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The Impact of Driving Factors on the High-Quality Development of Higher Vocational Colleges from the Perspective of Lifelong Education: The Mediating Role of Teachers' and Students' Self-Efficacy

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ABSTRACT: With the continuous advancement of the construction of a national lifelong learning system and the deepening reform of the modern vocational education system, exploring the internal and external driving factors underlying the high-quality development of higher vocational colleges in border regions can effectively address several prominent challenges faced by northern higher vocational institutions, including insufficient connotative development in relation to construction requirements, inadequate motivation for autonomous learning among teachers and students, and difficulties in adapting lifelong education services to the needs of regional industries. Therefore, this research has significant practical implications.Drawing on self-efficacy theory and lifelong education theory, this study clarifies the transmission mechanisms among variables and constructs a theoretical model centered on lifelong education driving factors, teachers' and students' self-efficacy, and the high-quality development of higher vocational colleges. The study conducted a survey among 14 public higher vocational colleges in Heilongjiang Province, collecting 628 valid teacher questionnaires and 864 valid student questionnaires. Empirical analysis was conducted using SPSS 26.0 and the PROCESS macro, including reliability and validity tests, correlation analysis, and Bootstrap tests of mediating effects.The empirical results reveal several key findings. First, four driving factors associated with lifelong education—digital learning resource provision, the implementation of industry–education integration, the cultivation of a lifelong learning-oriented campus environment, and modern institutional governance—can all positively promote the high-quality development of higher vocational colleges. Second, these four types of factors significantly enhance the self-efficacy levels of both teachers and students. Finally, teachers' and students' self-efficacy plays a mediating role in this process: various lifelong education-related factors not only directly improve the quality of institutional development but also indirectly facilitate the connotative development of colleges by strengthening teachers' and students' confidence in learning and career development.Based on the practical context of higher vocational education in Heilongjiang Province, this study enriches the theoretical framework concerning institutional development from the perspective of lifelong education and provides two practical implications for higher vocational colleges in northern border regions. Higher vocational institutions should not only align their educational practices with local industrial characteristics but also focus on stimulating the subjective initiative of teachers and students, thereby establishing a sustainable and stable model of high-quality development.

KEYWORDS: lifelong education, higher vocational colleges, high-quality development, teachers' and students' self-efficacy, mediating effect

I. INTRODUCTION

A. Research Background

China is making comprehensive efforts to advance the construction of a leading country in education. The Implementation Plan for the Construction and Reform of the Modern Vocational Education System clearly defines a new development pathway for vocational education: moving beyond the traditional limitation of focusing solely on degree-oriented education and actively integrating vocational education into the national lifelong learning system, thereby making it a key carrier throughout individuals' lifelong learning and development. As a core component of the modern vocational education system, higher vocational colleges are not only responsible for cultivating technical and skilled talents but also need to expand their educational service functions. They are expected to provide skill improvement training for enterprise employees, undertake various continuing education

programs for in-service workers, and offer general education courses for the elderly and other members of society, thereby fulfilling diversified lifelong education service responsibilities. This transformation in educational positioning has directly reshaped the criteria for evaluating the quality of higher vocational colleges. In the past, institutional quality was mainly assessed based on hardware conditions such as professional programs and training facilities. However, current evaluations increasingly emphasize teachers' and students' autonomous learning capabilities, internal governance capacity, and regional social service capabilities, making connotative development the core indicator for measuring institutional development.

From the perspective of the current development of higher vocational education in China, there remain two major challenges in achieving high-quality development. First, institutional development is highly dependent on external forces. Long-term reliance on government funding, special projects, and other external resources for development may easily lead to similar development models among colleges, making it difficult to meet the differentiated and personalized learning demands of society in the era of lifelong learning. Second, the focus of educational evaluation has shifted inadequately. Existing assessment systems generally place excessive emphasis on hardware construction indicators while paying insufficient attention to the continuous professional development of teachers and the cultivation of students' confidence in lifelong autonomous learning. As a result, many reform initiatives related to lifelong education have failed to achieve the expected outcomes after implementation.

Existing academic research also has certain limitations. Most studies focus only on the direct effects of individual factors, such as industry–education integration and digital transformation, on institutional development. Few studies have integrated multidimensional driving factors within a comprehensive lifelong education framework while simultaneously considering the mediating role of teachers' and students' self-efficacy. Systematic investigations into the underlying mechanisms driving the high-quality development of higher vocational colleges remain relatively limited.

