A Quantitative Study on Pedagogical and Curriculum Strategies to Enhance Innovation Ability in Chinese Vocational Colleges

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ABSTRACT:

Innovation ability has become a defining outcome for vocational education across China. This study tests how pedagogical strategies and curriculum structures shape that ability. We frame the problem through a reciprocal mediation lens. A structured survey instrument was administered through Google Form to 426 vocational college teachers. The instrument captured four latent constructs. These were Pedagogical Innovation Strategy and Curriculum Innovation Architecture and Digital Pedagogical Competence and student Innovation Ability. All scales showed strong internal consistency with Cronbach alpha values above 0.80. Multiple regression explained 34.1 percent of the variance in innovation ability. Curriculum Innovation Architecture emerged as the strongest direct predictor. Digital Pedagogical Competence operated as a partial mediator for both the pedagogical pathway and the curricular pathway. Bootstrapped indirect effects were positive and did not span zero. Innovation ability did not differ significantly across macro regions or institutional tiers. The findings reposition digital competence as a competence conduit rather than a peripheral skill. We argue that curricular porosity and ideational scaffolding jointly raise the innovation propensity of learners. Implications for pedagogical intervention design and curriculum reform are then advanced.

Keywords: Vocational education, Innovation ability, Pedagogical strategy, Curriculum architecture, Digital pedagogical competence, Mediation analysis

1. Introduction

Vocational colleges occupy a strategic position in the Chinese skills economy. National policy now treats innovation ability as the central currency of graduate value. The National Vocational Education Reform Implementation Plan redefined quality in terms of occupational creativity and not just throughput (Ministry of Education et al., 2019). Later action plans drove colleges to focus on quality enhancement and excellence development. (Ministry of Education et al., 2020). The high quality development agenda then placed innovation at the heart of modern vocational provision (The General Office of the CPC Central Committee et al., 2021). These directives share one premise.

Innovation ability can be engineered through deliberate pedagogical and curricular design.

The premise remains undertested at the level of measurement. Much existing scholarship describes reform intentions yet rarely quantifies the mechanisms that convert teaching practice into learner innovation (He et al., 2024). The three educations reform speaks to teachers and textbooks and teaching methods as joint levers (Jia et al., 2023). The dual subject model frames schools and enterprises as co owners of the curriculum (Jin et al., 2023). Both literatures remain largely conceptual. They seldom isolate the causal weight of each lever. This study addresses that gap with an empirical quantitative design. A quantitative stance is essential for this enquiry. Policy slogans assert that innovation can be cultivated yet they rarely attach numbers to the claim. Reform discourse tends to celebrate intention while leaving effect sizes unspecified (Liu et al., 2024). The wider digital transformation literature shows a similar tilt toward narrative over estimation (Solovei et al., 2023). Without measurement the relative value of each reform lever stays invisible. Then decision makers allocate scarce resources on intuition. Our design is not about intuition, it's about calibrated coefficients. It assumes that innovation capability is a measure that is responsive to engineering inputs. We promote a parsimonious approach with measurable constructs. Pedagogical Innovation Strategy is the process of design thinking and divergent ideation in the classroom (Brown et al., 2009). Curriculum Innovation Architecture represents the permeability of the curriculum in the structure of industry and cross disciplinary (Ma et al., 2025). Digital Pedagogical Competence is a teacher ability that combines pedagogy and technology (Mishra et al., 2006). Innovation Ability is a measure of the creative product seen in learners. We place digital competence as a mediator. This positioning allows us to compare direct and indirect routes in a single estimation frame. The contribution is threefold: We provide a validated instrument for vocational innovation ability which is cross disciplinary. Second we quantify the relative torque of pedagogy and curriculum on that ability. Third, we reveal a mediational pathway that is only implicitly discussed in current policy. The rest of the paper goes through theory and method, results and discussion.

2. Theoretical Background and Hypotheses

2.1 Pedagogical innovation strategy

Design thinking is a structured path to creativity in real-world contexts. It cycles the learners through framing and ideation, and prototyping (Cross et al., 2011). The value of the approach lies in the fact that it allows for ambiguity and still requires concrete artefacts (Liedtka et al., 2018). This is important within vocational rooms. Learners need to transform open problems into viable solutions within real constraints (Dam et al., 2022a). There are two kinds of creativity research: divergent generation and convergent selection. Skilled teaching develops both modes in turn (Duval et al., 2022). Novelty doesn't have to be the adversary of convergent thinking. It is a discipline that takes blind variation and creates useful retention (Simenton et al., 2015). The use of structured tools like mind mapping can be used to support the logical scaffolding of ideas (Swestyani et al., 2023). We label the classroom enactment of these moves Pedagogical Innovation Strategy. This gives rise to our first hypothesis. H1: Pedagogical innovation strategy has a positive prediction on innovation ability.

