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Optimizing the E-commerce Curriculum System in Higher Vocational Colleges from the Perspective of Industry-Education Integration

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ABSTRACT

The rapid expansion of the digital economy has increased pressure on higher vocational institutions to ensure that e-commerce curricula remain aligned with evolving industry demands. However, limited empirical attention has been given to how students perceive the optimization of the e-commerce curriculum system within the framework of industry-education integration. This study, therefore, aimed to examine students' perceptions of e-commerce curriculum optimization in a Chinese higher vocational education setting. A quantitative cross-sectional survey with a descriptive-exploratory orientation was employed. Data were collected from 32 students at Guangdong Province Huali Technician College, China, using a 30-item questionnaire measured on a five-point Likert scale. The instrument covered five dimensions: Current Curriculum Issues, School-Enterprise Collaboration, Curriculum Optimization, Teaching and Evaluation, and Safeguard Measures. Data were analyzed using descriptive statistics and Cronbach's alpha. The results showed an overall mean of 3.672, indicating a moderately positive orientation toward curriculum reform. Safeguard Measures obtained the highest mean (3.953), followed by Curriculum Optimization (3.859), School-Enterprise Collaboration (3.703), and Teaching and Evaluation (3.667), while Current Curriculum Issues recorded the lowest mean (3.177). The overall instrument demonstrated excellent reliability ($\alpha = 0.921$), although the Current Curriculum Issues subscale showed very weak internal consistency, so interpretations related to this dimension should be treated cautiously. Overall, the findings suggest that students perceive curriculum optimization primarily as a practice-oriented, institutionally supported reform process involving stronger enterprise collaboration, structured implementation mechanisms, and workplace-linked learning. As the study is exploratory and based on a single institutional context, it offers context-specific evidence for prioritizing institutionalized and practice-based reform in vocational e-commerce curricula.

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I. INTRODUCTION

The rapid expansion of the digital economy has intensified demands on higher vocational institutions to ensure that e-commerce curricula remain relevant to changing industrial practices. In areas such as digital marketing, platform-based business, cross-border trade, and data-driven retail, competence requirements evolve quickly, making curriculum relevance a strategic issue rather than a routine academic concern [1]-[5]. In higher vocational education, this challenge is particularly important because program quality is closely linked to whether graduates are prepared for applied, rapidly changing work environments [6]-[12].

In this context, curriculum optimization should not be understood as simply adding new topics or superficially revising course titles. A more substantive view of optimization requires attention to the coherence of learning outcomes, the balance between theory and practice, the relevance of teaching content, the design of assessment, and the extent to which learning is connected to actual industrial processes [13]-[16]. This issue is especially salient in e-commerce education, where curricular content can quickly become outdated as digital business models, platform ecosystems, and commercial technologies continue to change.

The perspective of industry-education integration offers a useful framework for examining this problem. Rather than treating curriculum reform as an internal academic adjustment alone, this perspective places curriculum development within a wider relationship among schools, enterprises, and institutional support mechanisms. In vocational education, enterprise participation is important not only for practical training, but also for aligning curriculum design, teaching processes, and graduate competence with workplace realities [17]-[21]. From this perspective, curriculum optimization must be viewed structurally, including the quality of school-enterprise collaboration, the design of practice-based learning, the reform of teaching and evaluation, and the institutional safeguards that sustain implementation.

Although prior studies have discussed digital competence, employability, work-integrated learning, and enterprise engagement in vocational education, fewer studies have examined the e-commerce curriculum system itself as an integrated object of reform from the perspective of industry-education integration [22]. Existing scholarship tends to address these issues in broad terms. In contrast, limited empirical attention has been given to how students perceive the interrelationship among current curriculum issues, school-enterprise collaboration, curriculum optimization, teaching and evaluation reform, and safeguard measures within a single analytical framework. This gap is important because curriculum reform in vocational education is not judged only by policy design, but also by how it is experienced in practice.