B. Literature Review

Lifelong Education and High-Quality Development of Higher Vocational Colleges

Research on lifelong education first emerged internationally. Developed regions in Europe and North America have long incorporated community colleges into comprehensive lifelong learning service systems and have placed particular emphasis on the functions of vocational institutions in providing continuing education and public skill development services for society.Existing Chinese studies generally recognize that lifelong education can promote the improvement and development of higher vocational colleges through multiple dimensions. Digital learning resources, which are not restricted by time or location, effectively expand the coverage of educational services provided by higher vocational colleges. Continuously deepened industry–education cooperation keeps pace with technological advancement in industries and meets the long-term career development needs of professionals. In addition, a strong campus culture of lifelong learning can reshape the overall educational environment and better implement the fundamental educational mission of fostering virtue through education. However, existing studies mainly remain at the theoretical discussion level and lack empirical verification based on large-scale survey data.

Self-Efficacy and Educational Development

Self-efficacy refers to an individual's subjective evaluation of their own ability to perform tasks. Within the context of higher vocational education, it can mainly be divided into two dimensions: teachers' self-efficacy in teaching and students' self-efficacy in learning.

Existing studies indicate that a high-quality educational environment and comprehensive learning support systems can effectively enhance teachers' and students' self-efficacy. Conversely, self-efficacy also influences the overall quality of institutional development. Higher teacher self-efficacy can enhance teachers' willingness to engage in teaching reform and educational research. When students possess sufficient confidence in learning, their motivation and ability for autonomous learning are also strengthened. The simultaneous improvement of both teachers' and students' psychological states can effectively contribute to the enhancement of higher vocational education quality.

However, current research still has limitations. Most studies focus separately on teachers or students as individual groups, with limited attention paid to integrating the self-efficacy of both groups. Few studies have examined whether combined teachers' and students' self-efficacy plays a mediating role between lifelong education driving factors and the high-quality development of higher vocational colleges. This research gap provides the starting point for the present study.

Research Content and Contributions

Existing research in vocational education has significant gaps, and this study develops a comprehensive research framework based on these deficiencies. Specifically, this study identifies four core driving factors influencing the high-quality development of higher vocational colleges within the context of lifelong education. By introducing teachers' and students' self-efficacy as a mediating variable, a theoretical model of variable relationships is constructed to clarify the underlying mechanisms among

variables. Questionnaire surveys are conducted to collect empirical data and examine the significance of each pathway within the model. Based on empirical findings, optimization strategies are proposed to improve the development mechanism of higher vocational colleges under the lifelong education system.

This study makes three major contributions.

First, macro-level educational environments and micro-level psychological variables have long been studied separately. How external educational conditions influence internal institutional development processes has lacked a complete transmission mechanism analysis. This study integrates these two perspectives and clarifies the internal mechanism through which external educational factors influence institutional quality.

Second, existing research on self-efficacy mainly focuses separately on teachers or students, neglecting the interactive characteristics of teaching and learning processes. By incorporating the self-efficacy of both groups into a unified analytical framework, this study better reflects the actual operational process of teaching and talent cultivation in higher vocational colleges.

Third, existing empirical studies on vocational education mainly investigate institutions located in central and eastern China, while higher vocational colleges in border regions possess unique geographical characteristics, limiting the applicability of generalized conclusions. Based on the lifelong transformation of vocational education and considering regional industrial structures and vocational education development conditions, this study provides findings that better correspond to the realities of higher vocational education in border regions.

II. THEORETICAL FOUNDATIONS AND RESEARCH HYPOTHESES

A. Definition of Core Concepts

Driving Factors for High-Quality Development of Higher Vocational Colleges from the Perspective of Lifelong Education

Based on the perspective of lifelong education, this study identifies four core driving factors that contribute to the high-quality development of higher vocational colleges. The first factor is digital learning resource provision, which includes both online lifelong learning courses open to the public and the construction and improvement of digitalized practical training resources within colleges. The second factor is lifelong industry–education integration, which requires long-term and stable cooperation between colleges and enterprises, the provision of continuing education for enterprise employees, and continuous updating of teaching content in accordance with technological advancement in industries. The third factor is lifelong learning-oriented campus culture, which emphasizes the cultivation of a campus environment characterized by lifelong learning and the regular organization of general continuing education activities. The fourth factor is lifelong institutional governance, through which colleges improve internal management systems compatible with lifelong education development, implement flexible credit systems, and address deficiencies in the management of non-degree education.