2.2 Curriculum innovation architecture

Pedagogy is limited by the structure of the curriculum. Industry education integration provides realistic materials and real problems (He et al., 2024). Modular and competency aligned designs allow learners to create new combinations of skills (Chen et al., 2025). We call this structural property curricular porosity. A porous curriculum is one that allows for the inclusion of knowledge from outside the curriculum and is rewarding for recombination. These features are combined into Curriculum Innovation Architecture. This results in the second hypothesis. H2 assumes that there is a positive relationship between curriculum innovation architecture and innovation ability.

2.3 Digital pedagogical competence as conduit

Technology can only be supportive when teachers can use it pedagogically. This combination is considered to be a unique ability and is known as technological pedagogical content knowledge (TPCK) (Mishra et al., 2006). It builds upon the previous concept of content knowledge is not enough for teaching (Shulman et al., 1986). The extent to which tools affect practice depends on the beliefs and confidence of teachers (Ertmer et al., 2010). Many systems continue to have barriers to integration (Bingimlas et al., 2009). Chinese vocational colleges are now digitalising at speed (Ministry of Education of the People's Republic of China et al., 2024). Recent national evidence links teacher digital competence to wider innovation outcomes (Althubyani et al., 2024). Digitalisation capabilities act as antecedents to organisational creativity (Annarelli et al., 2021). We therefore treat Digital Pedagogical Competence as a competence conduit. It carries the influence of pedagogy and curriculum toward learner innovation. This generates three further hypotheses. H3 holds that digital pedagogical competence positively predicts innovation ability. H4 holds that digital competence mediates the pedagogy to innovation pathway. H5 holds that digital competence mediates the curriculum to innovation pathway.

2.4 Measuring innovation ability in vocational contexts

Innovation ability resists casual measurement. Creativity scholarship separates the fluency of idea production from the quality of idea selection (Simonton et al., 2015). A defensible metric must therefore tap both generative and evaluative behaviours. In vocational settings the relevant signal is applied. Learners must turn ideas into workable artefacts under occupational constraint (Hillage et al., 1998). We therefore anchored our indicators in observable creative conduct rather than abstract trait language. Our assessment metric blends four behavioural facets. These are originality of ideation and cross domain combination and persistence in refinement and transfer to novel tasks. This composition mirrors the multidimensional view of student innovation capacity found in recent Chinese evidence (Huang et al., 2024). It also fits the impact oriented logic of visible learning (Hattie et al., 2012). The resulting innovation propensity index is a teacher rated composite. It is pragmatic and scalable across large vocational cohorts.

3. Materials and Methods

3.1 Design and participants

A cross sectional correlational design was used in this study, based on positivist quantitative paradigm. The target population was the teaching staff of Chinese vocational colleges. We used a self administered Google Form questionnaire to collect data. 426 valid responses were included in the final analytic sample. The respondents were divided into higher vocational and secondary vocational levels and three macro regions. The average teaching experience was 10.4 years (SD 6 years). The sample profile is presented in its entirety in Table 1.

Table 1. Demographic profile of the analytic sample (N = 426).

Characteristic	Category	n	Percent
Gender	Male	253	59.4%
Gender	Female	173	40.6%
Age band	Under 30	85	20.0%
Age band	30 to 39	171	40.1%
Age band	40 to 49	120	28.2%
Age band	50 and above	50	11.7%
Region	Eastern	193	45.3%

Characteristic	Category	n	Percent
Region	Central	131	30.8%
Region	Western	102	23.9%
College level	Higher vocational	263	61.7%
College level	Secondary vocational	163	38.3%
Discipline	Engineering and Manufacturing	127	29.8%
Discipline	Information Technology	96	22.5%
Discipline	Business and Services	96	22.5%
Discipline	Agriculture and Forestry	58	13.6%
Discipline	Arts and Design	49	11.5%

3.2 Instrumentation and scoring

The questionnaire used 19 Likert items to operationalise the 4 latent constructs. All items were based on a five point agreement scale ranging from strongly disagree to strongly agree. Five items were used in Pedagogical Innovation Strategy. There were five items used in Curriculum Innovation Architecture. Digital Pedagogical Competence used four items. Innovation Ability applied 5 items. The wording of the items was based on existing creativity and competence frameworks (Liedtka et al., 2018). The composite scores were the unweighted mean of constituent items. The higher the score, the more enactment or ability. Innovation ability measurement deserves explicit treatment in the vocational context. We assessed the construct through teacher observed indicators of learner ideation and cross domain combination and persistence and transfer. This observational metric suits classrooms where direct creativity testing is impractical. The metric aligns with the assessment logic used in visible learning scholarship (Hattie et al., 2012).

