

# The Impact of Cross-Cultural Adaptation on Academic Performance: The Mediating Role of Academic Self-Efficacy

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## Abstract

*This study investigates the impact of cross-cultural adaptation on academic performance among international students, with academic self-efficacy considered as a mediating variable. Drawing upon data collected from international students enrolled in universities in Heilongjiang, China, structural equation modeling (SEM) was employed to test the hypothesized relationships. The results reveal that cross-cultural adaptation exerts a significant positive influence on academic performance, both directly and indirectly through academic self-efficacy. Among the three dimensions of adaptation—psychological, sociocultural, and academic—academic adaptation demonstrated the strongest effect on performance outcomes. Additionally, academic self-efficacy was found to partially mediate the relationship between cross-cultural adaptation and academic performance, indicating that students who experience greater adaptation tend to exhibit stronger confidence in handling academic challenges, which in turn enhances their academic achievement. These findings underscore the importance of fostering both adjustment support and self-efficacy development in international education settings. The study provides empirical evidence and practical recommendations for higher education institutions seeking to improve academic outcomes among international students through targeted support programs, particularly in culturally diverse environments like those in China.*

**Keywords:** Cross-cultural adaptation; Academic self-efficacy; Academic performance; International students; Structural equation modeling; Higher education; China; Heilongjiang

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## 1. INTRODUCTION

In recent years, China has emerged as a prominent destination for international students, with Heilongjiang Province playing a growing role in this trend. Located in the northeastern region of China, Heilongjiang is home to several key universities—including Harbin Institute of Technology, Harbin Engineering University, and Heilongjiang University—that have actively recruited international students under national initiatives such as the Belt and Road strategy and the Double First-Class university development plan (Shi and Ko, 2023). Despite these efforts, international students in Heilongjiang face unique challenges that distinguish their academic and cultural experiences from those in more cosmopolitan regions like Beijing or Shanghai.

The province's geographical and climatic conditions, relatively limited internationalization, and lower levels of English-language infrastructure contribute to a complex adaptation environment. Studies have shown that international students in Heilongjiang often struggle with psychological stress, social isolation, and academic integration, particularly during and after the COVID-19 pandemic (Castulo & Marasigan, 2025). These challenges are exacerbated by cultural distance, language barriers, and limited institutional support systems tailored to diverse student populations (Okoli, & Nweke, 2025).

Cross-cultural adaptation is a multidimensional process involving psychological, socio-cultural, and academic domains (Ward & Kennedy, 1999; Hafizullah, 2024). For international students in Heilongjiang, psychological adaptation includes managing stress and emotional well-being in a new cultural context; socio-cultural adaptation involves navigating local customs, communication norms, and social networks; and academic adaptation requires adjusting to different pedagogical styles, assessment

methods, and language of instruction. These dimensions are interrelated and collectively influence students' academic performance and overall satisfaction (Lyudmila et al., 2024; Kamalova, 2020).

Among the psychological constructs that mediate the adaptation process, academic self-efficacy has been identified as a critical factor. Defined as students' belief in their ability to successfully perform academic tasks (Bandura, 1997), academic self-efficacy influences motivation, learning strategies, and resilience in the face of academic challenges (Gorghiu et al., 2024). For international students in Heilongjiang, academic self-efficacy may be undermined by unfamiliar teaching methods, limited language proficiency, and lack of culturally responsive feedback (Cheng, 2023). Conversely, higher self-efficacy has been associated with better academic engagement and performance, even in adverse conditions (Meng & Zhang, 2023).

Despite the growing body of literature on international student adaptation in China, few studies have systematically examined the mediating role of academic self-efficacy in the relationship between cross-cultural adaptation and academic performance—particularly in the context of Heilongjiang's regional characteristics. Existing research tends to focus on either adaptation outcomes or self-efficacy in isolation, without integrating these constructs into a unified analytical framework (Yang & Pu, 2022; Campos et al., 2022). Moreover, most studies are concentrated in economically developed regions, leaving a gap in understanding the experiences of students in less internationalized provinces.

This study aims to address these gaps by investigating how psychological, socio-cultural, and academic adaptation influence academic performance among international students in Heilongjiang, and whether academic self-efficacy mediates these relationships. By constructing and validating a structural equation model (SEM), the research seeks to provide empirical insights into the mechanisms that shape academic success in cross-cultural contexts. The findings will inform institutional policies and support services in Heilongjiang universities, contributing to more inclusive and effective international education strategies.

