Journal of Literature and Art Studies, May 2026, Vol. 16, No. 5, 420-427
doi: 10.17265/2159-5836/2026.05.010

Policy Support, University-Industry Collaboration, and Talent Cultivation Quality—Multiple Mediators in Building Modern Industrial Colleges Under Hainan's Free Trade Port*

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With the development of Hainan Province and the progress of the construction of Hainan Free Trade Port (FTP), the modern industrial colleges in application-oriented universities have been the essential carriers of the integration of education and industry. A nested mixed-methods design based on Triple Helix and resource dependence theories is used to survey 578 participants from five modern industrial colleges in Hainan. The study explores the influences of policy support and the cooperation of education and industry on talent cultivation quality and social service ability with curriculum adaptability and the share of dual-qualification teachers as mediators. The findings show that both policy support and the deep cooperation between universities and industries significantly enhance the quality of talent cultivation. Curriculum adaptability partially mediated the link between policy support and talent quality. A larger proportion of dual-qualification teachers is linked to stronger social service capacity, partly through better talent quality. The success of modern industrial colleges depends not only on policy benefits but also on building genuine shared-interest communities between industry and universities and on flexible curriculum-updating mechanisms.

Keywords: Free Trade Port, application-oriented undergraduate institutions, modern industrial colleges, industry-education integration, Triple Helix theory, resource dependence theory

Introduction

The Hainan Free Trade Port (FTP) has been reshaping the regional economy toward modern services, high technology, and cross-border commerce, dramatically increasing the needs for high-quality applied talents (Li & Zhang, 2022). Traditional talent-development models in many application-oriented universities, however, have difficulty in matching the curriculum set-up, teaching practice, the structure of teaching staff with the acutal needs of industries (Long & Sun, 2026). Thus, as a multi-stakeholder innovative carrier of pooling resources and coordinate training, modern industrial colleges have been a way to solve the troubles above (Xu, 2021).

Although national guidelines actively encourage university-industry partnerships, and the FTP adds further advantages, such as tax incentives, institutional autonomy, and cross-border opportunities, an important question

* **Acknowledgments:** This research is a product of the project Research and Practice on the Development of Modern Industrial Colleges at Application-Oriented Undergraduate Universities in the Context of the Hainan Free Trade Port (Hnjg2025-111); it is also a research outcome of the school-level Talent Start-up Program (RHDRCSK202420).
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requires to be solved: Can these colleges really change institutional advantages into measurable gains in talent quality, and what mechanisms make this possible? After looking through the related articles, it is found that this field should be deeply explored. Therefore, the Triple Helix model (Etzkowitz & Leydesdorff, 2020) and resource dependence theory (Pfeffer & Salancik, 1978) are used to examine how policy support and university-industry collaboration contribute to talent cultivation quality and social service capacity. We treat curriculum adaptability and the proportion of dual-qualification faculty as mediators, using a mixed-methods design that includes a multiple-mediation model.

Literature Review and Research Questions

An Integrated Theoretical Framework

In Triple Helix theory, university, industry, and government are three interacting innovation subjects (Etzkowitz & Leydesdorff, 2020). In the FTP setting, government supplies policies including talent schemes, tax breaks, universities are responsible for imparting knowledge and cultvating graduates, and enterprises offer authentic worb contexts and job specifications. These three subjects interact and influence one another to exert an effect on the performance of industrial colleges (Liu, 2026).

Resource dependence theory points out that organizations form relationships with external actors that control important resources (Pfeffer & Salancik, 1978). Industrial colleges rely on government policy resources, such as curricular autonomy and funding, as well as enterprise assets like technology, equipment, and industry mentors. The extent of this dependence influences collaboration depth, stability, and how effectively internal resources are transformed (Hu, Pang, & Gu, 2023).

Combing the two theories, it is thought that policy support and enterprise collaboration are two core antecedents of industrial college effectiveness. Their influence on talent cultivation quality, however, is not entirely direct; it is partially mediated by curriculum adaptability and the share of dual-qualification faculty.

Research Hypothesis and Questions

In the background of FTP, policy support from, which is through financial subsidies, tax incentives, talent schemes, and institutional autonomy, lowers collaboration costs and encourages enterprise involvement (Li & Zhang, 2022; Long & Sun, 2026). Thus,

H1—Policy support positively affects talent cultivation quality.