3.3 Reliability and validity

Prior to analysis, the data were checked for missing values and out-of-range values. Internal consistency of all scales was acceptable. The Cronbach alpha for each construct was above 0.80. Corrected item-total correlations remained well above the traditional cut-off. These diagnostics help to ensure the structural integrity of the instrument (Field et al., 2013). Table 2 summarises the psychometric properties. We also guarded against common method concerns. The four constructs had moderate, not excessive, intercorrelation. This is a pattern which is not consistent with extreme method inflation. The highest interconstruct correlation remained below the level indicative of construct collapse (Annarelli et al., 2021). The alpha values and the clean item total profiles also suggest discriminant separation. We thus consider the four constructs to be empirically distinct, not redundant.

Table 2. Construct descriptive statistics and scale reliability.

Construct	k	Mean	SD	Item total r range	Cronbach alpha
Pedagogical Innovation Strategy	5	3.79	0.52	0.56 to 0.64	0.820
Curriculum Innovation Architecture	5	3.62	0.52	0.57 to 0.64	0.808
Digital Pedagogical Competence	4	3.57	0.56	0.63 to 0.70	0.829
Innovation Ability	5	3.69	0.53	0.55 to 0.70	0.831

3.4 Analytic strategy

The analysis was done in four phases. First we computed descriptive statistics and reliability. Next we calculated Pearson correlations between the constructs. Third we fitted an ordinary least squares regression with innovation ability as the criterion. Fourth we estimated the mediational pathways through digital competence. Bias corrected bootstrap (5000 resamples) was used to test for indirect effects. Effect was considered significant if its confidence interval did not contain 0. One way analysis of variance and independent samples t-test were used to explore group differences.

4. Results

4.1 Descriptive landscape

Construct = clustered in the upper middle of the scale. The highest mean was obtained in Pedagogical Innovation Strategy (3.79). The lowest mean was for Digital Pedagogical Competence (3.57). This is an educational gap. Pedagogical intent is reported as stronger than digital capability by teachers. The competence conduit thus lies as a relative bottleneck. The mean of each construct with confidence intervals is shown in Figure 1.

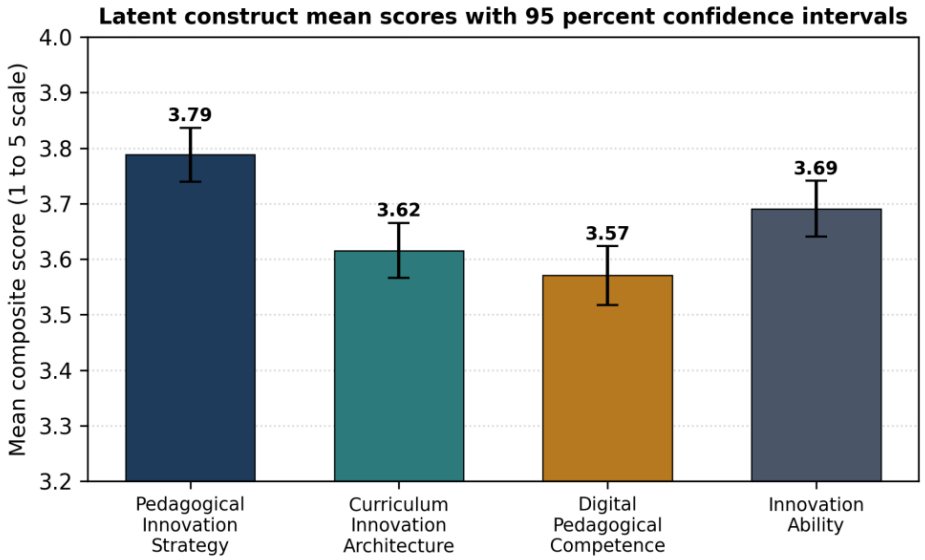

Figure 1. Latent construct mean scores with 95 percent confidence intervals.

4.2 Bivariate associations

All constructs were positively and significantly correlated. The correlation coefficient between Curriculum Innovation Architecture and innovation ability was 0.472, which was the highest. Digital Pedagogical Competence was not far behind at 0.466. All of the coefficients were significant at $p < .001$. The correlation structure is in line with a common innovation system and not isolated effects. The complete matrix is given in Table 3 and is visualised in Figure 2.