Teachers' and Students' Self-Efficacy

Previous studies have mostly examined self-efficacy levels among teachers or students separately, overlooking the inherent interaction between teaching and learning. Therefore, this study integrates the self-efficacy of both groups and treats it as a comprehensive mediating variable within the research model.Teachers' self-efficacy refers to teachers' internal recognition of their professional competence, their willingness to actively participate in lifelong teaching innovation and continuing professional development, and their confidence in effectively providing social skill training services while maintaining high teaching quality.Students' self-efficacy refers to students' psychological confidence when facing lifelong learning and career development. It includes their willingness to persist in autonomous lifelong learning, continuously improve professional skills, and confidently adapt to technological changes, occupational upgrading, and workplace transitions.

High-Quality Development of Higher Vocational Colleges

For a long period, the evaluation criteria for the quality of higher vocational colleges in China have been relatively narrow. Influenced by traditional stage-based degree education concepts, both academic research and internal institutional evaluations have excessively focused on talent cultivation outcomes within colleges, often relying only on basic indicators such as students' academic performance, practical training completion, and graduate employment rates to assess institutional quality. Although this evaluation approach matched the previous educational goal of cultivating on-campus skilled talents, it is insufficient for the current environment of universal lifelong learning. Today, higher vocational colleges are no longer merely institutions for degree education; they also undertake multiple responsibilities, including providing continuing education services for society, supporting skill upgrading among employed workers, and promoting long-term regional industrial development. Therefore, a single evaluation dimension cannot fully reflect the comprehensive value of higher vocational colleges or meet the requirements of the lifelong transformation of vocational education.

Accordingly, this study moves beyond traditional evaluation perspectives and defines the connotation of high-quality development of higher vocational colleges based on the core requirements of lifelong education and the practical conditions of vocational education. Talent cultivation remains the fundamental mission of higher vocational colleges. High-quality talent cultivation requires colleges to strengthen daily teaching and practical training, comprehensively improve students' professional competencies, and maintain the fundamental educational function of vocational education. In accordance with the principle of lifelong education for all, higher vocational colleges should also undertake social lifelong education services by providing non-degree skill training and general learning services for employees, unemployed individuals, and other members of society, thereby enhancing their public educational service functions.

Faculty development serves as a key foundation for institutional growth. High-quality development of higher vocational colleges requires continuous growth of teaching teams, encouraging teachers to continuously update educational concepts, deepen research activities, and enhance social service capabilities, thereby forming a diversified faculty structure compatible with lifelong education demands. Meanwhile, internal governance capacity is also essential. Governance measures such as optimizing flexible credit systems, improving lifelong education support mechanisms, and standardizing non-degree education processes can provide institutional guarantees for lifelong learning activities throughout the entire learning cycle. In addition, stable and long-term industry–college collaborative development mechanisms are indispensable. Through deep cooperation between colleges and enterprises, teaching content and industrial technologies can be updated simultaneously, connecting campus learning with workplace development and meeting learners' lifelong career development needs. These multidimensional elements mutually support each other, fully reflecting the diversified educational positioning of higher vocational colleges in the new era and more accurately representing their actual development level under the lifelong education context.

B. Theoretical Foundations

Self-Efficacy Theory

Bandura's self-efficacy theory suggests that external environmental stimuli influence individual cognition, while individual cognition further affects behavior and ultimately organizational development. A supportive lifelong education environment (driving factors) represents a positive external stimulus that can enhance teachers' and students' self-efficacy (individual cognition), thereby promoting active participation in teaching reform and autonomous learning, and ultimately improving institutional quality (organizational development). This provides theoretical support for the mediating model proposed in this study.

Lifelong Education Theory

Lifelong education theory emphasizes that education extends throughout an individual's entire life, educational participants include all members of society, and educational forms encompass both degree and non-degree education. This theory establishes that higher vocational colleges are no longer merely institutions for degree education but public service hubs for lifelong learning, providing a theoretical basis for the classification of independent variables.

