

The Impact of International Cooperation Programs and Scholarly Exchanges on the Cultivation of International Talent through Internationalization Development Strategy: Evidence from Universities in Heilongjiang Province, China

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Abstract

This study investigates the mechanisms through which international cooperation programs (ICP) and international student exchange (ISE) contribute to the development of collaborative international ties (CIT), with international scholarly exchanges (IDS) examined as a mediating factor. Using structural equation modeling (SEM), data were analyzed to test seven hypotheses. The results show that while ICP did not significantly predict IDS, ISE had a strong positive effect on IDS, highlighting the importance of academic mobility in fostering scholarly collaboration. Both ICP and ISE directly enhanced CIT, and IDS further reinforced CIT, confirming its mediating role. Mediation analysis revealed that IDS did not mediate the relationship between ICP and CIT but significantly mediated the effect of ISE on CIT. These findings underscore the centrality of student exchanges and scholarly collaboration in building sustainable international partnerships. The study contributes to the literature on higher education internationalization by clarifying the pathways through which institutional strategies influence global academic ties and provides practical insights for policymakers and universities aiming to strengthen international collaboration.

Keywords: *International Cooperation Programs, International Scholarly Exchanges, Cultivation of International Talent, Internationalization Development Strategy, Universities students.*

Introduction

The internationalization of higher education has become a central strategic priority worldwide, as universities increasingly aim to cultivate graduates with global competencies, intercultural adaptability, and international employability. In China, this transformation is particularly significant, where higher education institutions are under growing pressure to align with the demands of the global knowledge economy (Liang, 2025). Within this context, Heilongjiang Province represents a unique case. As a border region adjacent to Russia, Heilongjiang has both opportunities and challenges in advancing its internationalization agenda. While the province benefits from geographical proximity that facilitates cross-border educational cooperation, its universities face constraints such as insufficient international faculty, limited curriculum internationalization, and underdeveloped global exchange networks (Weiyu & Li, 2021; Hou, 2022).

A key challenge is the absence of coherent internationalization development strategies (IDS). Although many universities have implemented fragmented initiatives such as visiting scholar exchanges or joint programs, these efforts often lack integration into long-term institutional frameworks. This results in limited impact on the cultivation of international talent (CIT), which has become a critical benchmark for assessing the effectiveness of higher education internationalization (Zhang & Wang, 2024). The cultivation of such talent requires not only participation in international cooperation programs (ICP) and

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scholarly exchanges (ISE) but also the establishment of comprehensive strategies that can mediate and amplify their outcomes.

Recent evidence suggests that international cooperation programs, including joint degree initiatives and bilateral partnerships, play a vital role in enhancing institutional visibility and resource sharing (Zheng, 2024b). Similarly, international scholarly exchanges strengthen academic mobility, foster cross-cultural competencies, and expand research collaboration (Hou, 2022). However, without a strong IDS, the impact of ICP and ISE on CIT remains fragmented and inconsistent. Thus, IDS may act as a mediating mechanism through which these initiatives translate into meaningful educational outcomes.

Against this backdrop, this study focuses on universities in Heilongjiang Province and investigates the interplay between ICP, ISE, IDS, and CIT. Specifically, it examines how international cooperation programs and scholarly exchanges contribute to talent cultivation, both directly and indirectly, through the implementation of internationalization development strategies. By doing so, the research aims to generate insights into how local institutions can effectively operationalize internationalization in ways that align with global standards while addressing regional challenges.

Literature Review and Hypotheses Development

International Cooperation Programs (ICP), International Scholarly Exchanges (ISE) and Cultivation of International Talent (CIT)

Recent empirical research on Sino-foreign cooperative education and joint degree programs indicates that institutionalized international cooperation initiatives significantly enhance students' global competence and readiness for further study or employment. Mechanisms such as joint curriculum design, dual or co-supervision, and inter-campus resource sharing have been shown to contribute meaningfully to these outcomes. Studies focusing on Sino-foreign universities in China reveal that, at the master's level, cooperative programs exhibit greater alignment with international standards in curriculum frameworks, industry integration, and competency models—thereby strengthening students' cross-cultural communication, research methodology, and transferable professional skills (Lai, 2024). Case-based empirical evidence further demonstrates that students enrolled in liberal arts pathways within Sino-foreign institutions report higher self-assessed employability—particularly in problem-solving, teamwork, and intercultural expression—compared to control groups (He, 2024). In addition, longitudinal comparative studies tracking transitions to postgraduate education in the UK and US suggest that English-medium Sino-foreign programs (as a form of International Cooperation Program, ICP) improve students' academic adaptation and scholarly output abroad, thereby indirectly enhancing their international competitiveness (Zou et al., 2022). Overall, ICPs contribute positively to key dimensions of Cultivation of International Talent (CIT), including competence development, adaptive capacity, and general employability skills, through mechanisms such as curriculum internationalization, aligned evaluation standards, and cross-institutional mentorship.

Recent quasi-experimental and large-sample studies on international scholarly exchanges, including student and faculty mobility, academic visits, and short-term training, consistently demonstrate their positive impact on graduate employment prospects, cross-border mobility intentions, and transition quality. Drawing on multi-country data from the EU's Erasmus program, De Benedetto and Scicchitano (2025) found that participation in exchange programs significantly increased employment probability and job search efficiency within three years of graduation. Granato and de Paola (2024) further reported improved graduation outcomes among STEM and technical majors with exchange experience. Longitudinal analyses by Knutsen (2024) revealed that outbound exchanges and internships enhance language proficiency, cultural awareness, and transferable professional skills, thereby increasing the likelihood of living and working abroad. Similarly, Croce and Zaccaria (2024) identified a positive effect of academic mobility on the school-to-work transition among European samples. Collectively, these findings suggest that International Scholarly Exchanges (ISE) promote the Cultivation of International Talent (CIT) through a tripartite mechanism of capability enhancement, embedded international networks, and access to cross-border opportunities.

International Cooperation Programs (ICP), International Scholarly Exchanges (ISE) and Internationalization Development Strategy (IDS)

Recent studies indicate that sustained international cooperation programs (ICP), including joint and dual degrees, strategic partnerships, and cross-border research consortia—do more than increase activity volume; they recalibrate institutional strategy by embedding external coordination, quality assurance, and resource allocation into internationalization-driven strategies (IDS). Comparative and

case-based evidence from Europe–China partnerships shows that the design of partnerships—such as their scope, reciprocity, and governance—feeds back into universities' strategic decisions regarding curriculum internationalization, quality assurance procedures, and risk management. This process shifts institutions from fragmented, ad hoc projects toward integrated internationalization portfolios (Qu, 2025; Xu, 2024). Analyses of Sino-foreign cooperative universities further reveal that when cooperation is only loosely coupled, institutions face challenges in translating ICP into strategic outcomes, exposing misalignments between academic operations and IDS and prompting structural adjustments (Zhang & Xu, 2024). Sector-wide frameworks support this trajectory: institutions that treat partnerships as strategic anchors, rather than as counts of memoranda of understanding, tend to embed them into planning, budgeting, and leadership structures—hallmarks of comprehensive internationalization (ACE, 2024; NAFSA, 2023). Within China's regulated context, the legitimacy-seeking behaviors of Sino-foreign cooperative universities—whether regulative, cognitive, moral, or pragmatic—also influence strategic positioning, illustrating how ICP architectures and external expectations jointly shape IDS (Zhao & Chen, 2025). Empirical panel data adds a performance dimension: recruiting international faculty within ICP ecosystems is associated with higher levels of international academic impact, particularly in less-advanced institutions. These findings inform strategic decisions about which partnerships and faculty lines yield the greatest marginal returns (Fan et al., 2025). Overall, ICP function as strategic catalysts, encouraging universities to formalize governance structures, align institutional incentives, and embed internationalization within core strategic frameworks.