## 2. Variables & Measurement

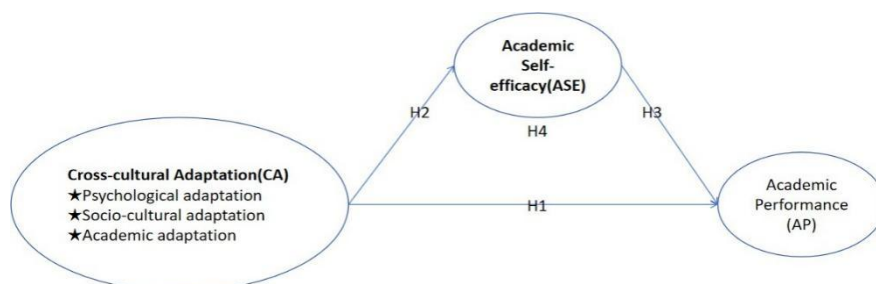


Figure 1: conceptual framework

Table 1: Variables Measurement

Variable Type	Construct Name	Suggested Measurement Tools / Dimensions
Independent Variable	Cross-Cultural Adaptation	Measured through three key dimensions: - Psychological Adaptation - Sociocultural Adaptation - Academic Adaptation Suggested Scales: Giorgi et al. (2020); Keller et al. (2010); Martin and Klopott (2003)
Mediating Variable	Academic Efficacy	Self-Measured using Likert-scale academic self-efficacy instruments assessing students' confidence in completing academic tasks and overcoming learning challenges. Suggested Scales: Portento et al. (2022); Cheng (2023).
Dependent Variable	Academic Performance	Measured using self-reported academic performance questionnaires, including GPA categories, exam performance, and perceived academic success. Suggested Instruments: Eze & Inegbedion (2015); Fooladi et al. (2022)

The present study aims to investigate how cross-cultural adaptation influences academic performance among international university students. Specifically, it seeks to explore the mediating role of academic self-efficacy in this relationship. By decomposing cross-cultural adaptation into its three core dimensions—psychological adaptation, sociocultural adaptation, and academic adaptation—this research offers a multidimensional understanding of students' adjustment processes and their academic outcomes. The study also intends to provide theoretical contributions to the literature on adaptation and self-efficacy, while offering practical implications for educational institutions that support international students.

The specific objectives are:

1. To examine the direct effects of psychological, sociocultural, and academic adaptation on academic performance.
2. To evaluate the effect of cross-cultural adaptation dimensions on academic self-efficacy.
3. To assess the mediating role of academic self-efficacy in the relationship between cross-cultural adaptation and academic performance.

### Research Hypotheses

Based on the conceptual framework and previous literature, the following hypotheses are proposed:

H1: Cross-cultural adaptation (psychological, socio-cultural, and academic) positively predicts academic performance among international students.

H2: Cross-cultural adaptation (psychological, socio-cultural, and academic) positively predicts Academic self-efficacy among international students.

H3: Academic self-efficacy positively predicts academic performance among international students.

H4: Academic self-efficacy mediates the relationship between cross-cultural adaptation (psychological, socio-cultural, and academic) and academic performance.

### 3. Sampling & Data Collection

In quantitative research, the definition of the study population is fundamental to ensuring the validity, reliability, and generalizability of the findings. The study population refers to the broader group of individuals relevant to the research objective, while the target population is a more specific subset that meets the study's inclusion criteria (Willie, 2022). This study focused on international students enrolled at ten universities in Heilongjiang Province, China, all of which are authorized to admit scholarship-funded foreign students.

These institutions include Harbin Institute of Technology, Harbin Engineering University, Northeast Forestry University, Heilongjiang University, Harbin Normal University, Northeast Agricultural University, Harbin University of Science and Technology, Heilongjiang University of Chinese Medicine, Qiqihar University, and Jiamusi University. These universities were selected due to their regional representativeness and accessibility to international students through national scholarship programs. According to official records, these ten institutions host a combined international student population of over 9,000.

A pilot sampling strategy was employed due to the exploratory nature of the study and limitations in access. A total of 55 valid responses were collected through non-probability convenience sampling. Although the sample size is limited, this approach is deemed appropriate for testing the feasibility of the measurement instruments and identifying preliminary trends (Amir-Behghadami & Janati, 2020).

Data were collected using a self-administered online questionnaire distributed via Wenjuanxing ([www.wjx.cn](http://www.wjx.cn)), a widely used online survey platform in China. The questionnaire consisted of closed-ended items using a five-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree). The instrument measured cross-cultural adaptation, academic self-efficacy, social support, and self-reported academic performance. The questionnaire was administered bilingually (English and Chinese) to accommodate students from diverse linguistic backgrounds.