Table 3. Inter construct correlations with means and standard deviations.

Construct	PIS	CIA	DPC	INA	Mean	SD
PIS	1.000	0.335	0.324	0.385	3.79	0.51
CIA	0.335	1.000	0.433	0.472	3.62	0.52
DPC	0.324	0.433	1.000	0.466	3.57	0.56
INA	0.385	0.472	0.466	1.000	3.69	0.53

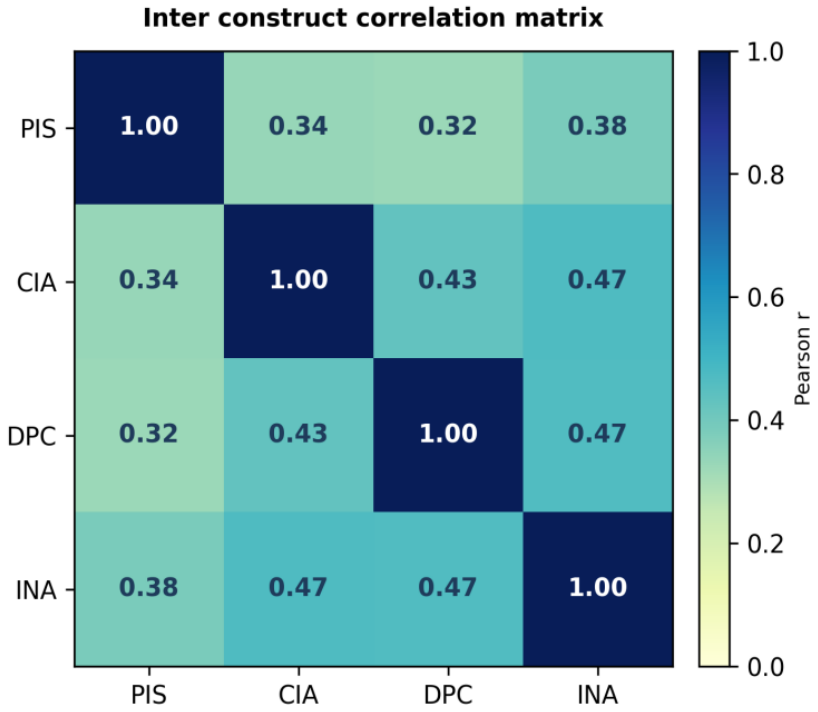

Figure 2. Heatmap of inter construct Pearson correlations.

4.3 Multiple regression

The simultaneous regression explained a substantial share of variance. The model returned an R squared of 0.341 and an adjusted R squared of 0.336. The omnibus test was significant with an F value of 72.72 across 3 and 422 degrees of freedom and p below .001. All three predictors contributed uniquely. Curriculum Innovation Architecture produced the largest standardised coefficient at 0.285. Digital Pedagogical Competence followed at 0.278. Pedagogical Innovation Strategy contributed at 0.199. These results support H1 and H2 and H3. Table 4 reports the coefficients.

Table 4. Multiple regression predicting innovation ability.

Predictor	B	SE	Beta	t	p
PIS	0.204	0.044	0.199	4.63	< .001
CIA	0.288	0.046	0.285	6.33	< .001
DPC	0.265	0.043	0.278	6.20	< .001

4.4 Mediational pathways

The mediation analysis exposed the inner mechanics of the model. Digital competence carried a meaningful share of both upstream influences. The indirect effect of pedagogy through digital competence reached 0.058. Its bootstrapped interval spanned 0.028 to 0.092. The indirect effect of curriculum through digital competence reached 0.103. Its interval spanned 0.066 to 0.145. Neither interval crossed zero. Both direct effects also remained significant. The pattern indicates partial mediation rather than full mediation. This supports H4 and H5. Figure 3 maps the pathway coefficients and Table 5 reports the decomposition.