International scholarly exchanges, including faculty mobility, visiting scholars, joint supervision, and virtual mobility, play a transformative role in shaping institutional internationalization strategies. These exchanges enhance internal capacities and expand external academic networks, which are subsequently embedded into strategic planning. Systematic research on international academic mobility demonstrates that mobility flows reconfigure knowledge production patterns and reputation dynamics, thereby informing strategic decisions on disciplinary priorities, recruitment practices, and institutional support mechanisms (Shen 2022). Multi-institutional surveys and policy analyses indicate that universities increasingly draw on insights from exchange activities such as supervision models, co-teaching arrangements, and virtual mobility experiences to revise strategic components including human resource policies, language and professional development programs, and digital internationalization frameworks (Velkoska 2024; Ngalomba et al. 2025). Global monitoring data further reveal that institutions are aligning exchange outcomes with strategic key performance indicators such as graduate attributes, research visibility, and community engagement, integrating these practices into institutional planning cycles (IAU 2024). Post-pandemic evaluations highlight a strategic shift toward portfolio-based approaches that combine physical and virtual exchanges, with decision-making principles such as equity, accessibility, and resilience now formally embedded in strategic frameworks (ACE 2024; Ngalomba et al. 2025). In essence, international scholarly exchanges function as iterative design experiments where successful practices are scaled and standardized within institutional strategies, while identified gaps such as weak coupling, inequitable access, and limited curricular integration prompt targeted strategic adjustments.

Cultivation of International Talent (CIT) as the dependent outcome

Cultivation of International Talent (CIT) has increasingly been positioned not only as an educational outcome but also as a mediating construct that links internationalization development strategies (IDS) to broader institutional and societal impacts. Recent scholarship emphasizes that CIT embodies competencies such as intercultural adaptability, global leadership, and cross-disciplinary problem-solving, which serve as crucial mediators between international cooperation initiatives and the global competitiveness of higher education institutions (Huang et al., 2020). For example, integration of internationalized curricula and global teaching models often produces improvements in global employability, with CIT functioning as the mechanism through which institutional strategies translate into workforce outcomes (Wu & Zha, 2022).

From an empirical perspective, studies highlight that CIT mediates the relationship between international cooperation programs and institutional innovation performance. By embedding transnational learning experiences, such as joint-degree programs and multinational research collaborations, institutions foster talent who not only achieve academic excellence but also enhance institutional prestige through global knowledge circulation (Zhang & Zhu, 2021). Similarly, international scholarly exchanges create opportunities for faculty and students to co-produce knowledge in cross-cultural contexts, with CIT emerging as the pathway that connects these exchanges to measurable academic outputs and reputational gains (Lee & Kuzhabekova, 2020).

Furthermore, research underscores the role of CIT in mediating between IDS and long-term societal contributions. As argued by Tian and Lowe (2023), graduates with high levels of international competencies act as bridges for transnational cooperation in industry, research, and policy-making. This suggests that the cultivation of such talent does not solely serve institutional objectives but also contributes to national soft power and innovation ecosystems. The mediating effect of CIT therefore provides a robust explanatory mechanism for how IDS translate into macro-level benefits in global competitiveness and sustainable development.

Theoretical Review

Internationalization Theory

Internationalization Theory provides a macro-level institutional and strategic framework for this study, offering insights into why and how universities engage in international cooperation programs and scholarly exchanges to construct and adjust their internationalization development strategies. These strategic shifts ultimately influence the cultivation of international talent. Specifically, the theory posits that internationalization is both a response to external pressures, such as global rankings, policy directives, and regional collaboration opportunities, and a result of internal strategic choices, including resource allocation, curriculum internationalization, and governance restructuring (Xu 2023; IAU 2024). In the context of Heilongjiang Province, Internationalization Theory enables us to conceptualize cooperation initiatives as key mechanisms driving the structural evolution of institutional strategies. When universities accumulate international capital through sustained and institutionalized collaborations, such as dual-degree programs, joint research, and faculty exchanges, these activities are increasingly integrated into medium- and long-term planning. This integration leads to adjustments in recruitment, evaluation, budgeting, and quality assurance systems, transforming internationalization from fragmented activities into a coherent strategic framework. Accordingly, the theory supports the following causal logic in this study's hypothesis testing: international cooperation and exchange activities influence institutional governance and resource distribution, which in turn shape strategic implementation, ultimately affecting talent development outcomes. Furthermore, the theory offers operational dimensions—such as motivation, governance, embeddedness, and institutionalization—that facilitate the quantification of qualitative strategic features into survey items or secondary data indicators for structural equation modeling (Xu 2023; Soulé 2024; IAU 2024).

Transformative Learning Theory

Transformative Learning Theory offers a micro-level, process-oriented framework for this study, elucidating how individuals—both faculty and students—undergo deep cognitive and attitudinal shifts within cross-cultural learning contexts such as international cooperation programs and scholarly exchanges. These transformative experiences contribute to the development of international competencies. The theory emphasizes a learning trajectory characterized by disorienting dilemmas, critical reflection, and perspective transformation. When individuals are immersed in heterogeneous academic or cultural environments—such as joint teaching, short-term visits, or collaborative supervision—their existing cognitive frameworks are challenged. This disruption prompts reflective reconstruction of thought and behavior, ultimately fostering intercultural communication skills, contextual problem-solving abilities, and global career adaptability (Pang 2023; Sugito 2024).

From an empirical design perspective, Transformative Learning Theory supports the inclusion of individual-level mediating variables—such as critical reflection, intercultural self-efficacy, and self-reported perspective shifts—as mechanism indicators for assessing the formation of international competencies. These mediators can be tested within both the ICP/ISE to CIT and IDS to CIT pathways. In light of recent methodological discussions on evaluating transformative learning, this study also incorporates multi-source measurement approaches—including self-assessment, peer or mentor evaluations, and behavioral evidence—to enhance internal validity (Pang 2023; O'Grady 2023).

In sum, Transformative Learning Theory provides a theoretically grounded explanation of the psychological and educational processes through which international visits and exchanges foster global competence. It also enables the operationalization of individual learning transformations as testable mediating constructs within quantitative models.