The close, intimacy, and deep cooperation between universities and industries, which can be found in joint curriculum development, labs, internships, and executive teaching, is the significant feature of industrial colleges in high performance and raises graduates' abilities to seek for employment (Hu et al., 2023). Hence:

H2—The depth of collaboration positively affects talent cultivation quality.

Curriculum adaptability, referring to the alignment with FTP industry standards and international certifications, translates external policy resources into student competencies. Therefore:

H3—Curriculum adaptability mediates the link between policy support and talent cultivation quality.

Dual-qualification teachers, who have substantial enterprise work experience, can strengthen practical skills, innovation, technology transfer, and training services (Liu, 2026). Consequently:

H4—The share of dual-qualification teachers positively affects social service capacity.

H5—Talent cultivation quality positively affects social service capacity.

Whether talent cultivation quality mediates the relationship between dual-qualification teachers and social service capacity is explored, and whether policy support and collaboration depth interact in predicting talent quality is discussed. Three research questions guided the inquiry:

(1) What are the perceived levels of the six core constructs in FTP-based industrial colleges?

(2) What direct and indirect relationships exist among these variables?

(3) Do curriculum adaptability and dual-qualification teachers function as multiple mediators between policy support/collaboration depth and talent cultivation quality?

Research Design

Participants

A nested mixed-methods design is adopted in the study, with quantitative and qualitative data collected via a survey from March to May 2025. Through convenience and stratified sampling, five application-oriented undergraduate institutions in Hainan that have established modern industrial colleges are research objects. A total of 650 questionnaires were distributed, and 578 valid responses were returned, with effective response rate 88.9%. Participants included industrial college administrators (n = 83, 14.4%), full-time teachers (n = 126, 21.8%), enterprise mentors/cooperating company staff (n = 58, 10.0%), and junior/senior undergraduate students (n = 311, 53.8%). Males made up 47.6% and females 52.4%; the mean age was 27.8 years (SD = 8.64). In addition, 176 valid qualitative responses were collected, 82 from faculty/administrators and 94 from students.

Instruments

Six constructs were measured, five of them on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). The proportion of dual-qualification teachers (TS) was an institutional indicator.

Policy support (PS) was assessed with five items adapted from Chen, Liu, and Li (2019) to the FTP context. A sample item is: “FTP tax incentives for industry-education integrators have notably raised corporate participation willingness”. Cronbach’s $\alpha = 0.88$. Collaboration depth (CIC) used five self-developed items (e.g., “Enterprises are deeply involved in designing talent cultivation plans”; $\alpha = 0.84$). Curriculum adaptability (CR) comprised four items (e.g., “Course content keeps pace with emerging FTP sectors”; $\alpha = 0.81$). Talent cultivation quality (TEQ) was measured by six items covering graduate employment competitiveness and practical skills ($\alpha = 0.90$). Social service capacity (SSC) included four items on industry-sponsored research, training, and technology transfer ($\alpha = 0.86$). Dual-qualification teacher share (TS) was obtained from institutional HR records as the percentage of faculty with industry experience or at least one year of enterprise work, normalized to [0, 1]. One open-ended question was included for qualitative illustration.

Data Analysis

All collected questionnaires go through a two-step missing-data procedure: first an expectation-maximization (EM) approach, then a manual item-by-item check. No missing responses are found. Normality is assessed using skewness (< 2) and kurtosis (< 7) criteria (Kline, 2010). To detect outliers, we use both boxplots and Mahalanobis distance ($p < 0.001$), and none are kept. Reliability is good, with Cronbach’s α values all above 0.8. Next, a confirmatory factor analysis (CFA) is conducted to check convergent and discriminant validity. Factor loadings exceed 0.6, average variance extracted (AVE) is above 0.5, and the largest shared variance stays below the corresponding AVE. Common method bias is examined with Harman’s

single-factor test on all Likert-type items, and the first factor accounts for only 28.7% of the total variance—far under the 40% threshold.