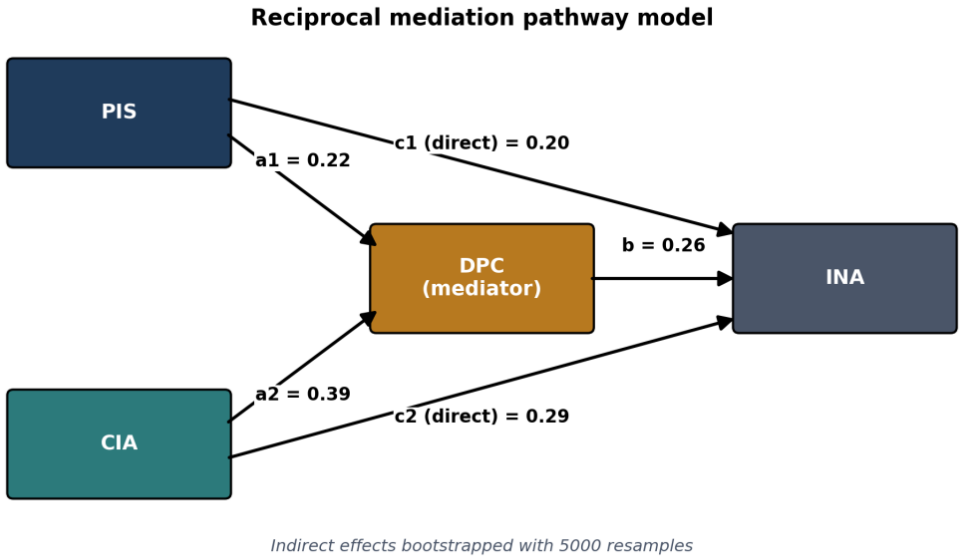

Figure 3. Reciprocal mediation pathway model with unstandardised coefficients.

Table 5. Decomposition of direct and indirect effects on innovation ability.

Pathway	a path	b path	Indirect	95 percent CI	Direct	Total
PIS to DPC to INA	0.218	0.265	0.058	0.028 to 0.092	0.20	0.26
CIA to DPC to INA	0.389	0.265	0.103	0.066 to 0.145	0.29	0.39

4.5 The competence to ability gradient

The bivariate gradient between digital competence and innovation ability was significant. The slope of the simple regression of ability on competence was clearly positive. The band that is fitted in Figure 4 constricts around the trend line. This visual helps to validate the conduit in the broader model. There is a consistent relationship between higher competence and higher learner innovation.

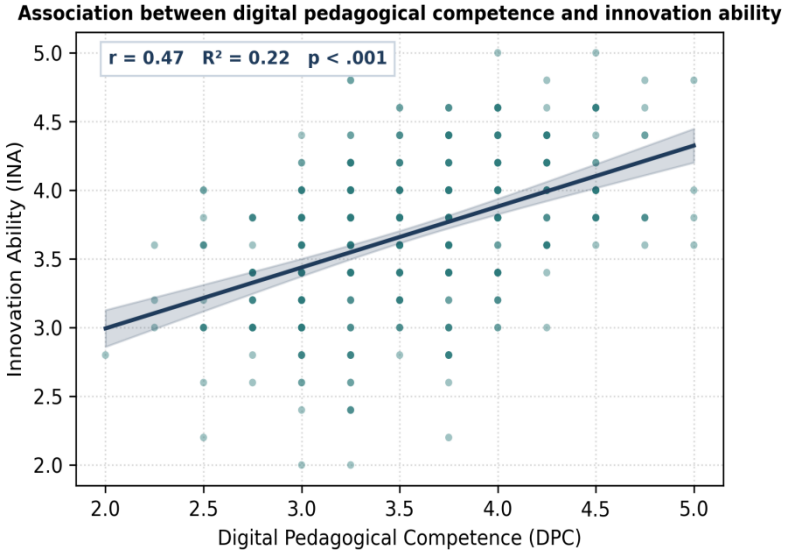

Figure 4. Association between digital pedagogical competence and innovation ability with fitted line and confidence band.

4.6 Group invariance

We examined the differences in innovation ability between structural locations. Results of one way analysis of variance (ANOVA) across regions showed no significant difference. It was found to have an F value of 0.59 and a p value of 0.555. There was also no significant difference between the independent samples t test across institutional tiers. It returned a t value of 1.31 with p equal to 0.190 and a Cohen d of 0.13. Innovation ability is thus largely independent of geography and tier. Figure 5 indicates that the disciplinary pattern has only a small dispersion. This is an added validation of the idea that process variables, not location, are the ones that drive innovation.