Conceptual framework and hypotheses development

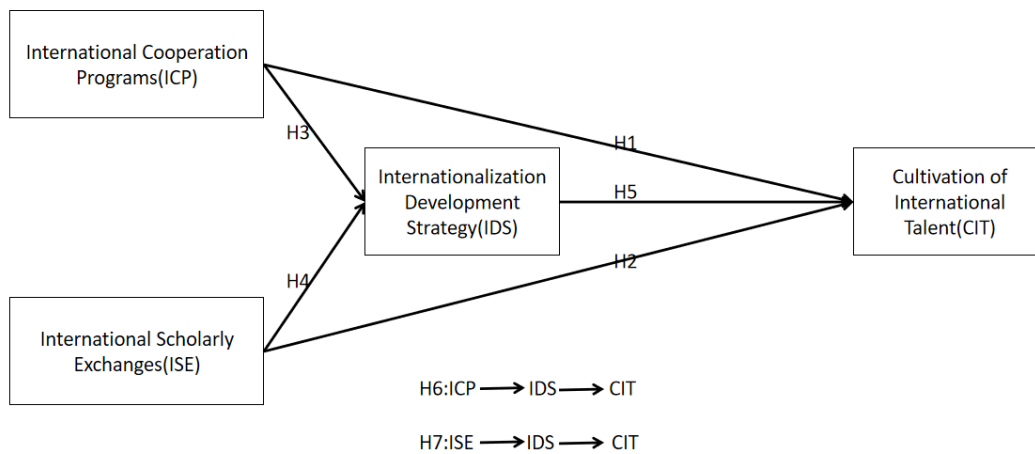


Figure 1: Conceptual Framework

According to the Conceptual Framework, we put forward the following hypotheses:

H1: International cooperation programs (ICP) positively influence the cultivation of international talent (CIT).

H2: International scholarly exchanges (ISE) positively influence the cultivation of international talent (CIT).

H3: International cooperation programs (ICP) positively influence internationalization development strategy (IDS).

H4: International scholarly exchanges (ISE) positively influence internationalization development strategy (IDS).

H5: Internationalization development strategy (IDS) positively influences the cultivation of international talent (CIT).

H6: Internationalization development strategy (IDS) mediates the relationship between international cooperation programs (ICP) and the cultivation of international talent (CIT).

H7: Internationalization development strategy (IDS) mediates the relationship between international scholarly exchanges (ISE) and the cultivation of international talent (CIT).

Research Methodology

Sampling Design Process

The study targeted approximately 77,000 faculty members across 39 universities in Heilongjiang Province that are officially accredited by the Ministry of Education. A probability-based stratified random sampling method was applied, treating each university as a stratum to capture institutional heterogeneity. The sampling frame was derived from the official Ministry of Education list and cross-verified with university websites to ensure accuracy and completeness. Within each stratum, random selection was performed according to demographic and professional characteristics such as gender, age, and academic discipline, thereby ensuring proportional representativeness. Based on Cochran's (1977) formula, the minimum required sample size at a 95% confidence level with a 5% margin of error was calculated to be 382, adjusted for the finite population. Considering an expected response rate of approximately 60 percent, 637 questionnaires were distributed to secure statistical power and reliability.

Data Collection and Data Analysis Method

Data collection was conducted through a structured questionnaire, administered both online and offline to comprehensively cover the 39 universities. Prior to the main survey, a pilot test was performed with 30 faculty members to enhance item clarity and reliability. The collected data underwent descriptive

statistical analysis to summarize sample characteristics, confirmatory factor analysis (CFA) to validate construct validity, and structural equation modeling (SEM) to test the hypothesized relationships. Analytical procedures were conducted using SPSS 26 and AMOS 26. Overall, the rigorous sampling design, systematic data collection, and advanced statistical analyses enhanced both the validity and reliability of the study findings.

Measurement Items Internationalization Development Strategy (IDS)

The IDS construct was measured across five dimensions: curriculum internationalization, faculty internationalization, international cooperation and joint programs, academic exchanges, and institutional support. Items were adapted from established internationalization frameworks in higher education (Knight, 2004; Brandenburg & de Wit, 2011; Leask, 2015; Teichler, 2015), capturing the extent to which institutions integrate global elements into teaching, research, and organizational structures.

International Cooperation Programs

This construct was assessed with items reflecting institutional engagement in international partnerships and joint academic programs, including student exchange and dual-degree initiatives (Brandenburg & de Wit, 2011; Jones, 2014).

International Scholarly Exchanges

Measurement focused on research collaboration, joint publications, conference participation, and academic mobility, emphasizing their contribution to institutional reputation and international talent cultivation (Altbach & Knight, 2007; Teichler, 2015).

Cultivation of International Talent

CIT was measured by outcomes such as intercultural competence, global vision, foreign language proficiency, professional competitiveness, and application of knowledge in international contexts, drawing upon established models of intercultural and global competence (Byram, 1997; Deardorff, 2006, 2011; Altbach & Knight, 2007; Leask, 2015).

Measurement Scale

All constructs were assessed using a five point Likert scale (1 = strongly disagree, 5= strongly agree), consistent with prior internationalization research and enabling confirmatory factor analysis (CFA) for validation (Cantwell & Maldonado-Maldonado, 2009; Beelen & Jones, 2015).

Results and Analysis

Descriptive statistics of respondents

Descriptive statistics of Gender and Education level

Table1 : Gender and Education level

	Type	Number	Percentage
Gender	Male	233	61
	Female	149	39
Educationlevel	Bachelor	122	31.9
	Doctorate	27	7.1
	Master	233	61.0

The demographic profile of the valid sample (N = 382) demonstrates a balanced yet representative distribution aligned with the stratified random sampling approach adopted in this study. Regarding gender, male faculty members accounted for 61% (n = 233), whereas female faculty represented 39% (n = 149). This proportion is consistent with the general gender distribution among faculty in Heilongjiang Province, where male academics typically outnumber female counterparts, particularly in STEM-related disciplines. Such representation ensures that the findings reflect the gender heterogeneity across universities.

In terms of educational attainment, the sample indicates that the majority of respondents hold a master's degree (61.0%, n = 233), followed by bachelor's degree holders (31.9%, n = 122) and doctoral

degree holders (7.1%, $n = 27$). This distribution mirrors the academic qualifications prevalent among faculty in provincial universities, where master's-level educators constitute the backbone of teaching staff, while the proportion of doctoral-level faculty is comparatively smaller yet critical for advancing research and international cooperation.

The sample composition underscores the robustness of the stratified random sampling design described in Section 3.1. By aligning demographic features such as gender and education level with the population structure, the study enhances external validity and generalizability. Moreover, the representativeness of these characteristics provides a solid basis for subsequent analyses—particularly the investigation of how international cooperation programs and scholarly exchanges influence the cultivation of international talent through the internationalization development strategy.