C. Development of Research Hypotheses

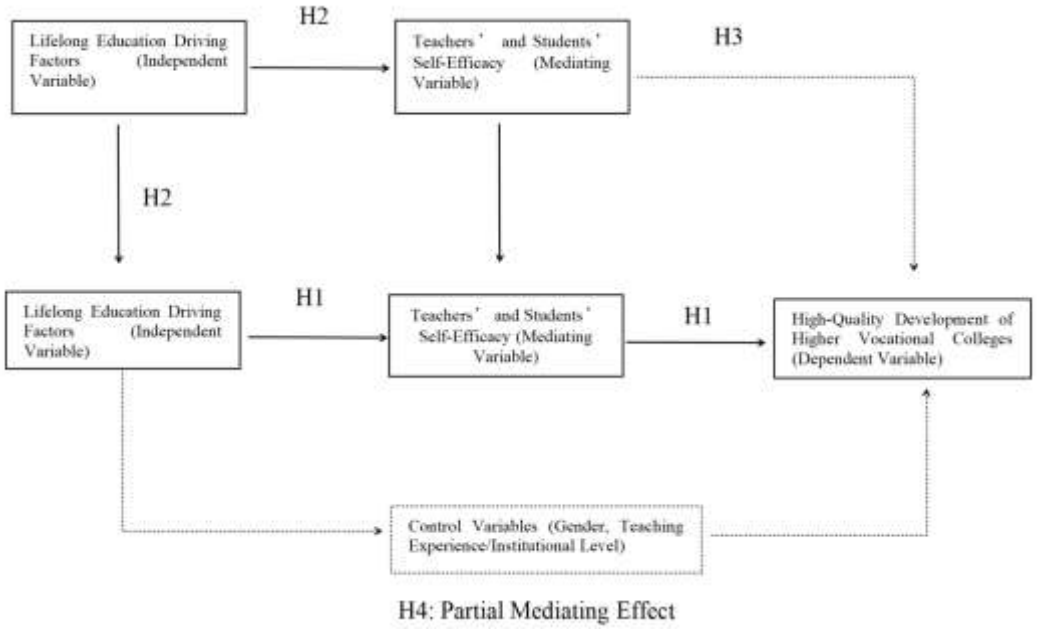
H1: The four driving factors of lifelong education positively and significantly influence the high-quality development of higher vocational colleges.

H2: The four driving factors of lifelong education positively and significantly influence teachers' and students' self-efficacy.

H3: Teachers' and students' self-efficacy positively and significantly influences the high-quality development of higher vocational colleges.

H4: Teachers' and students' self-efficacy plays a partial mediating role between lifelong education driving factors and the high-quality development of higher vocational colleges.

D. Construction of the Theoretical Model



H4: Partial Mediating Effect

III. RESEARCH SUBJECTS AND RESEARCH METHODS

A. Research Subjects

This study employed a stratified random sampling method to conduct a questionnaire survey among 14 public higher vocational colleges across Heilongjiang Province from September to November 2025, including three institutions participating in the national "Double High-Level Plan" and eleven general public higher vocational colleges. The respondents consisted of full-time frontline teachers and full-time second- and third-year undergraduate-equivalent vocational students. First-year students were excluded because they had only recently entered higher vocational institutions and had insufficient perceptions of institutional lifelong education development.A total of 1,550 questionnaires were distributed, of which 1,492 valid questionnaires were collected, resulting in an effective response rate of 96.26%. Among them, 628 valid questionnaires were obtained from teachers and 864 valid questionnaires were obtained from students. The specific demographic distribution of the sample is presented in Table 1.

Table 1. Demographic Distribution of the Sample

Classification Dimension	Category	Sample Size	Percentage (%)
Institutional Level	Institutions Included in the "Double High-Level Plan"	476	31.90
	General Public Higher Vocational Colleges	1016	68.10
Teaching Experience	1–3 Years	164	26.11
	4–10 Years	287	45.70
	More than 10 Years	177	28.18
Student Discipline Type	Engineering and Science Disciplines (e.g., equipment manufacturing, mechanical and electrical engineering, agriculture, ice and snow tourism, and other advantageous disciplines in Heilongjiang Province)	489	56.60
	Humanities and Business Disciplines (e.g., finance, preschool education, administrative management, etc.)	375	43.40
Overall Gender Distribution	Male	743	49.80
	Female	749	50.20

As shown in Table 1, the survey sample covers public higher vocational colleges with different levels of educational development in Heilongjiang Province, while incorporating full-time teachers with different years of teaching experience and student groups from mainstream engineering, science, humanities, and business disciplines within higher vocational colleges. The sample is consistent with the regional characteristics of professional structures, faculty composition, and student enrollment patterns in higher vocational education in Heilongjiang Province. Therefore, the sample adequately reflects the actual conditions of regional vocational education, and the survey data demonstrate strong representativeness.