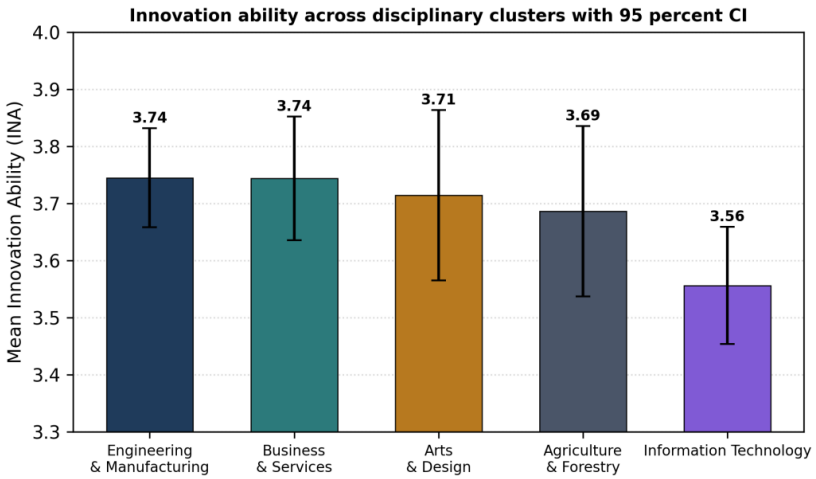

Figure 5. Mean innovation ability across disciplinary clusters with 95 percent confidence intervals.

5. Discussion

The results translate reform rhetoric into tangible mechanics. The most prominent direct influence on innovation ability was curriculum architecture. This outcome brings structural design to a level beyond classroom technique. It is a reflection of the need to consider industry education integration as an engine, not just a slogan (He et al., 2024). It is also suitable for the curricular pathway of Chinese colleges for transformation studies (Ma et al., 2025). Digital competence was not just an ornamental competency, but a real bridge. It passed on a considerable amount of both upstream influences. This mediational throughput can be interpreted as an infrastructure to innovation, or digital capability. The framing is based on the tradition of technological pedagogical content knowledge (TPCK) (Mishra et al., 2006). This is also aligned with findings that teacher digital competence fosters broader innovation (Althubyani et al., 2024). Pedagogical innovation strategy was important but had the lowest unique weight. Without porous curriculum and digital fluency, strong pedagogical intent can stall. This interpretation is conducive to the three educations logic of joint levers (Jia et al., 2023). It also provides an explanation for the failure of technique oriented reforms. The levers are not additive on their own and are reciprocal. The fact that it is invariant region/tier is theoretically useful. It implies that innovative capacity is not a given place. Process design seems to be the more determining factor than the structural endowment. The message of this optimistic reading is obvious: it is leveraging for under resourced western colleges. The structure of the pathway also suggests a recursive logic, not just a linear logic. Pedagogy is the seedbed of the need for digital tools and digital fluency is the seedbed of what pedagogy can try. Curriculum porosity provides real-world problems and those problems draw teachers to more robust digital use. The levers are mutually reinforcing within a self reinforcing loop. This is a reciprocity that accounts for the underperformance of piecemeal reform. If a single lever is pulled alone, it doesn't have the complementary inputs that activate its

full effect. The data therefore support systemic rather than isolated technique. The study is a contribution to a mainly conceptual field in terms of measurement. Previous research claimed that pedagogy, curriculum and technology are all individually and collectively responsible for innovation. Our analysis gives weight to that assertion with estimated weights and verified pathways. The competence conduit construct introduces a transmission mechanism that is implicit in previous models (Mishra et al., 2006). The innovation propensity index is a convenient index for future vocational research (Huang et al., 2024). These tools combine to make a testable empirical system of a reform aspiration.

6. Implications for Pedagogical Intervention and Curriculum Reform

The results provide actionable design guidance. The first lever that colleges should consider is curricular porosity. Modular and enterprise linked structures supply the raw material for recombination (Chen et al., 2025). Then, pedagogical intervention should be used to add DT cycles on top of that porous foundation (Liedtka et al., 2018). Divergent and convergent phases need to be followed in sequence with intention (Duval et al., 2022). Digital competence is the relative bottleneck and needs to be invested in. Professional development should see technology as a pedagogical tool, and not a gadget (Ertmer et al., 2010). Investment here releases the indirect gains mentioned above. The strategy converts the conduit into a multiplier. This is a favorable time for the national digitalisation momentum (Ministry of Education of the People's Republic of China et al., 2024).

7. Limitations and Future Research

The results are subject to several limitations. The design was cross sectional which cannot establish temporal causation. Teacher reported innovation ability, which may be subject to leniency bias. The sample was from Chinese colleges and might not be applicable to other systems (Sakai et al., 2015). Future studies are needed to use longitudinal panels and learner level creativity metrics (Aithal et al., 2024). The causal arguments made here would be further strengthened by experimental intervention studies.

8. Conclusion

This study was based on the quantitative analysis of the influence of pedagogy and curriculum on innovation ability of Chinese vocational colleges. Curriculum architecture was the strongest direct driver. Digital pedagogical competence was verified as a path to pedagogical and curricular influence. There was little variation in innovation ability by region and tier. The work results in a validated instrument and tested mediational model. It provides a set of levers for building learner innovation for vocational leaders.