Descriptive statistics of Age

Table 2 : Age

Age	Frequency	Percent
25	9	2.4
26	11	2.9
27	7	1.8
28	10	2.6
29	10	2.6
30	7	1.8
31	14	3.7
32	13	3.4
33	12	3.1
34	13	3.4
35	11	2.9
36	12	3.1
37	17	4.5
38	13	3.4
39	7	1.8
40	17	4.5
41	13	3.4
42	9	2.4
43	8	2.1
44	10	2.6
45	7	1.8
46	12	3.1
47	12	3.1
48	10	2.6
49	5	1.3
50	10	2.6
51	4	1.0
52	13	3.4
53	12	3.1
54	12	3.1
55	9	2.4
56	12	3.1
57	12	3.1
58	12	3.1
59	9	2.4
60	8	2.1
Total	382	100.0

The age distribution of the respondents ($N = 382$) indicates a wide coverage across early-career, mid-career, and senior faculty members, thereby ensuring representativeness and diversity in professional experience. The youngest participants were 25 years old (2.4%), while the oldest were 60 years old (2.1%), reflecting the typical span of faculty employment in Chinese universities.

A closer look shows that the largest proportions are concentrated in the late 30s to early 40s: ages 37 (4.5%), 40 (4.5%), 31 (3.7%), 32 (3.4%), 34 (3.4%), 38 (3.4%), and 41 (3.4%). Together, this middle-aged cohort constitutes a substantial share of the sample, consistent with the demographic reality that faculty members in their 30s and 40s form the backbone of teaching and research staff in Heilongjiang universities.

Early-career faculty (aged 25–30) collectively account for approximately 12.3% of the sample, representing the younger generation of academics who are often engaged in foundational teaching and initial stages of research development. Meanwhile, senior faculty aged 50 and above make up about 20.6% of respondents, embodying experienced academics with significant influence in international cooperation programs, scholarly exchanges, and the cultivation of international talent.

Overall, the age distribution aligns with the stratified random sampling design outlined in Section 3.1, reflecting demographic and professional diversity across the province's universities. This balanced representation across career stages enhances the generalizability of findings, ensuring that perspectives from younger, mid-career, and senior faculty members are adequately captured in analyzing the impact of international cooperation programs and scholarly exchanges on internationalization strategies.

Descriptive statistics of Institution

Table 3: Institution

Institution	Frequency	Percent
Daqing Normal University	11	2.9
Harbin Cambridge University	10	2.6
Harbin Conservatory of Music	11	2.9
Harbin Engineering University	5	1.3
Harbin Far East Institute of Technology	13	3.4
Harbin Finance University	5	1.3
Harbin Guangsha University	17	4.5
Harbin Huade University	8	2.1
Harbin Information Engineering University	9	2.4
Harbin Institute of Technology	11	2.9
Harbin Medical University	9	2.4
Harbin Normal University	13	3.4
Harbin Petroleum University	7	1.8
Harbin Sport University	13	3.4
Harbin University	9	2.4
Harbin University of Commerce	8	2.1
Harbin University of Science and Technology	9	2.4
Heihe University	10	2.6
Heilongjiang Bayi Agricultural University	10	2.6
Heilongjiang Business University	7	1.8
Heilongjiang East University	11	2.9
Heilongjiang Finance University	10	2.6
Heilongjiang Institute of Engineering	9	2.4
Heilongjiang Institute of Engineering Kunlun Tourism College	9	2.4
Heilongjiang Institute of Technology	8	2.1
Heilongjiang International University	9	2.4
Heilongjiang University	11	2.9
Heilongjiang University of Chinese Medicine	12	3.1
Heilongjiang University of Science and Technology	9	2.4
Jiamusi University	10	2.6
Mudanjiang Medical University	13	3.4
Mudanjiang Normal University	11	2.9
Northeast Agricultural University	8	2.1
Northeast Forestry University	6	1.6
Northeast Petroleum University	14	3.7

Qiqihar Institute of Engineering	6	1.6
Qiqihar Medical University	9	2.4
Qiqihar University	10	2.6
Suihua University	12	3.1
Total	382	100.0

The institutional distribution of respondents (N = 382) shows wide coverage across 39 accredited universities in Heilongjiang Province, which reflects the effectiveness of the stratified random sampling design described in Section 3.1. The number of respondents from each university varies between 5 (1.3 percent, such as Harbin Engineering University and Harbin Finance University) and 17 (4.5 percent, Harbin Guangsha University), indicating that no single institution dominates the sample.

Participation covers different types of institutions, including comprehensive universities such as Heilongjiang University and Harbin University, specialized institutions such as Harbin Conservatory of Music, Harbin Medical University and Northeast Agricultural University, as well as applied universities such as Qiqihar Institute of Engineering and Heilongjiang Institute of Engineering. This distribution ensures that the study reflects perspectives from diverse academic and professional settings, including teaching oriented, research oriented and practice oriented institutions.

Most universities contribute between 2.1 percent and 3.7 percent of the respondents, which demonstrates a relatively balanced distribution consistent with the stratified random sampling strategy. This wide coverage strengthens the external validity of the study, reduces potential institutional bias and allows the findings on international cooperation programs, scholarly exchanges and the cultivation of international talent to be applied across the higher education sector in Heilongjiang Province.

Reliability and validity tests

Table 4: Reliability

Variable	Cronbach's α
ICP	.915
ISE	.919
IDS	.933
CIT	.870

The reliability of the measurement scales was assessed using Cronbach's α coefficient. As shown in the table, all constructs demonstrated strong internal consistency. The Cronbach's α values were 0.915 for International Cooperation Programs (ICP), 0.919 for International Scholarly Exchanges (ISE), 0.933 for Internationalization Development Strategy (IDS), and 0.870 for Cultivation of International Talent (CIT). According to the threshold suggested by Nunnally and Bernstein (1994), a Cronbach's α above 0.70 indicates acceptable reliability, while values above 0.80 represent good reliability.

Therefore, the results confirm that all constructs used in this study meet the required standards of internal consistency. The high values, particularly for IDS (0.933), ICP (0.915), and ISE (0.919), suggest that the measurement items within these constructs are highly correlated and reliable. Even the lowest coefficient, observed for CIT (0.870), still exceeds the recommended threshold and reflects satisfactory reliability. These findings provide a solid foundation for subsequent confirmatory factor analysis (CFA) and structural equation modeling (SEM).

KMO and Bartlett's Test

Table 5: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.914
Bartlett's Test of Sphericity	Approx. Chi-Square	5285.401
	df	190
	Sig.	.000

The suitability of the data for factor analysis was examined using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO value was 0.914, which is considered excellent according to Kaiser (1974), as values above 0.90 indicate that the correlations among variables are sufficiently compact and suitable for factor extraction.

Bartlett's test of sphericity produced a chi-square value of 5285.401 with 190 degrees of freedom, and the result was statistically significant at $p < 0.001$. This indicates that the correlation matrix is not an identity matrix, further confirming the appropriateness of factor analysis.

Together, the high KMO value and the significant Bartlett's test demonstrate that the dataset meets the requirements for conducting confirmatory factor analysis (CFA). These results provide strong evidence of construct validity for the measurement items employed in this study.