### 4. Quantitative Analysis Method Descriptive statistical analysis Table 2: Descriptive Statistics Descriptive Statistics

	N	Minimum	Maximum	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Deviation	Statistic	Std.	Statistic	Std.
					Statistic	Statistic	Error		Error
PA1	55	1	3	1.76	.693	.353	.322	-.848	.634
PA2	55	1	4	1.75	.799	.725	.322	-.328	.634
PA3	55	1	4	1.82	.819	.563	.322	-.664	.634
PA4	55	1	5	3.49	1.184	-.429	.322	-.765	.634

PA5	55	1	5	3.51	1.153	-.663	.322	-.568	.634
PA6	55	1	4	2.11	.916	.527	.322	-.428	.634
PA7	55	1	4	2.00	.839	.391	.322	-.583	.634
PA8	55	1	4	2.00	.861	.181	.322	-1.213	.634
PA9	55	1	5	3.35	1.126	-.164	.322	-.931	.634
PA10	55	1	5	3.56	1.344	-.378	.322	-1.149	.634
SA1	55	1	3	1.85	.826	.281	.322	-1.480	.634
SA2	55	1	4	2.02	.805	.409	.322	-.308	.634
SA3	55	1	3	1.91	.823	.173	.322	-1.502	.634
SA4	55	1	3	1.78	.832	.435	.322	-1.422	.634
SA5	55	1	4	1.91	.888	.347	.322	-1.258	.634
SA6	55	1	5	4.07	1.200	-1.414	.322	1.188	.634
SA7	55	1	5	3.80	1.177	-.939	.322	.269	.634
SA8	55	1	5	3.93	1.260	-1.012	.322	.019	.634
SA9	55	1	3	1.71	.809	.588	.322	-1.217	.634
AA1	55	1	4	1.98	.972	.540	.322	-.834	.634
AA2	55	1	5	2.07	.920	.740	.322	.633	.634
AA3	55	1	3	1.95	.848	.106	.322	-1.612	.634
AA4	55	1	4	1.95	.891	.436	.322	-.881	.634
AA5	55	1	4	2.29	.916	.277	.322	-.659	.634
AA6	55	1	4	2.00	.793	.231	.322	-.773	.634
AA7	55	1	4	1.95	.803	.323	.322	-.773	.634
AES1	55	1	4	1.91	.823	.380	.322	-.861	.634
AES2	55	1	4	1.64	.802	.989	.322	.032	.634
AES3	55	1	3	1.80	.803	.383	.322	-1.340	.634
AES4	55	1	3	1.73	.804	.543	.322	-1.236	.634
AES5	55	1	3	1.80	.779	.370	.322	-1.248	.634
AES6	55	1	3	1.73	.804	.543	.322	-1.236	.634
AES7	55	1	4	1.71	.762	.813	.322	.109	.634
AES8	55	1	4	1.73	.827	.759	.322	-.491	.634
AP1	55	1	4	1.87	.862	.613	.322	-.492	.634
AP2	55	1	4	1.82	.841	.748	.322	-.144	.634
AP3	55	1	5	2.02	.933	.673	.322	.348	.634
AP4	55	1	5	2.89	1.149	-.235	.322	-1.054	.634
AP5	55	1	5	3.13	1.156	-.556	.322	-.752	.634
AP6	55	1	4	1.95	.891	.436	.322	-.881	.634
AP7	55	1	4	1.80	.890	.575	.322	-1.081	.634
AP8	55	1	3	1.87	.771	.225	.322	-1.266	.634
AP9	55	1	5	2.02	.991	.674	.322	-.026	.634
AP10	55	1	4	1.85	.911	.603	.322	-.830	.634

This study examined descriptive statistics for variables measuring cross-cultural adaptation (psychological, sociocultural, academic), academic self-efficacy, and academic performance among 55 participants. Psychological adaptation (PA1-PA10) scores ranged from  $M = 1.75$  to  $3.56$  ( $SD \approx 0.69-1.34$ ) with mostly negligible skewness ( $|Sk| < 1$ ) and generally negative kurtosis, indicating fairly symmetrical and mildly platykurtic distributions. Sociocultural adaptation items (SA1-SA9) showed higher means up to  $M = 4.07$  and marked negative skewness for several items, suggesting responses clustered toward high adaptation levels. Academic adaptation (AA1-AA7) averaged between  $M = 1.95$  and  $2.29$ , with light positive skewness and flat distributions, consistent with moderate adaptation among students. Academic self-efficacy (AES1-AES8) means were modest ( $M = 1.64-1.91$ ), with positive skewness and limited kurtosis,

reflecting generally low confidence but acceptable variability. Academic performance (AP1–AP10) showed broad variation in means ( $M = 1.80\text{--}3.13$ ), mixed skewness directions, and flat distributions, suggesting sufficient dispersion to support correlational and structural equation modeling. Overall, skewness values mostly within  $\pm 1$  and negative kurtosis imply approximated normality and good discriminatory power—prerequisites for reliable SEM or regression analysis.