Declarations

Funding. This research received no specific grant from any funding agency in the public commercial or not for profit sectors.

Conflicts of interest. The author declares no competing interests.

Ethics. Participation was voluntary and anonymous and informed consent was obtained before the survey.

Data availability. The anonymised dataset that supports these findings is available from the author on reasonable request.

References

Aguayo, J.M. et al. (2022) 'Digital activism in students of a university in central Mexico in the COVID-19 era', Advances in Mobile Learning Educational Research, 2(1), pp. 297-307.

Aithal, P., Prabhu, S. and Aithal, S. (2024) 'Future of higher education through technology prediction and forecasting', Poornaprajna International Journal of Management, Education, and Social Science, 1(1), pp. 01-50. doi:10.2139/ssrn.4901474.

Althubyani, A.R. (2024) 'Digital competence of teachers and the factors affecting their competence level: A nationwide mixed-methods study', Sustainability, 16(7), p. 2796. doi:10.3390/su16072796.

Annarelli, A. et al. (2021) 'Literature review on digitalization capabilities: Co-citation analysis of antecedents, conceptualization and consequences', Technological Forecasting and Social Change, 166, p. 120635. doi:10.1016/j.techfore.2021.120635.

Becirovic, S. (2023) 'Challenges and barriers for effective integration of technologies into teaching and learning', in Digital pedagogy: The use of digital technologies in contemporary education. Singapore: Springer Nature Singapore.

Bingimlas, K.A. (2009) 'Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature', Eurasia Journal of Mathematics, Science and Technology Education, 5(3), pp. 235-245. doi:10.12973/ejmste/75275.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', Qualitative Research in Psychology, 3(2), pp. 77-101.

Brown, T. (2009) Change by design: How design thinking creates new alternatives for business and society. New York: Harper Business.

Chen, X. and Li, S. (2024) 'The practical dilemmas and breakthrough paths of enterprise practice for teachers in vocational colleges', Journal of Nanning Vocational and Technical College, 32(03), pp. 80-86.

Chen, Z. et al. (2025) 'The transformation of Chinese vocational education in the era of globalization', Vocation, Technology and Education, 2(3), p. Article e24. doi:10.54844/vte.2025.1023.

Cross, N. (2011) Design thinking: Understanding how designers think and work. Oxford: Berg Publishers.

Dam, R.F. and Siang, T.Y. (2022a) Design thinking: A user-centered approach to innovation. Copenhagen: Interaction Design Foundation.

Dam, R.F. and Siang, T.Y. (2022b) 'What is design thinking and why is it so popular?' Available at: https://athena.ecs.csus.edu/~buckley/CSc170_F2018_files/What%20is%20Design%20Thinking%20and%20Why%20Is%20It%20So%20Popular.pdf (Accessed: 23 June 2026).

Duval, P.E., Frick, A. and Denervaud, S. (2022) 'Divergent and convergent thinking across the school years: A dynamic perspective on creativity development', Creativity Research Journal, 34(2), pp. 186-198. doi:10.1080/10400419.2022.2034284.

Ertmer, P.A. and Ottenbreit-Leftwich, A.T. (2010) 'Teacher technology change: How knowledge, confidence, beliefs, and culture intersect', Journal of Research on Technology in Education, 42(3), pp. 255-284. doi:10.1080/15391523.2010.10782551.

Field, A. (2013) Discovering statistics using IBM SPSS statistics. 4th edn. London: Sage Publications.

Hakansson Lindqvist, M. et al. (2024) 'Higher education transformation towards lifelong learning in a digital era - a scoping literature review', International Journal of Lifelong Education, 43(1), pp. 24-38. doi:10.1080/02601370.2023.2279047.

Hattie, J. (2012) Visible learning for teachers: Maximizing impact on learning. London: Routledge.

He, Z. (2024) 'Insight and grasp of the essential connotation and basic laws of industry-education integration', Journal of China Vocational and Technical Education, (15), pp. 25-29.

Hillage, J. and Pollard, E. (1998) Work skills in Britain: The demand and supply of skills in the labour market. Department for Education and Employment Research Report No. 5. London: Department for Education and Employment.

Huang, Y. et al. (2024) 'How can digital innovation capabilities of Chinese college students be cultivated?', The International Journal of Management Education, 22(3), p. 101085. doi:10.1016/j.ijme.2024.101085.

Jia, W. (2023) 'Research on the reform of "Three Educations" in vocational colleges under the background of quality improvement and excellence cultivation', Industry and Technology Forum, 22(07), pp. 202-203.