B. Measurement Instruments

All measurement scales adopted a five-point Likert scale, where 1 indicates "strongly disagree" and 5 indicates "strongly agree." Higher scores represent higher levels of the corresponding variables.

All measurement scales used in this study employed a five-point Likert scale, with 1 representing "strongly disagree" and 5 representing "strongly agree." Higher scores indicate higher levels of the corresponding variables. The measurement scales were developed through the adaptation and refinement of established scales from both domestic and international studies, combined with the specific research context of this study. The dimensions, number of items, sources, and measurement contents of each scale are summarized in Table2.

Table 2. Dimensions, Number of Items, Sources and Measurement Contents of Each Scale

Variable Type	Variable Name	Dimensions	Number of Items	Scale Source and Modification Description
Independent Variable	Lifelong Education Driving Factors	Digital Learning Resource Provision; Lifelong Industry–Education Integration; Lifelong Learning-Oriented Campus Culture; Lifelong Institutional Governance	16	Developed by combining vocational education lifelong education policies and existing literature-based measurement scales
Mediating Variable	Teachers' and Students' Self-Efficacy	Teachers' Self-Efficacy in Teaching Development; Students' Self-Efficacy in Lifelong Learning	12	Adapted from the General Self-Efficacy Scale (GSE) and modified based on the context of higher vocational education
Dependent Variable	High-Quality Development of Higher Vocational Colleges	Talent Cultivation Quality; Social Lifelong Education Service Quality; Faculty Development Quality; Institutional Governance Quality; College–Enterprise Collaborative Development Quality	15	Developed with reference to the official evaluation indicator system for high-quality development of vocational education

C. Data Processing Methods

This study employed SPSS 26.0, AMOS 24.0 statistical analysis software, and the PROCESS macro for data processing and empirical testing. The testing criteria and sampling procedures were uniformly established. The complete data processing procedure and the results of the common method bias test are summarized in Table 3.

Table 3. Complete Data Processing Procedures, Commonly Used Methods and Bias Test Results

Analysis Item	Analytical Tool / Test Method	Key Procedures and Criteria	Test Results
Reliability Test	SPSS 26.0	Cronbach's α coefficient; criterion: α > 0.7 indicates acceptable reliability	Cronbach's α coefficients of all dimensions and overall scales were greater than 0.8, indicating excellent reliability
Validity Test	AMOS 24.0	Confirmatory factor analysis; criteria: $\chi^2/df < 3$, RMSEA < 0.08, CFI/TLI > 0.9	All model fit indices met the criteria, indicating satisfactory convergent validity and discriminant validity

Correlation and Hierarchical Regression Analysis	SPSS 26.0	Pearson correlation analysis and hierarchical regression analysis; demographic variables were controlled	Correlations among variables were consistent with theoretical expectations, and the main effects were significant
Mediation Effect Test	PROCESS Model 4	Bootstrap resampling (5,000 times); 95% confidence interval; the mediation effect is significant when the confidence interval does not include zero	The confidence interval of the mediation effect did not include zero, confirming the existence of a partial mediation effect
Common Method Bias Test	Harman's Single-Factor Test	Unrotated exploratory factor analysis; the variance explained by the first factor should be less than 40% to indicate no serious common method bias	The first factor explained 18.72% of the variance, indicating no serious common method bias

Four demographic variables, including gender, years of teaching experience/years of study, institutional level, and regional location, were controlled throughout the data processing procedure to eliminate the interference of irrelevant variables and ensure the objectivity and reliability of the empirical analysis results.

IV. RESEARCH RESULTS AND DATA ANALYSIS

A. Reliability Test

Cronbach's α coefficient was used to examine the internal consistency reliability of the scales. An α value greater than 0.7 indicates satisfactory reliability.

Table 4 Results of Reliability Test

Variable	Dimension	Number of Items	Cronbach's α Coefficient	Overall α Coefficient
Lifelong Education Driving Factors	Digital Learning Resource Provision	4	0.826	0.914
	Lifelong Industry–Education Integration	4	0.841	
	Lifelong Learning-Oriented Campus Culture	4	0.817	
	Lifelong Institutional Governance	4	0.835	
Teachers' and Students' Self-Efficacy	Teachers' Self-Efficacy / Students' Self-Efficacy	12	0.892	0.892
High-Quality Development of Higher Vocational Colleges	Five Dimensions of Institutional Development	15	0.906	0.906

As shown in Table 4, the Cronbach's α coefficients of all dimensions of the variables were greater than 0.8, and the overall Cronbach's α coefficients of the scales were greater than 0.9. Therefore, the scales demonstrated excellent reliability and good internal consistency.