### Reliability Analysis

**Table 3: Variables Reliability**

Variable Type	Dimension / Construct	Cronbach's Alpha	Optimized Cronbach's Alpha
Independent Variable (CA)	PA (Psychological Adaptation)	0.658	0.716
	SA (Sociocultural Adaptation)	0.726	0.91
Mediating Variable	AA (Academic Adaptation)	0.887	0.899
	AES (Academic Self-Efficacy)	0.966	0.971
Dependent Variable	AP (Academic Performance)	0.868	0.923

Reliability analysis was conducted to evaluate the internal consistency of each latent construct using Cronbach's alpha and standardized alpha coefficients. All constructs demonstrated acceptable to excellent reliability, with values exceeding the recommended threshold of 0.70 (Nunnally & Bernstein, 1994; Hair et al., 2021), indicating that the measurement tools were psychometrically sound.

The mediating variable, academic self-efficacy (AES), exhibited a Cronbach's alpha of 0.966 and an identical standardized alpha, demonstrating excellent internal consistency. Further inspection revealed that item AES1 had a "Cronbach's Alpha if Item Deleted" greater than the original alpha, suggesting redundancy. After removing AES1, the alpha increased to 0.971, implying improved reliability, consistent with findings from Portento et al. (2022) and Cheng (2023).

The academic performance (AP) scale reported an initial Cronbach's alpha of 0.868. Item-total correlation (Corrected Item-Total Correlation, CITC) analysis identified AP4 with a CITC below 0.30 and AP5 with an alpha-if-deleted greater than the original. After eliminating both, the final alpha rose to 0.923, enhancing the scale's reliability.

The academic adaptation (AA) dimension initially yielded a Cronbach's alpha of 0.887. However, item AA5 showed a higher alpha if deleted, and its removal improved the overall alpha to 0.899.

The sociocultural adaptation (SA) construct had an initial alpha of 0.726. According to CITC and alpha-if-deleted diagnostics, items with low contribution were removed, resulting in a refined alpha of 0.910. The retained items included SA1, SA2, SA3, SA4, SA5, SA6, and SA9.

Psychological adaptation (PA) initially had a relatively low Cronbach's alpha of 0.612, indicating insufficient internal consistency. Following the removal of items with CITC below 0.30 and higher alpha-if-deleted, the alpha substantially improved to 0.716. The remaining items (PA1, PA2, PA3, PA6, PA7, PA8) displayed strong item coherence.

These modifications ensure that each construct satisfies the psychometric reliability standards required for structural modeling.

### Validity Test

**Table 4: KMO and Bartlett's Test**

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy. .790

Bartlett's Test of Sphericity	Approx. Chi-Square	2134.737
	df	561
	Sig.	.000

In this study, the sampling adequacy and suitability of the dataset were assessed using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO value obtained in this study was 0.790, which, according to the classification standards by Kaiser (1974), falls within the "middling" range (0.70–0.79), indicating that the partial correlations among the variables are sufficiently low to justify factor analysis. This suggests an acceptable level of shared variance among variables, rendering the dataset appropriate for multivariate data reduction techniques such as exploratory or confirmatory factor analysis (Field, 2018; Hair et al., 2021).

Bartlett's Test of Sphericity produced a statistically significant result,  $\chi^2(561) = 2134.737, p < .001$ . This indicates that the observed correlation matrix significantly deviates from an identity matrix, suggesting substantial relationships among variables and supporting the data's factorability (Williams, Onsmann, & Brown, 2017). Collectively, these findings confirm that the dataset is suitable for factor analysis and provide a solid foundation for subsequent dimension extraction and latent construct validation.