Student perception, therefore, is a valid and important analytical lens in this study. Students are the primary actors who encounter curriculum implementation directly through classroom learning, practical training, assessment arrangements, and institutional support. Although student perceptions do not provide a complete institutional evaluation, they offer valuable evidence of whether curriculum reform is experienced as visible, credible, and meaningful in everyday educational practice. In rapidly changing vocational contexts, such

perception-based evidence helps reveal which aspects of reform are most strongly recognized and which remain less clearly consolidated.

Accordingly, this study aims to examine how the optimization of the e-commerce curriculum system is perceived in higher vocational education from the perspective of industry-education integration in a Chinese vocational education setting. Empirically, the study is based on a structured questionnaire administered to students at Guangdong Province Huali Technician College, China. The inquiry is positioned as descriptive and exploratory rather than causal. As shown in Figure 1, the conceptual framework is operationalized through five analytical dimensions embedded in the instrument: Current Curriculum Issues, School-Enterprise Collaboration, Curriculum Optimization, Teaching & Evaluation, and Safeguard Measures. On this basis, the study addresses the following research question: How is the optimization of the e-commerce curriculum system perceived in higher vocational education from the perspective of industry-education integration?

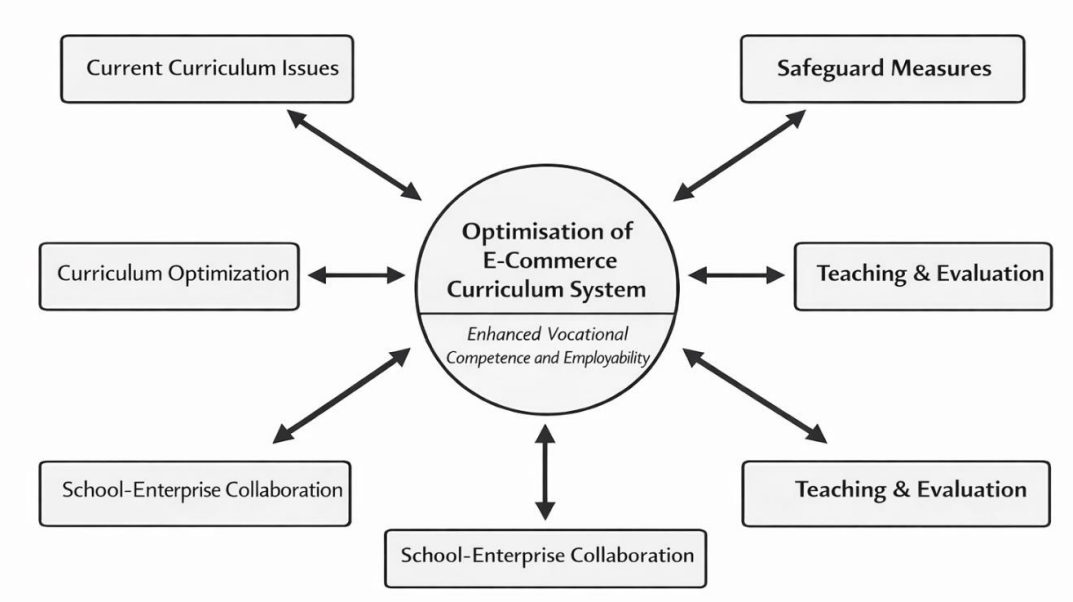

Figure 1. Conceptual framework of e-commerce curriculum optimization

2. METHOD

2.1 Research Design

This study employed a quantitative cross-sectional survey design with a descriptive-exploratory orientation. The design was selected because the objective of the study was not to test causal relationships, evaluate intervention effects, or validate a structural model, but to examine how students perceived the optimization of the e-commerce curriculum system from the perspective of industry-education integration. The study, therefore, focused on mapping response patterns, comparing the relative prominence of reform dimensions, and assessing the measurement instrument's internal consistency.