Descriptive Statistics of Measurement Items

Table 6: Descriptive Statistics and normal test

Items	Missing	Mean	Std. Deviation	Skewness	Kurtosis
ICP1	0	3.38	.636	.090	-.172
ICP2	0	3.38	.653	.206	-.077
ICP3	0	3.40	.613	.062	-.259
ICP4	0	3.38	.602	.109	.233
ICP5	0	3.36	.637	.062	-.186
ISE1	0	3.62	.624	-.160	-.144
ISE2	0	3.63	.635	-.171	-.105
ISE3	0	3.58	.638	-.032	-.224
ISE4	0	3.59	.652	.018	-.233
ISE5	0	3.61	.642	-.138	-.140
IDS1	0	3.82	.613	-.148	.096
IDS2	0	3.84	.606	.021	-.242
IDS3	0	3.83	.633	-.031	-.193
IDS4	0	3.81	.608	-.088	-.030
IDS5	0	3.80	.601	-.106	.003
CIT1	0	2.99	1.414	.015	-1.292
CIT2	0	3.02	1.415	-.010	-1.304
CIT3	0	3.02	1.433	-.015	-1.325
CIT4	0	2.99	1.402	.014	-1.298
CIT5	0	2.99	1.410	-.005	-1.305

The descriptive statistics of the measurement items are summarized in the table. No missing data were observed, which ensures completeness and reliability of the dataset. The mean scores for the International Cooperation Programs (ICP) items ranged between 3.36 and 3.40, with relatively small standard deviations (approximately 0.60), indicating that respondents expressed moderate agreement with limited variability across items.

The International Scholarly Exchanges (ISE) items yielded mean values between 3.58 and 3.63, with standard deviations around 0.63. This suggests that faculty members generally perceived a slightly higher level of engagement in scholarly exchanges compared with cooperation programs.

The Internationalization Development Strategy (IDS) items reported the highest means, ranging from 3.80 to 3.84, accompanied by standard deviations around 0.61. This indicates that respondents strongly recognized the role of internationalization strategies in their institutions, with responses showing consistent agreement across items.

In contrast, the Cultivation of International Talent (CIT) items had lower mean values (around 2.99 to 3.02) and larger standard deviations (approximately 1.40). This suggests greater variation in respondents' views on talent cultivation outcomes, reflecting differences among institutions in terms of effectiveness and implementation.

Regarding normality, skewness values across all constructs fell within ± 0.20 , except for CIT items which showed near-zero skewness but relatively negative kurtosis (around -1.30). This indicates that responses for ICP, ISE, and IDS were approximately normally distributed, while CIT exhibited a slightly flatter distribution with higher variability. Such results are acceptable for further multivariate analysis, including confirmatory factor analysis (CFA) and structural equation modeling (SEM), given that large samples tend to mitigate minor deviations from normality (Kline, 2015).

Correlation and regression analysis

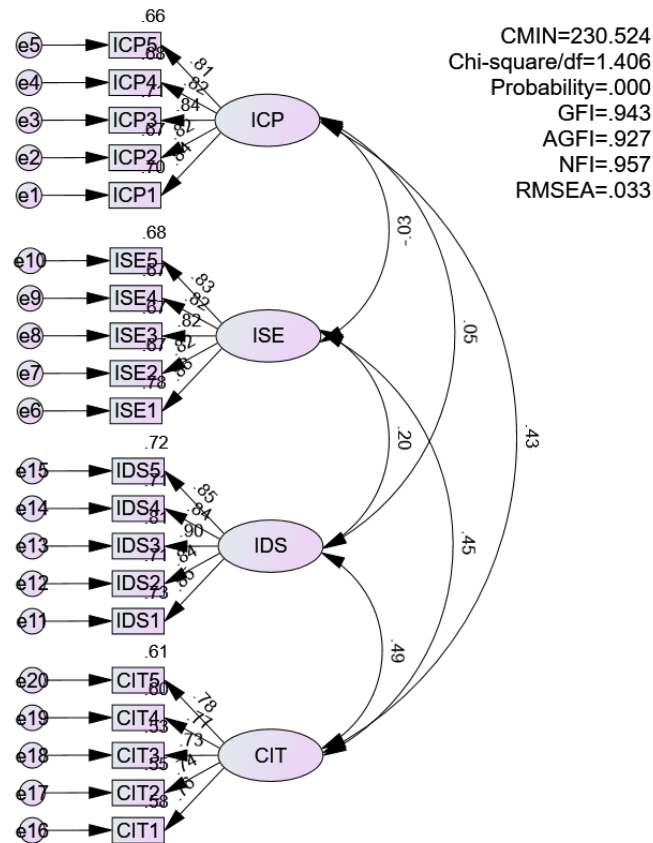
Table 7: Assessment of Multicollinearity

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
		B	Std. Error	Beta	t		Tolerance	VIF
1	(Constant)	4.086	.295		13.854	.000		
	ICP_Mean	-.025	.051	-.026	-.499	.618	.996	1.004
	ISE_Mean	.041	.050	.043	.815	.416	.963	1.039
	IDS_Mean	-.030	.051	-.031	-.592	.554	.962	1.039

a. Dependent Variable: CIT_Mean

Table 7 presents the results of the multicollinearity assessment. The Variance Inflation Factor (VIF) values for all independent variables are very close to 1 (ranging from 1.004 to 1.039), and tolerance values are well above the commonly accepted threshold of 0.10. According to Hair et al. (2019), VIF values below 5 and tolerance values above 0.20 indicate that multicollinearity is not a concern. Therefore, the results suggest that International Cooperation Programs (ICP), International Scholarly Exchanges (ISE), and Internationalization Development Strategy (IDS) are sufficiently independent of each other in this model.

Moreover, the regression coefficients of ICP ($\beta = -0.026$, $p = 0.618$), ISE ($\beta = 0.043$, $p = 0.416$), and IDS ($\beta = -0.031$, $p = 0.554$) are not statistically significant in predicting Cultivation of International Talent (CIT) when considered simultaneously. Although the lack of significance may reflect shared explanatory power among the constructs, the absence of multicollinearity ensures that the regression model remains statistically reliable and interpretable.

Structural equation modeling (SEM) results**Overall measurement model****Figure 2: measurement model**

Based on the comprehensive evaluation of the fit indices (GFI, AGFI, NFI, RMSEA, and the chi-square/df ratio), the results demonstrate that the model achieves the commonly accepted standards in academic research. In particular, the RMSEA value, which is close to 0.03, indicates that the residuals between the model and the sample data are minimal. This suggests that the overall structure is reasonable and exhibits strong explanatory power. Therefore, it can be concluded that the measurement model possesses good adequacy and reliability, providing a solid foundation for subsequent structural equation modeling analysis.