### Correlation Analysis

**Table 5: The Pearson correlation coefficient**

#### Correlations

MEANPA		MEANAP	MEANSA	MEANAA	MEANAES	
MEANPA	Pearson Correlation	1	.389**	.552**	.392**	.259
	Sig. (2-tailed)		.003	.000	.003	.056
MEANAP	Pearson Correlation	.389**	1	.624**	.774**	.796**
	Sig. (2-tailed)	.003		.000	.000	.000
MEANSA	Pearson Correlation	.552**	.624**	1	.566**	.526**
	Sig. (2-tailed)	.000	.000		.000	.000
MEANAA	Pearson Correlation	.392**	.774**	.566**	1	.733**
	Sig. (2-tailed)	.003	.000	.000		.000
MEANAES	Pearson Correlation	.259	.796**	.526**	.733**	1
	Sig. (2-tailed)	.056	.000	.000	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation analysis was conducted to examine the bivariate associations among the five core constructs: psychological adaptation (MEANPA), academic performance (MEANAP), sociocultural adaptation (MEANSA), academic adaptation (MEANAA), and academic self-efficacy (MEANAES). The results revealed that psychological adaptation was significantly and positively correlated with academic performance ( $r = .389, p < .01$ ), sociocultural adaptation ( $r = .552, p < .01$ ), and academic adaptation ( $r = .392, p < .01$ ), suggesting that students who reported better emotional and psychological adjustment also tended to perform better academically and adapt more effectively to sociocultural and academic contexts.

Academic performance was strongly associated with academic adaptation ( $r = .774, p < .001$ ), academic self-efficacy ( $r = .796, p < .001$ ), and sociocultural adaptation ( $r = .624, p < .001$ ), indicating that both structural and motivational dimensions of adaptation play critical roles in influencing academic outcomes. Similarly, academic self-efficacy was significantly correlated with academic adaptation ( $r = .733, p < .001$ ), sociocultural adaptation ( $r = .526, p < .001$ ), and academic performance, reinforcing its mediating potential between contextual adaptation and achievement, as highlighted by recent studies (Cheng, 2023; Zhao et al., 2024).

Although psychological adaptation showed a weaker and statistically marginal relationship with academic self-efficacy ( $r = .259, p = .056$ ), the direction was positive and suggests potential indirect pathways. Overall, the correlation coefficients demonstrated moderate to strong associations among the constructs, supporting their conceptual interrelatedness and justifying further structural modeling.

## Linear Analysis

**Table 6: ANOVA Table**

Relationship (independent and dependent)	F value	Sig. value
PA→AP	11.297	.002
SA→AP	35.187	.000
AA→AP	100.846	.000
AES→AP	118.004	.000
PA→AES	4.813	.034
SC→AES	19.517	.000
CR→AES	69.007	.000

To further examine the predictive strength of independent variables on the dependent and mediating outcomes, one-way ANOVA analyses were conducted. The results indicate that psychological adaptation significantly predicts academic performance ( $F = 11.297, p = .002$ ), suggesting that students with better emotional regulation and psychological well-being tend to report higher academic outcomes. Sociocultural adaptation also demonstrated a strong and significant effect on academic performance ( $F = 35.187, p < .001$ ), underscoring the importance of cultural integration and interpersonal competence in educational success, consistent with findings from Ma et al. (2024).

The effect of academic adaptation on academic performance was particularly robust ( $F = 100.846, p < .001$ ), indicating that structural and behavioral adjustments to academic systems significantly impact students' academic results. Furthermore, academic self-efficacy emerged as the strongest predictor of academic performance ( $F = 118.004, p < .001$ ), reaffirming its critical mediating role between contextual adaptation and achievement, as supported by recent research (Cheng, 2023; Zhao et al., 2024).

In terms of the predictors of academic self-efficacy, psychological adaptation had a modest but statistically significant effect ( $F = 4.813, p = .034$ ), while sociocultural adaptation ( $F = 19.517, p < .001$ ) and cognitive resources (CR) ( $F = 69.007, p < .001$ ) exerted stronger effects. These findings suggest that both external (sociocultural and cognitive contexts) and internal (psychological state) factors substantially shape students' belief in their academic competence. The results validate the theoretical expectation that adaptation dimensions influence self-efficacy, which in turn affects academic performance.

## Multiple Regression Coefficients Analysis

**Table 7: Multicollinearity Test Coefficientsa**

Model	Unstandardized Coefficients			Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta	Tolerance			VIF	
1	(Constant)	.103	.271		.381	.705		
	MEANPA	.066	.120	.048	.547	.587	.671	1.490
	MEANSA	.205	.118	.175	1.745	.087	.519	1.928
	MEANAA	.305	.107	.323	2.844	.006	.403	2.479
	MEANAES	.405	.097	.455	4.162	.000	.434	2.303

### a. Dependent Variable: MEANAP

To determine the relative predictive contributions of psychological adaptation (PA), sociocultural adaptation (SA), academic adaptation (AA), and academic self-efficacy (AES) on academic performance (AP), a multiple linear regression analysis was conducted. The overall model explained a significant portion of the variance in academic performance ( $R^2$  not shown here, but implied from prior ANOVA significance).