A descriptive-exploratory design was considered appropriate for three reasons. First, the phenomenon under investigation involves the institutional, pedagogical, and collaborative aspects of curriculum reform, which can be meaningfully captured through student perceptions. Second, the available data consisted of structured questionnaire responses suitable for respondent profiling, dimension-level comparisons, and item-level descriptive

analysis. Third, the study aimed to identify perceived reform priorities and tendencies rather than to infer causality or claim curriculum effectiveness. Accordingly, the methodological emphasis was placed on descriptive interpretation and reliability assessment.

2.2 Research Setting and Participants

The study was conducted at Guangdong Province Huali Technician College, China. The respondents were selected from students enrolled in the relevant vocational education setting where the e-commerce curriculum was being delivered. Given the nature of the available dataset, the study used a non-probability institutional sample of students who met the basic inclusion criterion of being active students and providing valid questionnaire responses. After data screening, 32 valid responses were retained for analysis.

Of the 32 respondents, 29 were male, and 3 were female. The mean age was 17.06 years, with an age range of 15 to 37 years. Although most respondents were concentrated in the typical younger vocational age bracket, the wider age range was retained because vocational education settings may include both standard-age students and non-traditional learners. For this reason, age was treated as an empirical characteristic of the sample rather than as a basis for exclusion.

Because the respondents were drawn from a single institution and the sample size was limited, the findings should be interpreted as context-specific and exploratory rather than statistically generalizable to all higher vocational colleges in China. The study therefore provides a descriptive account of students' perceptions within one institutional setting, rather than a national representation of vocational e-commerce education.

2.3 Instrument

Data were collected using a 30-item structured questionnaire measured on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The instrument was adapted from relevant literature and prior conceptual work on vocational curriculum reform, industry-education integration, work-based learning, and curriculum implementation, and was organized to fit the analytical focus of the present study. It was designed to capture student perceptions of curriculum optimization from the perspective of industry-education integration.

The questionnaire consisted of five dimensions, each represented by six items: Current Curriculum Issues (Q1-Q6), School-Enterprise Collaboration (Q7-Q12), Curriculum Optimization (Q13-Q18), Teaching & Evaluation (Q19-Q24), and Safeguard Measures (Q25-Q30). Data collection was conducted in China, where questionnaires were distributed to respondents individually and completed one by one. In the present study, the instrument was treated as a multidimensional perception measure and was examined primarily through descriptive statistics and internal consistency analysis.

2.4 Data Collection Procedure and Validity Considerations

The questionnaire data were collected directly in China through individual administration to student respondents. Each questionnaire was distributed and completed separately, allowing the researcher to ensure that all returned responses met the required

completeness criteria for analysis. Only complete and valid responses were retained in the final dataset.

Because this study was designed as a descriptive-exploratory inquiry, the instrument was not subjected to additional construct validation procedures such as exploratory factor analysis (EFA) or confirmatory factor analysis (CFA) at this stage. Accordingly, the questionnaire should be understood as an exploratory perception measure rather than a fully validated scale. In the present study, the measurement quality was assessed primarily through internal consistency analysis using Cronbach's alpha for the overall instrument and for each subscale.

This methodological position is important for interpreting the findings. The study provides useful descriptive evidence on the relative prominence of curriculum reform dimensions, but the dimensional structure of the instrument should still be interpreted cautiously and requires further refinement and broader validation in future research, particularly for subscales with weak internal consistency.

2.5 Data Source and Analysis

Table 1. Data Source and Analytical Procedure

Aspect	Description
Data source	Final tabulated questionnaire dataset provided by the researcher
Institutional context	Guangdong Province Huali Technician College, China
Unit of analysis	Individual student responses
Number of valid responses	32
Data format	Structured tabulated dataset with respondent-level entries
Main analytical focus	Student perceptions of e-commerce curriculum system optimization from the perspective of industry-education integration
Analytical approach	Descriptive statistics and reliability analysis
Descriptive levels	Respondent profile, dimension-level scores, and item-level results
Statistical indicators	Mean, standard deviation, item ranking, and Cronbach's alpha
Purpose of analysis	To identify response patterns, compare the relative prominence of each dimension, and assess the instrument's internal consistency.