Table 8: AVE and CR

Validity				
Variable	Item	Loading (Convergent Validity)	Construct Reliability	AVE (Construct Validity)
ICP	ICP1	0.836	0.915	0.683
	ICP2	0.818		
	ICP3	0.843		

	ICP4	0.823		
	ICP5	0.812		
ISE	ISE1	0.885	0.919	0.695
	ISE2	0.817		
	ISE3	0.818		
	ISE4	0.818		
	ISE5	0.827		
IDS	IDS1	0.851	0.933	0.736
	IDS2	0.843		
	IDS3	0.898		
	IDS4	0.845		
	IDS5	0.85		
CIT	CIT1	0.761	0.870	0.572
	CIT2	0.739		
	CIT3	0.728		
	CIT4	0.773		
	CIT5	0.78		

The results of the convergent and construct validity assessment are summarized in Table 8. All factor loadings are greater than the recommended threshold of 0.70 (Hair et al., 2019), indicating that the items are strongly representative of their respective constructs. Construct reliability (CR) values range from 0.870 to 0.933, which are well above the minimum criterion of 0.70, confirming the internal consistency of the measurement model. Furthermore, the average variance extracted (AVE) values fall between 0.572 and 0.736, exceeding the benchmark of 0.50, thereby demonstrating adequate convergent validity (Fornell & Larcker, 1981).

Specifically, ICP (CR = 0.915, AVE = 0.683), ISE (CR = 0.919, AVE = 0.695), and IDS (CR = 0.933, AVE = 0.736) exhibit excellent reliability and convergent validity, while CIT (CR = 0.870, AVE = 0.572) also meets the acceptable threshold, though with slightly lower variance extraction compared to other constructs. Overall, these results confirm that the measurement items provide reliable and valid representations of the underlying constructs, ensuring the robustness of the subsequent structural equation modeling.

Table 9: Discriminant validity

	CIT	IDS	ISE	ICP
CIT	0.756			
IDS	0.489	0.858		
ISE	0.452	0.203	0.834	
ICP	0.433	0.051	-0.034	0.826

The discriminant validity of the constructs was assessed using the Fornell–Larcker criterion, which compares the square root of the AVE values with the inter-construct correlations. As shown in Table 9, the square roots of the AVE for CIT (0.756), IDS (0.858), ISE (0.834), and ICP (0.826) are all greater than their respective inter-construct correlations. For instance, the correlation between CIT and IDS is 0.489, which is lower than both $\sqrt{\text{AVE}}$ of CIT (0.756) and IDS (0.858). Similarly, the correlation between ISE and ICP is -0.034, substantially lower than $\sqrt{\text{AVE}}$ values of both constructs. These results confirm that each construct is empirically distinct, thereby demonstrating satisfactory discriminant validity of the measurement model.

Structural Model

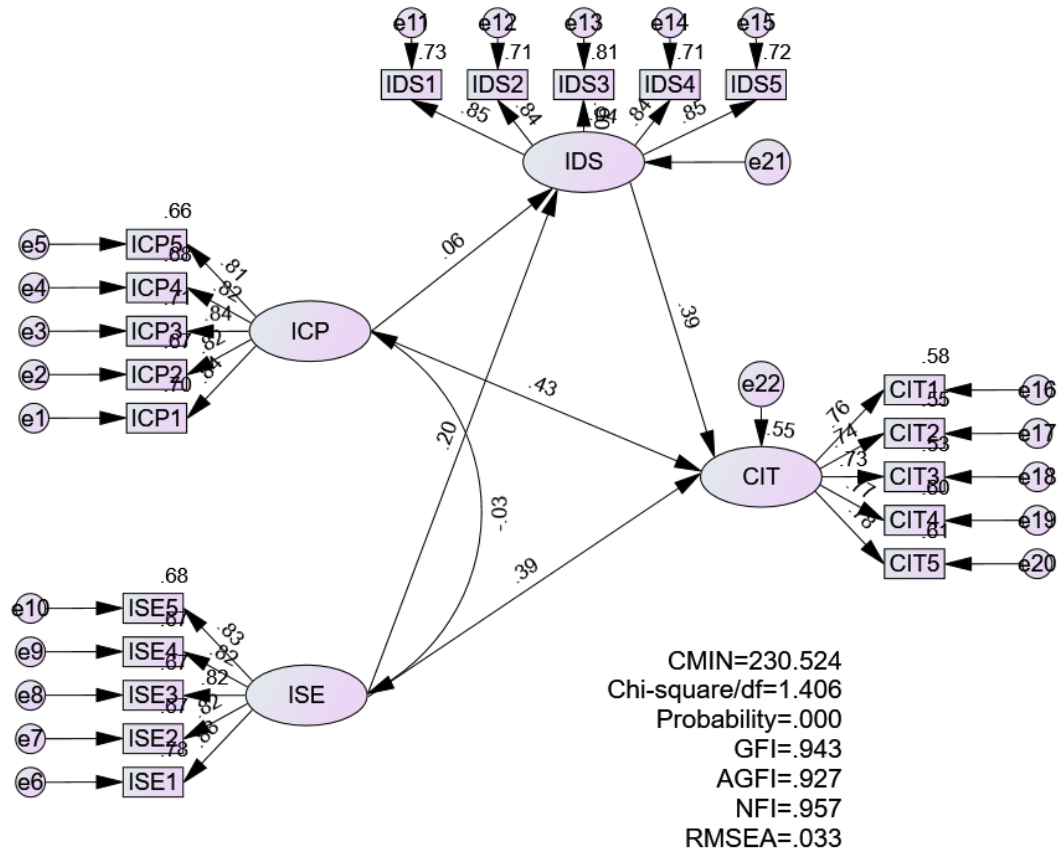


Figure 4: Structural Model

The overall fit indices of the structural equation model indicate a satisfactory model fit. The chi-square/df ratio is 1.406, which falls below the commonly accepted threshold of 3.0, suggesting a good fit between the hypothesized model and the observed data. The GFI (0.943) and AGFI (0.927) both exceed the recommended cutoff value of 0.90, reflecting a strong degree of model fit. The NFI (0.957) also surpasses the suggested benchmark of 0.90, further supporting the adequacy of the model. Additionally, the RMSEA value of 0.033 is well below the maximum recommended level of 0.08, with values closer to 0.05 indicating a very good fit.

Taken together, these results confirm that the measurement and structural models demonstrate robust goodness-of-fit and can provide reliable insights for subsequent hypothesis testing and path analysis.

Direct Relationship Test**Table 10: Path coefficient**

Hypothesis	relationship	Estimate	SD Estimate	S.E.	C.R.	P
H3	IDS<-ICP	.057	.058	.053	1.067	.286
H4	IDS<-ISE	.194	.205	.052	3.742	***
H1	CIT<-ICP	.865	.427	.099	8.778	***
H2	CIT<-ISE	.756	.388	.093	8.113	***
H5	CIT<-IDS	.801	.388	.099	8.094	***

Table 10 presents the results of the structural equation modeling. The path coefficient from International Cooperation Programs (ICP) to International Scholarly Exchanges (IDS) was not statistically significant ($\beta = 0.057$, C.R. = 1.067, $p = 0.286$), indicating that ICP does not have a direct effect on IDS. In contrast, the path from International Student Exchange (ISE) to IDS was statistically significant ($\beta = 0.194$, C.R. = 3.742, $p < 0.001$), suggesting that ISE contributes positively to the development of IDS.

Both ICP ($\beta = 0.865$, C.R. = 8.778, $p < 0.001$) and ISE ($\beta = 0.756$, C.R. = 8.113, $p < 0.001$) showed strong and significant positive effects on Collaborative International Ties (CIT). Additionally, IDS significantly influenced CIT ($\beta = 0.801$, C.R. = 8.094, $p < 0.001$), confirming its mediating role in promoting collaborative academic networks.