B. Validity Test (Confirmatory Factor Analysis)

Confirmatory factor analysis was conducted using AMOS 24.0 to examine convergent validity and discriminant validity. The model fit criteria were as follows: $\chi^2/df < 3$, RMSEA < 0.08, CFI and TLI > 0.9, and SRMR < 0.08.

Table 5. Results of Validity Test

Fit Index	χ^2/df	RMSEA	CFI	TLI	SRMR
Actual Fit Value	1.862	0.051	0.947	0.939	0.048
Recommended Criterion	<3	<0.08	>0.9	>0.9	<0.08

All model fit indices met the required criteria, indicating a good model fit. Meanwhile, the factor loadings of all measurement items were greater than 0.6, the average variance extracted (AVE) values were greater than 0.5, and the composite reliability (CR) values were greater than 0.8, demonstrating satisfactory convergent validity of the scales. In addition, the square roots of the AVE values for all variables were greater than the correlation coefficients between variables, indicating satisfactory discriminant validity.

C. Descriptive Statistics and Correlation Analysis

Table 6. Descriptive Statistics and Correlation Analysis Results

Variable	Mean	Standard Deviation	1	2	3
1. Lifelong Education Driving Factors	3.642	0.527	1		
2. Teachers' and Students' Self-Efficacy	3.518	0.561	0.624**	1	
3. High-Quality Development of Higher Vocational Colleges	3.573	0.549	0.671**	0.658**	1

Note: indicates $p < 0.01$ (two-tailed test), and the same applies below.

The descriptive statistics results show that the mean values of the three core variables are all at a moderately high level, indicating that the current development of lifelong education construction, teachers' and students' self-efficacy, and the overall quality of higher vocational colleges are at an intermediate stage of development, with considerable room for further improvement. The correlation analysis results indicate that lifelong education driving factors are significantly positively correlated with teachers' and students' self-efficacy ($r = 0.624$, $p < 0.01$); lifelong education driving factors are significantly positively correlated with the high-quality development of higher vocational colleges ($r = 0.671$, $p < 0.01$); and teachers' and students' self-efficacy is significantly positively correlated with the high-quality development of higher vocational colleges ($r = 0.658$, $p < 0.01$). All correlations among variables are consistent with expectations, providing a foundation for subsequent regression analysis and mediation effect testing.

D. Regression Analysis (Direct Effect Test)

After controlling for demographic variables, hierarchical regression analysis was conducted to examine the main effects. The results are as follows:

Table 7. Hierarchical Regression Results for Main Effect Test

Regression Path	Regression Coefficient β	SE	t-value	p-value	R^2
Driving Factors → High-Quality Development of Higher Vocational Colleges	0.482	0.036	13.389	<0.001	0.452
Driving Factors → Teachers' and Students' Self-Efficacy	0.516	0.039	13.231	<0.001	0.417
Driving Factors + Self-Efficacy → High-Quality Development of Higher Vocational Colleges	0.247 / 0.455	0.041 / 0.038	6.024 / 11.974	<0.001	0.576

The results indicate that: first, lifelong education driving factors significantly and positively predict the high-quality development of higher vocational colleges ($\beta = 0.482$, $p < 0.001$), supporting Hypothesis H1. Second, lifelong education driving factors significantly and positively predict teachers' and students' self-efficacy ($\beta = 0.516$, $p < 0.001$), supporting Hypothesis H2. Third, after simultaneously entering the independent variable and the mediating variable into the regression model, the regression

coefficient of driving factors on the dependent variable decreased from 0.482 to 0.247 but remained significant. Meanwhile, teachers' and students' self-efficacy significantly and positively predicted the high-quality development of higher vocational colleges ($\beta = 0.455$, $p < 0.001$), supporting Hypothesis H3 and providing preliminary evidence for the existence of a partial mediating effect.