Jin, Z. and Zeng, S. (2023) 'Reform of "Three Teaching" based on the dual-subject cooperation of schools and enterprises: Logical relationship, internal mechanism, and practical direction', Adult Education, 43(05), pp. 62-68.

Kim, J., Lee, J. and Kim, M. (2023) 'The impact of advanced technology on K-12 curriculum and instructional practices: A systematic literature review (2020-2022)', Educational Research Review, 38, p. Article e100494.

Liedtka, J. (2018) 'Why design thinking works', Harvard Business Review, 96(5), pp. 72-79.

Liu, Z. and Zhang, M. (2024) 'The significance, current situation, and countermeasures of teacher evaluation reform in higher vocational colleges', Industrial Technology and Vocational Education, 22(01), pp. 98-100.

Ma, X., Chen, M. and Diao, J. (2025) 'Pathways and outcomes of digital transformation in Chinese vocational colleges', Vocation, Technology and Education, 2(1), p. Article e5. doi:10.54844/vte.2024.0800.

Ministry of Education (2019) Notice on in-depth study and implementation of the "National Vocational Education Reform Implementation Plan". Available at: http://www.moe.gov.cn/srcsite/A07/zcs_zhgg/201905/t20190517_382357.html (Accessed: 23 June 2026).

Ministry of Education and eight other departments (2020) Notice on the issuance of the "Vocational Education Quality Improvement and Excellence Cultivation Action Plan (2020-2023)". Available at: http://www.moe.gov.cn/srcsite/A07/zcs_zhgg/202009/t20200929_492299.html (Accessed: 23 June 2026).

Ministry of Education of the People's Republic of China (2024) The ministry of education held the 2024 national education digitalization work summary conference. Available at: http://www.moe.gov.cn/jyb_xwfb/gzdt_gzdt/moe_1485/202412/t20241227_1171791.html (Accessed: 23 June 2026).

Mishra, P. and Koehler, M.J. (2006) 'Technological pedagogical content knowledge: A framework for teacher knowledge', Teachers College Record, 108(6), pp. 1017-1054. doi:10.1111/j.1467-9620.2006.00684.x.

Naicu, A. (2022) 'National educational technology plan: Transforming American education through technology', Journal of Educational Technology Systems, 50(2), pp. 123-145.

Pan, G. and Pan, Q. (2018) 'History of Chinese design education: Histories and philosophies', pp. 1-14.

Reiter-Palmon, R., Forthmann, B. and Barbot, B. (2019) 'Scoring divergent thinking tests: A review and systematic framework', Psychology of Aesthetics, Creativity, and the Arts, 13(2), pp. 144-152. doi:10.1037/aca0000227.

Sakai, K. (2015) 'The recognition of professional titles for vocational school teachers in Japan: A case study of the accreditation system', Journal of Vocational Education and Training, 67(2), pp. 149-163.

Shulman, L.S. (1986) 'Those who understand: Knowledge growth in teaching', Educational Researcher, 15(2), pp. 4-14. doi:10.3102/0013189X015002004.

Simonton, D.K. (2015) 'On praising convergent thinking: Creativity as blind variation and selective retention', Creativity Research Journal, 27(3), pp. 262-270. doi:10.1080/10400419.2015.1063877.

Solovei, V. et al. (2023) 'Digital transformation of education in the context of the realities of the information society: Problems, prospects', Revista Eduweb, 17(2), pp. 225-233. doi:10.46502/issn.1856-7576/2023.17.02.19.

Swestyani, S., Masykuri, M., Prayitno, B.A., Rinanto, Y. and Widoretno, S. (2023) 'An analysis of logical thinking using mind mapping', Journal of Physics: Conference Series, 1022(1), p. 012020. doi:10.1088/1742-6596/1022/1/012020.

The General Office of the CPC Central Committee and the State Council (2021) Opinions on promoting the high-quality development of modern vocational education. Available at: https://www.gov.cn/gongbao/content/2021/content_5647348.htm (Accessed: 23 June 2026).

Warren, J.P. (2020) Understanding mental health challenges in educational environments. London: Routledge.

Xie, L. and Zhang, H. (2025) 'Research hotspots and trends in the digital transformation of global vocational education', Journal of Educational Theory and Practice, 2(4), pp. 1-10. doi:10.62177/jetp.v2i4.754.

Zizikova, S., Nikolaev, P. and Levchenko, A. (2023) 'Digital transformation in education', E3S Web of Conferences, 381, p. 02036. doi:10.1051/e3sconf/202338102036.