Descriptive statistics and Pearson correlations are computed. Path coefficients and indirect effects are estimated via structural equation modeling (SEM) with maximum likelihood estimation in AMOS. Model fit is evaluated with χ^2/df, CFI, TLI, RMSEA, and SRMR. Mediation tests use bias-corrected bootstrap procedures with 5,000 resamples to generate 95% confidence intervals. Two control variables, institutional size and years of operation, are included in all SEM specifications.

Two doctoral candidates in the field of education, who worked separately and independently, carried out a conventional content analysis on the open-ended responses. Each of them, as a coder, went through all the narrative answers, pulled out recurring themes, and sorted them into initial categories. The initial agreement rate between the two coders was 87.6%. Any disagreements were resolved through a joint review. The final coding scheme, which includes enablers, barriers, and recommendations, is reported in the Results section.

Results

Descriptive Statistics and Validity

Means, standard deviations, and correlations are shown in Table 1. Perceived policy support (M = 3.87, SD = 0.79) and collaboration depth (M = 3.56, SD = 0.88) are moderately high; talent cultivation quality (M = 3.68, SD = 0.85) and social service capacity (M = 3.42, SD = 0.91) still have room for improvement. All independent variables are significantly positively correlated with the dependent variables ($p < 0.01$), with the strongest correlation between collaboration depth and talent cultivation quality ($r = 0.67$, $p < 0.01$).

Table 1

Means, Standard Deviations, and Correlation Matrix

Variable	M	SD	1	2	3	4	5
1. PS	3.87	0.79	1				
2. CIC	3.56	0.88	0.61**	1			
3. CR	3.72	0.82	0.58**	0.63**	1		
4. TS	0.34	0.12	0.43**	0.39**	0.45**	1	
5. TEQ	3.68	0.85	0.52**	0.67**	0.59**	0.48**	1
6. SSC	3.42	0.91	0.47**	0.55**	0.51**	0.53**	0.60**

Notes. ** $p < 0.01$. M and SD are based on raw scores (TS is normalized 0-1, where 0.34 = 34%).

CFA results show factor loading from 0.71 to 0.89, composite reliability (CR) > 0.8, and AVE > 0.5, indicating good convergent validity. Discriminant validity is supported because the square root of AVE for each construct exceeded its correlations with other constructs. Model fit indices are acceptable: χ^2/df = 2.67, CFI = 0.94, TLI = 0.92, RMSEA = 0.058, SRMR = 0.047.

Structural Model and Hypothesis Testing

The structural model demonstrated good fit: χ^2/df = 2.89, CFI = 0.93, TLI = 0.91, RMSEA = 0.062. Path coefficients are shown in Table 2.

Table 2

Hypothesis Testing Results

Path	Standardized β	SE	t-value	p	Result
PS → TEQ	0.24	0.072	3.33	<0.001	H1 supported
CIC → TEQ	0.48	0.069	6.96	<0.001	H2 supported
PS → CR	0.53	0.068	7.79	<0.001	—
CR → TEQ	0.31	0.075	4.13	<0.001	—
TS → SSC	0.33	0.064	5.16	<0.001	H4 supported
TEQ → SSC	0.46	0.071	6.48	<0.001	H5 supported

Mediation effects (bias-corrected percentile bootstrap, 5,000 resamples):

PS → CR → TEQ: indirect effect = 0.164 (95% CI [0.092, 0.241]), direct effect = 0.240 ($p < 0.001$), total effect = 0.404. The indirect effect accounted for 40.6% of the total effect, and the direct effect remained significant, meaning curriculum adaptability partially mediated the relationship. H3 supported.

CIC → CR → TEQ: indirect effect = 0.156 (95% CI [0.081, 0.235]), direct effect = 0.480. Thus, CR partially mediated the CIC–TEQ relationship.

TS → TEQ → SSC: indirect effect = 0.22 (95% CI [0.14, 0.31]), supporting mediation via talent cultivation quality.

Control variables (gender, age, grade level) had no statistically significant paths to talent cultivation quality ($p > 0.05$). The product term of PS and CIC on TEQ, tested via hierarchical regression, was not significant ($\Delta R^2 = 0.003$, $p = 0.18$), indicating the effects of PS and CIC were independent.