E. Bootstrap Mediation Effect Test

Table 8. Bootstrap Mediation Effect Test Results

Effect Type	Effect Value	Standard Error	95% Confidence Interval Lower Limit	95% Confidence Interval Upper Limit	Proportion of Mediating Effect
Total Effect	0.482	0.036	0.412	0.553	100%
Direct Effect	0.247	0.041	0.167	0.327	51.24%
Indirect Effect (Mediating Effect)	0.235	0.032	0.176	0.301	48.76%

The Bootstrap test results show that the 95% confidence interval of the indirect effect is [0.176, 0.301], which does not include zero, indicating that the mediating effect of teachers' and students' self-efficacy is significant. The value of the mediating effect is 0.235, accounting for 48.76% of the total effect, indicating a partial mediation effect. Therefore, Hypothesis H4 is supported.

V. DISCUSSION

A. Discussion on the Direct Impact of Lifelong Education Driving Factors on the High-Quality Development of Higher Vocational Colleges

The empirical results confirm that the four driving factors of lifelong education can directly and positively promote the high-quality development of higher vocational colleges, which is consistent with the conclusions of existing macro-level theoretical studies. Digital learning resource provision breaks the temporal and spatial limitations of traditional degree education and expands the boundaries of institutional social service functions. Lifelong industry–education integration aligns with the patterns of industrial technological advancement and addresses the mismatch between talent cultivation and occupational requirements. A lifelong learning-oriented campus culture reshapes the educational environment and implements the concept of holistic education. Institutional governance systems compatible with lifelong education can optimize management mechanisms and improve operational efficiency.According to the regression coefficients, the dimension of lifelong industry–education integration demonstrates the strongest direct effect, indicating that the primary foundation for higher vocational colleges to integrate into the lifelong education system remains the establishment of long-term college–enterprise cooperation mechanisms. By relying on enterprise resources to provide continuing education and vocational skill improvement training for employees, higher vocational colleges can better align with the functional positioning of vocational education.

B. Discussion on the Impact of Lifelong Education Driving Factors on Teachers' and Students' Self-Efficacy

A well-developed external support environment for lifelong education can significantly enhance teachers' and students' self-efficacy. For teachers, the construction of comprehensive lifelong teaching and research platforms and social training programs by colleges can broaden teachers' career development pathways, overcome the limitations of traditional classroom-based teaching models, and enhance their confidence in providing diversified educational services. For students, abundant online lifelong learning resources and campus-based lifelong learning activities can help cultivate lifelong learning awareness, alleviate career anxiety, and improve confidence in autonomous learning and career development.Conversely, if colleges focus only on hardware construction while neglecting the establishment of lifelong learning support environments, teachers and students may experience professional burnout and insufficient learning motivation, resulting in continuously declining self-efficacy.

C. Discussion on the Partial Mediating Role of Teachers' and Students' Self-Efficacy

The core innovative finding of this study is that teachers' and students' self-efficacy plays a mediating transmission role accounting for nearly half of the total effect. This indicates that nearly half of the empowerment effect generated by lifelong education driving factors is realized through teachers' and students' subjective psychological cognition.This finding also explains the current reform difficulties faced by some higher vocational colleges. Some institutions invest heavily in digital platforms and expand college–enterprise cooperation projects, yet the improvement in educational quality remains limited. The fundamental reason is that they neglect psychological empowerment of teachers and students as key stakeholders. External hardware reforms cannot automatically transform into endogenous development motivation among teachers and students. External policies and

institutional reforms provide external driving forces, while teachers' and students' self-efficacy represents the internal driving force of institutional development. Only through the integration of external and internal forces can sustainable high-quality development of higher vocational colleges truly be achieved.

D. Analysis of Specific Development Differences among Higher Vocational Colleges in Heilongjiang Province

Based on further analysis of regional characteristics using the local sample data from Heilongjiang Province, it can be observed that compared with higher vocational colleges in economically developed eastern regions of China, public higher vocational colleges in Heilongjiang Province generally demonstrate a lower level of lifelong education development. The delayed updating of digital lifelong learning resources, insufficient lifelong industry–education integration projects targeting local industries (such as equipment manufacturing, modern agriculture, and the ice and snow economy), and relatively weak awareness of lifelong learning among teachers and students in northern regions have directly contributed to lower overall self-efficacy levels. These factors have also weakened the mediating transmission effect of self-efficacy to some extent.Considering regional educational conditions and institutional characteristics, higher vocational education development in Heilongjiang Province still faces the structural limitation of emphasizing degree-oriented talent cultivation while neglecting lifelong social services. Institutional reforms have mainly focused on teaching full-time students while overlooking localized lifelong education services, such as continuing education for employed workers, rural skill training, and lifelong empowerment for employees in the ice and snow industry. Consequently, the endogenous development motivation of teachers and students has not been effectively activated. Therefore, higher vocational colleges in Heilongjiang Province should not simply replicate mature development models from eastern regions when pursuing high-quality development. Instead, they should address deficiencies in lifelong education resources based on local industrial characteristics while simultaneously strengthening psychological empowerment for lifelong learning among teachers and students.

