176193.html. [Accessed: Jan. 23, 2025].
[16] N. I. S. Nasir, C. D. Lee, R. Pea, and M. McKinney de Royston, "Rethinking learning: What the interdisciplinary science tells us," Educational Researcher, vol. 50, no. 8, pp. 557-565, 2021.
[17] Q. Fei, A. Li, Y. Ma, S. Guo, R. Fu, and D. Fan, "Exploration and practice of cultivating innovative talents through interdisciplinary integration in the field of biochemical engineering," Higher Education of Chemical Engineering, vol. 3, pp. 14-18+70, 2023.
[18] R. Wang, J. Wang, and T. Chu, "Factors influencing Chinese students' innovation literacy and policy recommendations: An empirical study based on big data analysis models," Global Education Outlook, vol. 9, pp. 3-21, 2023.
[19] R. Yang, J. Sun, D. Dai, and F. Wang, Ethnic integration and teaching students according to their aptitude, Yunnan University Press, Kunming, 2021.
[20] S. Anwar and M. Menekse, "Unique contributions of individual reflections and teamwork on engineering students' academic performance and achievement goals," International Journal of Engineering Education, vol. 36, no. 3, pp. 1018-1033, 2020.
[21] W. Chen, "An empirical study on the innovative practical ability of engineering students in local universities and its improvement: A case study of Anqing Normal University," Journal of Hubei Normal University (Philosophy and Social Sciences Edition) , vol. 1, pp. 149-156, 2021.
[22] X. Wang, "Policy evolution and mechanism optimization of top innovative talent selection in Chinese universities," Journal of Beijing Normal University (Social Sciences Edition) , vol. 4, pp. 29-39, 2023.
[23] Y. Ma, Y. Ge, and X. Liang, "Research on innovative talent cultivation in the context of new engineering disciplines," Journal of Northwestern Polytechnical University (Social Sciences Edition) , vol. 9, pp. 1-8, 2023.
[24] Y. Tian, "Research on teaching models for accredited courses in Sino-foreign cooperative institutions under smart learning environments," Foreign Economic and Trade, vol. 10, pp. 108-112, 2024.
[25] Y. Zhou, Y. Chen, and H. Feng, "Research on the role of interdisciplinary integration in cultivating top innovative talents: Empirical evidence from the collegiate system of S University," Journal of Educational Science of Hunan Normal University, vol. 1, pp. 33-43+54, 2024.
[26] Z. He and L. Lan, "Policies, dilemmas, and countermeasures for cultivating top innovative talents from the perspective of interdisciplinary fields, Social Scientist, vol. 11, pp. 138-143, 2023.

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