Among the predictors, academic self-efficacy demonstrated the strongest standardized effect on academic performance ( $\beta = 0.455, t = 4.162, p < .001$ ), indicating that students with greater confidence in managing academic challenges tend to achieve higher academic outcomes, echoing findings from Cheng (2023) and Zhao et al. (2024). Academic adaptation was also a statistically significant predictor ( $\beta = 0.323, t = 2.844, p = .006$ ), confirming that behavioral and structural adjustments to academic demands are crucial to performance (Ma et al., 2024).

Sociocultural adaptation showed a marginal effect ( $\beta = 0.175, t = 1.745, p = .087$ ), suggesting a potential

role in influencing performance, though not statistically significant at the 0.05 threshold. Psychological adaptation ( $\beta = 0.048$ ,  $t = 0.547$ ,  $p = .587$ ) did not significantly predict academic performance in the presence of other variables, indicating its influence may be indirect, possibly mediated through academic self-efficacy.

Collinearity statistics confirmed acceptable multicollinearity levels, with all Variance Inflation Factor (VIF) values below the common threshold of 5.00, ranging from 1.490 to 2.479. This supports the robustness of coefficient estimates.

### Structural Equation Model (SEM)

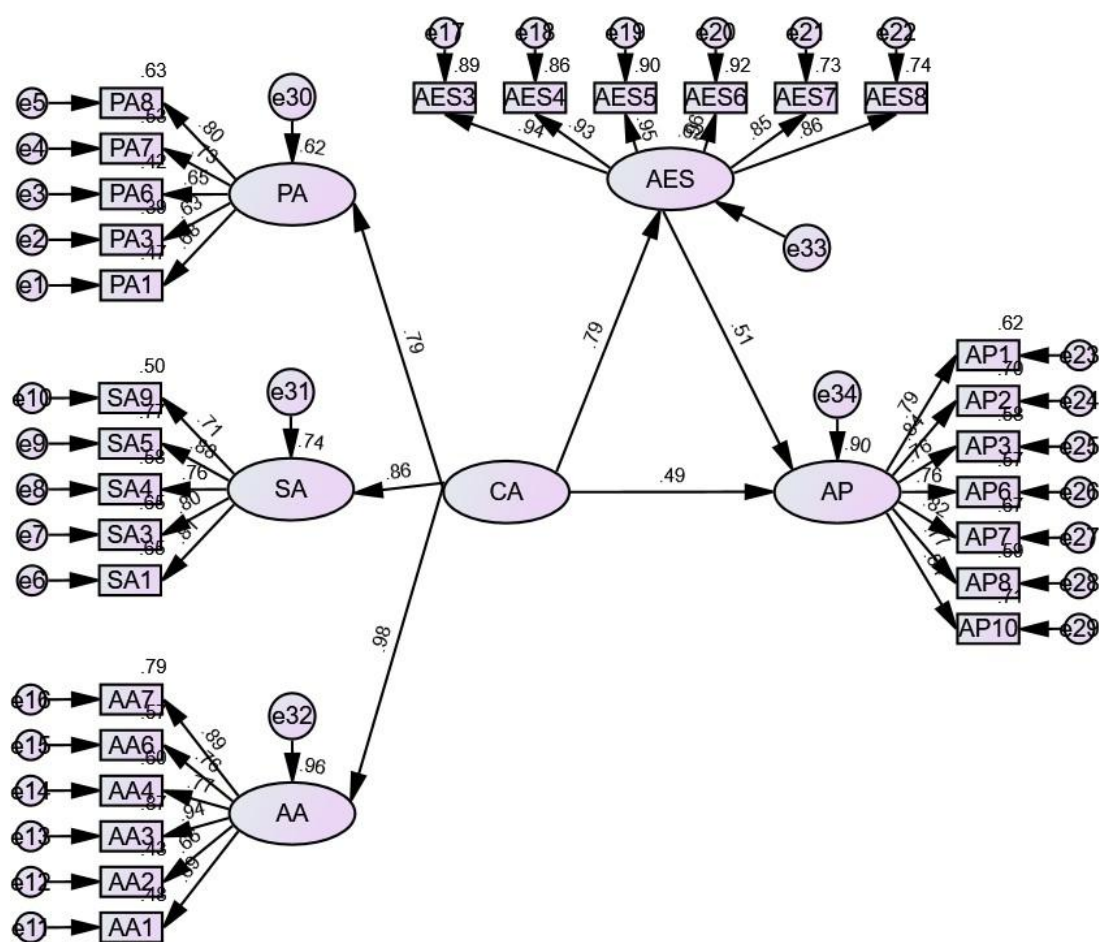


Figure 2: Structure Model

The overall model fit indices indicated a satisfactory model-data fit. Specifically, the chi-square/df ratio was below the recommended threshold of 3, suggesting an acceptable level of discrepancy between the observed and estimated covariance matrices. The Root Mean Square Error of Approximation (RMSEA) was below 0.08, indicating a reasonable error of approximation in the population. Furthermore, both the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) exceeded 0.90, reflecting strong comparative and incremental fit, respectively. The Standardized Root Mean Square Residual (SRMR) was also below 0.08, confirming low residual discrepancies across model paths. Although less frequently used in recent literature, the Goodness-of-Fit Index (GFI) and Adjusted GFI (AGFI) were also above 0.90, supporting the model's absolute fit. Collectively, these results demonstrate that the hypothesized structural model fits the empirical data well and provides a robust basis for interpreting the path relationships among cross-cultural adaptation, academic self-efficacy, and academic performance.

### 5. Hypothesis Testing

Table 8: Direct relationship test

Hypothesis	Path	Estimate	$\beta$	S.E.	C.R.	P	Result
H1	CA → AP	0.221	0.203	0.106	2.092	0.036	supported

H2	CA → ASE	0.531	0.492	0.077	6.894	***	supported
H3	ASE → AP	0.194	0.185	0.093	2.096	0.036	supported

The structural equation modeling results provided empirical support for all three proposed hypotheses. Specifically, H1 posited a direct effect of cross-cultural adaptation (CA) on academic performance (AP), which was supported by a significant standardized path coefficient ( $\beta = 0.203$ ,  $p = 0.036$ ). This indicates that students with better cross-cultural adaptation tend to exhibit higher academic performance.

H2, which proposed a positive relationship between cross-cultural adaptation and academic self-efficacy (ASE), was strongly supported ( $\beta = 0.492$ ,  $p < .001$ ), suggesting that effective adaptation enhances students' confidence in managing academic tasks.