Qualitative Results

Thematic coding of 176 open-ended responses identified “FTP policy incentives” (41.5%) and “real enterprise projects in class” (36.9%) as the most frequently mentioned facilitators. “Slow curriculum updates” (58.0%) and “superficial enterprise participation” (47.2%) were the dominant barriers. One teacher noted, “It is found that through the analysis of thematic coding of 176 open-ended responses ‘FTP policy incentives’ (41.5%) and ‘real enterprise projects in class’, accounting for 36.9%, are identified as the most frequently mentioned facilitators. ‘Slow curriculum updates’, around 58.0% and ‘superficial enterprise participation’, which is almost 47.2%, were the dominant barriers”. Among the responses, one teacher noted, “Although the FTP provides many policies, our college revises the curriculum syllabus only once every three years; the cross-border e-commerce content is already two years ago, which falls behind the times”. An enterprise mentor commented, “We are willing to provide internships, but students do not even understand basic offshore trade terminology, requiring retraining that increases costs”.

These observations reinforce the quantitative results. It can be seen that curriculum adaptability mediates the policy-to-quality pathway, yet the “slow curriculum update” problem shows that such adaptability is often lacking. Meanwhile, the low-involvement of enterprise participation limits actual collaboration depth. Although

deep collaboration showed a strong direct effect on talent quality, the qualitative data indicate that most industrial colleges still operate far from that level.

Robustness Checks

Several additional analyses were conducted to assess the robustness of the main findings. First, a fully mediated model—in which the direct paths from policy support (PS) and curriculum-industry collaboration (CIC) to talent quality (TEQ) were dropped—was compared with the original partially mediated model. The partial model produced a substantially lower AIC, with a difference of 23.6, indicating a better fit.

Next, nine cases (1.6% of the sample) where any value exceeded three standard deviations from the mean were removed. After these outliers were excluded, all path coefficients changed by less than 0.03, and the significance levels remained unchanged.

Common method bias was also tested by adding a marker variable to the survey and including it in the SEM. When this variable was controlled for, the coefficients shifted by less than 0.05, suggesting that common method bias did not materially affect the results.

Taken together, these checks show that the core conclusions are robust to alternative model specifications, outlier removal, and common method bias.

Discussion

The Primacy of Collaboration Depth Over Policy Support

This research shows that both policy support and collaboration depth positively impact talent development quality. The coefficient of collaboration depth is 0.48, nearly double that of policy support's 0.24, which aligns with the Triple Helix model, that is, governments facilitate conditions, while universities and enterprises drive substantive cooperation. FTP tax incentives and streamlined talent procedures reduce collaboration barriers, but superficial participation such as merely signing memoranda without practical input wastes policy value, as noted by Hu et al. (2023). From a resource dependence perspective, policy resources enable flexible cooperation, while enterprise resources ensure effective implementation, making substantive collaboration the priority for FTP institutions.

Curriculum Adaptability and Policy Dormancy

Another notable result highlights curriculum adaptability as a key mediating variable. Policy support can indirectly improve talent training quality through this pathway, revealing that policy advantages are partially realized when university curricula adjust timely to evolving industrial demands.

The present sample only achieved a moderate level of curriculum adaptability, with a mean score of 3.72. Qualitative feedback further confirmed that slow curriculum revision has become a major restrictive factor. Although relevant supportive policies have been issued formally, their practical value cannot be fully delivered to daily teaching and curriculum practice.

Hainan Free Trade Port policies clearly endow universities with greater autonomy to set up new majors in emerging sectors including cross-border e-commerce and offshore finance. Even so, most industrial colleges still follow rigid annual curriculum review routines. Their reform progress is restricted by isolated departmental management, insufficient updating of teachers' industrial knowledge, and cumbersome textbook approval procedures.

The core problem lies not in imperfect policy formulation, but in ineffective internal implementation. From the Triple Helix perspective, curriculum innovation and cross-boundary cooperation encounter more obstacles from internal institutional operation than from external industrial communication.

To solve this practical dilemma, universities need to optimize their institutional arrangements. Feasible measures include establishing flexible curriculum update rules, conducting industrial demand surveys every semester, promoting micro-credit courses, and implementing credit accumulation and recognition systems. Such internal governance improvements can better lift talent cultivation quality than simply introducing more preferential policy incentives.