Further analysis based on regional stratification of sample data reveals that institutions in eastern regions generally demonstrate higher levels of driving factors, teachers' and students' self-efficacy, and educational quality compared with institutions in central and western regions. Higher vocational colleges in central and western regions face insufficient lifelong education resource supply, fewer opportunities for teachers and students to access diversified lifelong learning channels, and lower levels of self-efficacy. Accordingly, the mediating transmission effect is weaker than that observed in eastern institutions. Therefore, higher vocational colleges in central and western regions need to simultaneously strengthen external resource development and internal psychological empowerment among teachers and students during the process of pursuing high-quality development.

VI. RESEARCH CONCLUSIONS AND POLICY RECOMMENDATIONS

A. Research Conclusions

First, from the perspective of lifelong education, the four driving factors—digital learning resource provision, lifelong industry–education integration, lifelong learning-oriented campus culture, and lifelong institutional governance—can directly and significantly promote the high-quality development of higher vocational colleges.Second, lifelong education driving factors can effectively enhance teachers' self-efficacy in teaching development and students' self-efficacy in lifelong learning.Third, teachers' and students' self-efficacy plays a significant partial mediating role between independent variables and dependent variables. Lifelong education driving factors can not only directly empower the high-quality development of higher vocational colleges but also indirectly promote institutional improvement by enhancing teachers' and students' self-efficacy. The mediating effect accounts for 48.76% of the total effect.

B. Practical Recommendations

Optimize the Four-Dimensional Driving System and Strengthen External Support for Lifelong Education in Higher Vocational Colleges

First, higher vocational colleges should improve digital lifelong learning resource databases and develop hierarchical online courses targeting students, social workers, and elderly groups. Second, colleges should establish long-term mechanisms for lifelong industry–education integration, move beyond short-term internship cooperation models, and construct a full-cycle college–enterprise cooperation system covering student cultivation, employee training, and career advancement. Third, colleges should create a campus culture of lifelong learning for all members by regularly organizing learning seminars, skills competitions, and other activities. Fourth, institutional governance systems should be reformed by implementing flexible credit systems and establishing credit recognition channels between degree education and non-degree education.

Focus on Empowering Teachers and Students and Activate the Internal Motivation of Self-Efficacy

For teachers, colleges should establish differentiated continuing education and teaching research training systems, improve incentive mechanisms for social training services, and enhance teachers' confidence in providing diversified educational services.For students, colleges should offer career planning courses and general lifelong learning education courses, eliminate the fixed perception that "learning ends after graduation," alleviate employment anxiety, and enhance autonomous learning efficacy.

Implement Regional Differentiated Development Strategies and Narrow the Educational Development Gap between Eastern and Western Regions

Based on the regional characteristics of Heilongjiang Province, differentiated development strategies should be formulated. Higher vocational colleges included in the provincial "Double High-Level Plan" can leverage their institutional advantages to develop lifelong learning platforms adapted to the ice and snow economy, modern agriculture, and high-end equipment manufacturing industries, while improving campus lifelong learning culture and institutional governance systems.General public higher vocational colleges should prioritize addressing deficiencies in digital lifelong learning resources, deepen lifelong industry–education integration with local leading enterprises, and provide continuing education for employees in accordance with the needs of industrial transformation in Heilongjiang Province. At the same time, targeted psychological support for lifelong learning should be provided to teachers and students to enhance self-efficacy and avoid the development misconception of emphasizing hardware investment while neglecting stakeholder empowerment.

C. Research Limitations and Future Directions

Research Limitations: This study adopted a cross-sectional questionnaire survey design, which limits the ability to analyze the dynamic changes of variables over time. In addition, only one mediating variable was introduced, while moderating variables were not considered.Future Directions: Future research could conduct longitudinal tracking studies, incorporate campus learning atmosphere as a moderating variable, and construct a moderated mediation model. Meanwhile, the sample scope could be expanded to include private higher vocational colleges, thereby further improving the robustness and applicability of research conclusions.

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