Overall, the findings suggest that although ICP does not directly enhance IDS, it plays a key role in fostering CIT, both independently and through its interaction with other variables. ISE stands out as a particularly impactful factor, exerting direct and significant influence on both IDS and CIT.

Indirect Relationship Test

The mediated roll of IDS between ICP and CIT

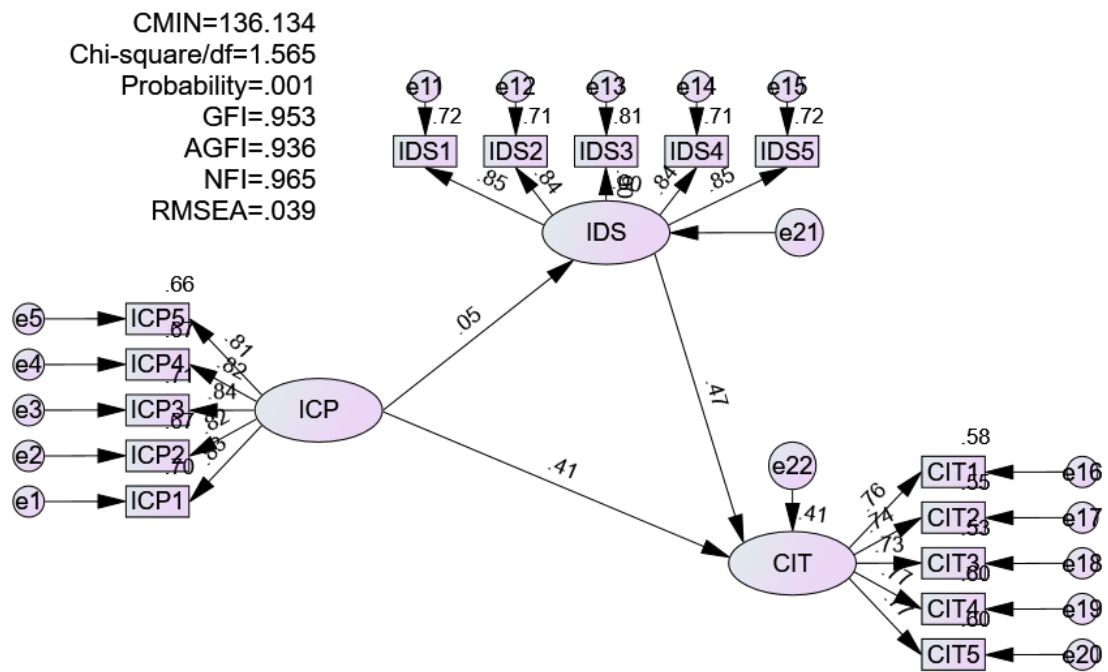


Figure 5: Intermediary Relationship Model (ICP-IDS-CIT)

Table 11: ICP-IDS-CIT

Parameter	Estimate	Lower	Upper	P
direct	.833	.695	1.121	.003
indirect	.049	-.102	.145	.456
total	.881	.732	1.156	.004

The structural equation modeling results indicate a statistically significant direct effect from the independent variable to the dependent variable, with an estimate of 0.833 ($p = 0.003$) and a confidence interval ranging from 0.695 to 1.121. The total effect is also significant (estimate = 0.881, $p = 0.004$), suggesting that the overall influence is substantial and primarily driven by the direct pathway. These findings underscore the robustness of the direct relationship within the model.

In contrast, the indirect effect is not statistically significant (estimate = 0.049, $p = 0.456$), with a confidence interval that includes zero (-0.102 to 0.145). This indicates that the mediating variable does not play a meaningful role in transmitting the effect between the independent and dependent variables. Therefore, the model does not support a mediating relationship, and the emphasis should be placed on interpreting the direct effect as the dominant mechanism of influence.

The mediated roll of IDS between ISE and CIT

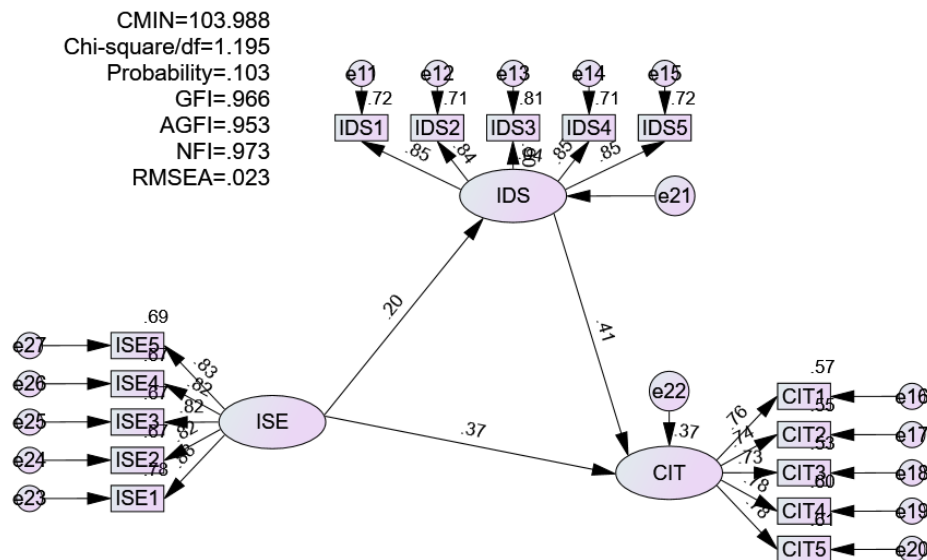


Figure 6: Intermediary Relationship Model (ISE-IDS-CIT)

Table 12: ISE-IDS-CIT

Parameter	Estimate	Lower	Upper	P
direct	.714	.502	.901	.015

Parameter	Estimate	Lower	Upper	P
indirect	.163	.073	.272	.009
total	.877	.613	1.056	.021

The structural equation modeling results reveal a statistically significant direct effect (Estimate = 0.714, $p = 0.015$), with a 95% confidence interval ranging from 0.502 to 0.901. This indicates that the independent variable exerts a substantial and reliable influence on the dependent variable through a direct pathway. Additionally, the total effect is also significant (Estimate = 0.877, $p = 0.021$), suggesting that the overall relationship is robust and meaningful within the proposed model.

Importantly, the indirect effect is statistically significant as well (Estimate = 0.163, $p = 0.009$), with a confidence interval that does not include zero (0.073 to 0.272). This confirms the presence of a mediating mechanism, whereby the independent variable influences the dependent variable not only directly but also indirectly through a mediator. The coexistence of significant direct and indirect effects supports a partial mediation model, which is theoretically and empirically relevant for SCI-level research.