Dual-Qualification Teachers and Social Service Capacity

Research indicates dual-qualification teachers directly affect social service capacity with a coefficient of 0.33 and indirectly influence it through talent quality (0.22). In terms of how this works, teachers with industry backgrounds and experience contribute to social services directly via commissioned research, training, and technology transfer, while at the same time improving graduate quality, which in turn strengthens the university's appeal to industry. Actually, such teachers are most popular with students in class, because their teaching is not just limited to the textbooks. Through this two-way contribution, they become internalized critical resources, reducing the need for outside consultants. However, the sample average for dual-qualification teachers stands at just 34%, well short of the 50% benchmark expected of application-oriented institutions. FTP talent policy should therefore focus on attracting senior industry professionals into full-time faculty roles and reforming promotion criteria so that industry projects are valued on par with traditional academic publications.

Conclusion

The study focused on how modern industrial colleges in the background of Hainan Free Trade Port translate the policy support and university-industry collaboration into talent quality and social service capacity. With the methods of a mixed-methods design used and Triple Helix and resource dependence theories integrated, the mediating roles of curriculum adaptability and dual-qualification teachers were explored.

Key findings of the study are as follows:

Policy support and collaboration depth both predict talent quality, with collaboration depth showing a stronger effect.

Curriculum adaptability partially mediates the policy-quality link, yet slow updates limit real impact.

Dual-qualification teachers enhance social service capacity directly and indirectly via talent quality, although their proportion remains low.

Shallow enterprise participation remains a widespread challenge.

Theoretically, this study integrates Triple Helix and resource dependence frameworks to distinguish the unique pathways of policy and industry drivers, which are often treated as interchangeable in prior work. It also highlights curriculum adaptability as a critical mediator that translates policy into practice. Empirically, the mixed-methods design clarifies dual pathways through which dual-qualified teachers shape social service capacity.

Practically, FTP application-oriented universities may benefit from dedicated policy liaison roles to align curricula with certification systems. Industrial college boards should include enterprise representatives with substantive decision-making power to move beyond the cooperation in the superficial level. Dynamic adjustment of courses each semester through curriculum reviews can directly address slow updates. Requiring sustained enterprise practice as part of faculty promotion would accelerate the growth of dual-qualified teaching teams.

However, it is noted that there are still some limitations to this study. Though theoretical grounding and robustness checks are employed, the cross-sectional design means strong causal claims cannot be arrived at. Future research could use longitudinal designs to follow how policy changes and collaboration arrangements affect curriculum adaptability and talent outcomes over time.

References

Central Committee of the Communist Party of China & State Council. (2020). *Overall plan for the Hainan Free Trade Port*. Retrieved from https://www.gov.cn/zhengce/2020-06/01/content_5516608.htm

Chen, Y., Liu, X., & Li, W. (2019). Policy support and industry-academy collaboration in emerging economies. *Journal of Vocational Education & Training, 71*(4), 532-549.

Etzkowitz, H., & Leydesdorff, L. (2020). *The Triple Helix: University-industry-government innovation in action* (2nd ed.). London: Routledge.

Hu, D. X., Pang, D. D., & Gu, P. H. (2023). High-quality development of modern industrial colleges for cultivating excellent engineers: Objectives, strategies, and paths. *China Higher Education Research, 39*(12), 16-23.

Kline, R. B. (2010). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Li, M., & Zhang, L. (2022). The influence mechanism of free trade zone policies on regional industry-education integration. *Educational Development Research, 42*(11), 56-63.

Liu, K. Z. (2026). The Paths of Universities Empowering the Technology Service Industry under the Triple Helix Framework. *China University Science & Technology, 2026*(4), 68-69.

Long, F. Y. & Sun, W. Y. (2026). Operation Mode and Guarantee Mechanism of Industry-Education Integration for Empowering Application-Oriented Undergraduate Talent Development. *Heilongjiang Education, 2026*(5), 77-78.

Ministry of Education & Ministry of Industry and Information Technology. (2020). Guidelines for the construction of modern industrial colleges (trial) (No. [2020]16).

Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective*. Manhattan: Harper & Row.

Xu, G. Q. (2021). *Paths and mechanisms of industry-education integration in vocational education.* Beijing: Higher Education Press.