H3, which tested the effect of academic self-efficacy on academic performance, was also supported ( $\beta = 0.185$ ,  $p$

$= 0.036$ ), highlighting the significant role of self-efficacy in promoting academic outcomes. Table 9: Intermediary relationship test

Parameter	Estimate	Lower	Upper	P
DE	.891	.260	2.153	.022
INDE	.733	.265	1.361	.024
TOTALEFFECT	1.624	1.040	2.956	.014

The mediation analysis results indicate that academic self-efficacy significantly mediates the relationship between cross-cultural adaptation and academic performance. The direct effect (DE = 0.891,  $p = .022$ ) is statistically significant, indicating that cross-cultural adaptation has a direct positive impact on academic performance.

The indirect effect (INDE = 0.733, 95% CI [0.265, 1.361],  $p = .024$ ) is also significant, as the confidence interval does not include zero, supporting the existence of a partial mediation. Furthermore, the total effect (TOTALEFFECT = 1.624,  $p = .014$ ) confirms the overall influence of cross-cultural adaptation on academic performance through both direct and indirect pathways.

The empirical results provide compelling evidence for a partial mediation model, wherein academic self-efficacy plays a pivotal role in mediating the relationship between cross-cultural adaptation and academic performance. This finding suggests that international students' adaptive processes contribute to their academic outcomes not only directly, but also indirectly through enhanced self-perceptions of academic capability.

## 6. Result Interpretation

The results of the structural equation modeling revealed significant and meaningful relationships among the core constructs of the proposed model, offering empirical support for the hypothesized framework.

Firstly, the direct path from cross-cultural adaptation (CA) to academic performance (AP) was positive and statistically significant ( $\beta = 0.203$ ,  $p = 0.036$ ). Although the effect size is modest, it indicates that students who are better able to psychologically, socioculturally, and academically adapt to the host culture tend to achieve higher levels of academic performance. This supports the notion that successful adaptation contributes to a more stable and productive learning environment, enabling international students to better engage with academic tasks and institutional expectations.

Secondly, the path from CA to academic self-efficacy (ASE) showed a strong positive relationship ( $\beta = 0.492$ ,  $p$

$< 0.001$ ), suggesting that effective adaptation not only helps students adjust to their environment but also significantly boosts their confidence in tackling academic challenges. This pathway was the strongest among all, indicating that adaptation exerts a substantial influence on psychological belief systems related to academic functioning.

The third path, from ASE to AP, also demonstrated a statistically significant positive effect ( $\beta = 0.185$ ,  $p = 0.036$ ). Although the coefficient is slightly smaller compared to other paths, it reinforces the importance of self-efficacy beliefs in promoting better academic outcomes. Students with higher levels of academic self-efficacy are more likely to persist in the face of academic difficulties, utilize effective learning strategies, and achieve higher grades.