Discussion

Interpretation of findings for ICP, ISE, IDS, and CIT

The structural equation modeling results provide mixed evidence regarding the hypothesized relationships among International Cooperation Programs (ICP), International Student Exchange (ISE), International Scholarly Exchanges (IDS), and Collaborative International Ties (CIT). Specifically, ICP did not significantly predict IDS (H3 not supported), suggesting that cooperative initiatives alone do not directly translate into active scholarly exchanges. Instead, the development of IDS appears to require additional mechanisms, such as academic mobility or researcher engagement. In contrast, ISE exerted a significant positive influence on IDS (H4 supported), demonstrating that student exchange programs serve as a key driver in promoting international scholarly exchanges.

Furthermore, both ICP and ISE were found to have strong and statistically significant effects on CIT (H1 and H2 supported), highlighting their essential role in fostering long-term collaborative ties. These findings suggest that while institutional cooperation and student exchange operate through different mechanisms, they both contribute meaningfully to building sustainable international academic relationships. Additionally, IDS emerged as a robust predictor of CIT (H5 supported), underscoring its function as a bridge between individual exchange experiences and broader institutional collaboration.

The mediation analysis further strengthens these interpretations. ICP did not show a significant indirect effect on CIT through IDS (H6 not supported), indicating that scholarly exchanges do not serve as a mediator for the ICP–CIT relationship. In contrast, ISE demonstrated both direct and significant indirect effects on CIT via IDS (H7 supported). This result confirms that IDS plays a mediating role in transforming student mobility into institutionalized collaborative ties, thereby emphasizing the complementary relationship between ISE and IDS in advancing global academic networks.

Table 13: Interpretation of findings

Hypothesis	Path Relationship	Estimate	p-value	Supported
H1	CIT ← ICP	0.865	***	Yes
H2	CIT ← ISE	0.756	***	Yes
H3	IDS ← ICP	0.057	0.286	No
H4	IDS ← ISE	0.194	***	Yes
H5	CIT ← IDS	0.801	***	Yes
H6	ICP → IDS → CIT	0.049	0.456	No
H7	ISE → IDS → CIT	0.163	0.009	Yes

Theoretical implications

This study advances the discourse on higher education internationalization by deepening both macro-level institutional and micro-level individual theoretical perspectives. At the institutional level, the findings offer partial support for Internationalization Theory, revealing that international cooperative programs (ICP) and student exchange initiatives (ISE) play a significant role in shaping international collaboration outcomes (CIT). However, their influence on institutional strategy (IDS) appears more complex. Notably, the absence of a significant effect of ICP on IDS challenges the assumption that formalized cooperation inherently leads to strategic integration. This underscores the need for Internationalization Theory to more clearly differentiate between operational collaborations and

partnerships that are strategically embedded. The findings suggest that the translation of ICP into IDS is contingent upon factors such as governance structures, resource distribution, and institutional efforts to enhance legitimacy.

At the individual level, the study extends the application of Transformative Learning Theory by affirming its relevance in the context of international student exchange. The significant linkage from ISE to IDS, and the mediating role of IDS in the ISE–CIT pathway, demonstrate that cross-cultural learning experiences not only foster individual growth but also contribute to broader strategic shifts within institutions. These results support the view that micro-level transformations—such as enhanced intercultural competence and broadened perspectives—can collectively influence institutional and systemic internationalization outcomes. Moreover, the mediating effect of IDS highlights that the impact of individual learning is amplified when aligned with institutional strategic frameworks, thereby connecting psychological learning processes with organizational development.

Overall, the study proposes a multi-level analytical model that integrates institutional cooperation, individual learning transformation, and strategic internationalization outcomes. It shows that while both ICP and ISE contribute to the development of international talent (CIT), they do so through distinct mechanisms: ICP serves as a structural foundation, whereas ISE acts as a transformative conduit, reinforced by strategic alignment through IDS. This integrated perspective offers a more comprehensive understanding of how internationalization efforts across different levels interact to foster talent cultivation and strategic advancement in higher education.

Practical implications

Policy-Level Strategies

At the policy level, the findings suggest that international student exchange (ISE) and international scholarly exchanges (IDS) play a central role in strengthening collaborative international ties (CIT). Therefore, policymakers should prioritize the design and funding of programs that directly support student mobility and academic research collaborations. National governments and regional authorities may provide scholarships, mobility grants, and bilateral agreements that encourage cross-border student participation and joint research initiatives. Furthermore, given that institutional cooperation programs (ICP) alone did not significantly predict IDS, policymakers should ensure that cooperation agreements are not only symbolic but also contain actionable mechanisms, such as research fellowships, collaborative publishing funds, and innovation hubs, to translate cooperation into tangible academic outcomes.

University-Level Strategies

At the university level, the results highlight that both student exchange programs and scholarly collaborations are key drivers for building sustainable international ties. Universities should therefore strengthen their capacity to host and send exchange students by improving administrative support, academic credit recognition, and cross-cultural training. In addition, universities need to institutionalize international research collaborations by establishing joint laboratories, encouraging co-publications, and providing incentives for faculty engagement in global networks. Importantly, since IDS mediates the relationship between ISE and CIT, universities should design exchange programs that deliberately integrate research components, such as involving exchange students in faculty-led projects, thereby transforming mobility experiences into long-term academic partnerships.

Integrated Perspective

Overall, the findings indicate that international collaboration cannot rely solely on broad institutional agreements (ICP) but must be reinforced by active academic and student engagement. Policymakers and universities should jointly create a synergy where policy provides resources and frameworks, while universities operationalize these into meaningful exchanges and collaborations. This integrated approach will ensure that international cooperation translates into sustainable scholarly networks and strong collaborative ties.

Conclusion

This study examined the relationships among international cooperation programs (ICP), international student exchange (ISE), international scholarly exchanges (IDS), and collaborative international ties (CIT). The findings revealed that ICP and ISE significantly strengthen CIT, while IDS also plays a critical role in fostering institutional collaboration. However, ICP did not directly influence IDS, indicating that formal cooperation agreements alone are insufficient to generate scholarly exchange. Instead, ISE

emerged as the most influential factor, both directly enhancing IDS and indirectly strengthening CIT through IDS. Overall, the results highlight the centrality of student mobility and academic exchange in building sustainable international collaboration.

Limitations of the study and Future research directions

This study has several limitations that should be acknowledged. First, the data were collected cross-sectionally, which restricts the ability to establish causal relationships among ICP, ISE, IDS, and CIT. Longitudinal or panel data would provide a more dynamic understanding of how international cooperation evolves over time. Second, the sample was limited to a specific regional and institutional context, which may affect the generalizability of the findings to other higher education systems with different cultural, political, or economic conditions. Third, the study primarily relied on self-reported measures, which may introduce response bias and limit the objectivity of the results.

Future research can address these limitations in several ways. Longitudinal designs could be employed to track how cooperation programs and exchanges influence collaborative ties across different stages of institutional partnerships. Comparative studies across countries or types of universities would help to test the robustness and external validity of the model. In addition, integrating mixed methods—such as interviews or case studies—would provide deeper qualitative insights into the mechanisms driving international academic collaboration. Finally, exploring other potential mediating or moderating variables, such as institutional capacity, funding availability, or digital collaboration tools, could enrich the theoretical framework and offer a more comprehensive explanation of internationalization outcomes.

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