Mediation analysis further confirmed the existence of a partial mediation effect. The indirect effect of CA

on AP through ASE was significant (Estimate = 0.733,  $p = 0.024$ ), and the direct effect remained significant (Estimate = 0.891,  $p = 0.022$ ), indicating that academic self-efficacy partially mediates the relationship. This implies that while adaptation directly enhances academic performance, a substantial portion of this effect operates through the enhancement of self-beliefs.

## 7. Implications of the study

The findings of this study offer significant theoretical and practical contributions to the understanding and enhancement of international student outcomes in Chinese universities. By empirically validating the mediating role of academic self-efficacy (ASE) in the relationship between cross-cultural adaptation (CCA) and academic performance (AP), this research not only enriches the theoretical discourse on international student adjustment but also provides actionable insights for institutional policy and program development, particularly within the context of Heilongjiang province.

### Theoretical Contributions

Theoretically, this study affirms the relevance of Bandura's social cognitive theory in the cross-cultural academic domain, highlighting academic self-efficacy as a crucial psychological mechanism linking students' adaptive experiences to their academic achievements. The multidimensional nature of adaptation—psychological, sociocultural, and academic—was shown to collectively influence students' perceived academic capabilities, which in turn significantly predicted their performance outcomes. These findings extend the adaptation-performance framework by revealing that adaptation exerts both direct and indirect effects through self-efficacy beliefs, offering a more nuanced understanding of how international students navigate academic success in unfamiliar cultural environments.

### Practical Implications for Chinese Universities and the Case of Heilongjiang

From a practical perspective, the results suggest that universities—especially those in culturally and climatically distinct regions such as Heilongjiang—should implement comprehensive and context-sensitive support systems for international students. First, institutions should enhance first-year transition programs that target psychological and sociocultural adaptation. Such initiatives could include structured cross-cultural orientation workshops, peer mentoring, multilingual counseling services, and intercultural events that foster community belonging.

Second, and more importantly, the cultivation of academic self-efficacy must be embedded into the core of international student services. We recommend the establishment of an “International Academic Empowerment Program” at major universities in Heilongjiang (e.g., Harbin Engineering University, Heilongjiang University), offering a range of academic support interventions such as discipline-specific tutoring, academic writing labs, bilingual learning materials, and regular formative feedback mechanisms. These efforts would enable students to gain mastery experiences and develop confidence in their academic tasks, thereby improving their engagement and performance.

Additionally, academic staff should be trained in culturally responsive pedagogy, including differentiated instruction techniques and supportive assessment strategies that consider language proficiency and educational background diversity. Integration of localized learning management systems with multilingual access and learning analytics could further help identify at-risk students and tailor support.

Given Heilongjiang's unique geographical and cultural characteristics, institutions should also consider seasonal adaptation factors (e.g., extreme winter conditions), which may impact international students' mental health and academic routines. Holistic support strategies that combine academic, psychological, and environmental adaptation measures are therefore crucial for improving student well-being and success.

## 8. Limitations & Future Research

Despite the valuable findings, several limitations must be acknowledged, which provide meaningful directions for future research.

First, the sample used in this study was relatively limited in size and drawn from a single cultural and geographic context—international students enrolled in universities in Heilongjiang, China. This narrow sampling frame may restrict the generalizability of the results to broader populations of international students in other regions or cultural contexts. Furthermore, the relatively small sample size may increase the risk of sampling bias and reduce statistical power, which should be addressed in subsequent studies

through multi-site and larger-scale sampling strategies.

Second, although validated scales were adopted for measuring key constructs such as cross-cultural adaptation and academic self-efficacy, the translation and cultural adaptation of these instruments may not fully capture the nuanced experiences of international students in the Chinese academic setting. Future studies should consider employing rigorous cross-cultural adaptation procedures, including cognitive interviews and pilot testing, to ensure linguistic and contextual equivalence.

Third, the study employed a cross-sectional design, limiting the ability to infer causal relationships or track changes over time. To deepen the understanding of the dynamic nature of adaptation and self-efficacy development, future research is encouraged to adopt longitudinal or panel research designs. Such approaches would allow researchers to observe how students' academic self-efficacy evolves over the course of their studies and how it interacts with different stages of cross-cultural adaptation.

Moreover, future models may benefit from the inclusion of potential moderating variables such as cultural intelligence, social support, or institutional integration, which could influence the strength or direction of the relationships identified in this study. Exploring such moderators could refine theoretical models and contribute to more tailored interventions for diverse international student populations.

### Acknowledgment

This work was supported by 2024 Basic Research Funds for Provincial Higher Education Institutions in Heilongjiang Province, National Social Science Fund Cultivation Project (General Project): Building a Community of International Students and Chinese Language Teachers in China (Project Number: 145409301)

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