The data were analyzed descriptively to examine respondent characteristics, the relative strength of each questionnaire dimension, and the ranking of individual items. Mean and standard deviation were used to assess central tendency and variation, while Cronbach's alpha was applied to the overall instrument and each subscale to evaluate internal consistency and support cautious interpretation of dimensions with weaker reliability.

3. RESULTS AND DISCUSSION

3.1 Respondent Profile

A total of 32 valid respondents were included in the analysis. All respondents came from Guangdong Province Huali Technician College, China, indicating that the present study represents a single-institution vocational education setting rather than a multi-site or nationally representative sample. In terms of gender composition, the sample was heavily male-dominated, consisting of 29 male students (90.6%) and 3 female students (9.4%). The respondents had a mean age of 17.06 years, with ages ranging from 15 to 37 years. The age

distribution was concentrated in the younger bracket, particularly at age 16, which accounted for half of the sample.

These characteristics are relevant because the study examines curriculum optimization from the perspective of students who experience it directly through classroom learning, practical activities, and assessment processes. At the same time, the findings should be interpreted within the empirical limits of one institutional setting. Accordingly, the respondent profile provides contextual support for an exploratory descriptive reading of the results rather than for broad statistical generalization.

Table 2. Respondent Profile

Variable	Category	Frequency	Percentage (%)
Gender	Male	29	90.6
	Female	3	9.4
Institution	Guangdong Province Huali Technician College	32	100.0
Age	15	7	21.9
	16	16	50.0
	17	5	15.6
	18	1	3.1
	19	1	3.1
	26	1	3.1
	37	1	3.1
Age summary	Mean = 17.06	Range = 15–37	-

3.2 Descriptive Results by Dimension

Across all 30 items, the instrument produced an overall mean of 3.672 and an overall standard deviation of 1.088, indicating a moderately positive orientation toward the optimization of the e-commerce curriculum system from the perspective of industry-education integration. This overall pattern suggests that respondents generally recognized the relevance of curriculum reform, although the degree of agreement varied across dimensions.

At the dimensional level, the highest mean score was recorded for Safeguard Measures (M = 3.953, SD = 1.136), followed by Curriculum Optimization (M = 3.859, SD = 1.100), School-Enterprise Collaboration (M = 3.703, SD = 0.982), and Teaching & Evaluation (M = 3.667, SD = 1.040). The lowest mean was found in Current Curriculum Issues (M = 3.177, SD = 1.018). At a descriptive level, this pattern indicates that respondents expressed stronger support for solution-oriented and implementation-oriented aspects of reform than for the direct diagnosis of weaknesses in the existing curriculum system.

The prominence of Safeguard Measures suggests that respondents associated meaningful curriculum optimization with enabling conditions, such as institutional commitment, oversight of implementation, long-term school-enterprise arrangements, and formal support mechanisms. Curriculum Optimization, as the second-highest dimension, similarly indicates relatively strong support for practice-based and industry-relevant restructuring of the curriculum. These two dimensions, therefore, point more clearly to the reform directions most visibly endorsed by respondents.

By contrast, the lower mean for Current Curriculum Issues should be interpreted more cautiously. At the descriptive level, it may suggest a weaker consensus in identifying existing curriculum deficiencies. However, because the reliability of this subscale was very low, its mean score should not be treated as a firm diagnostic indicator of the current curriculum's actual adequacy. For this reason, the dimension is reported here as part of the descriptive profile, but its interpretive weight is more limited than that of the more reliable reform-oriented subscales.

Table 3. Descriptive Statistics by Dimension

Rank	Dimension	Number of Items	Mean	SD
1	Safeguard Measures	5	3.953	1.136
2	Curriculum Optimization	5	3.859	1.100
3	School-Enterprise Collaboration	5	3.703	0.982
4	Teaching & Evaluation	5	3.667	1.040
5	Current Curriculum Issues	5	3.177	1.018
	Overall Instrument	30	3.672	1.088

3.3 Item-Level Results and Reliability Analysis

As shown in Table 4, the item-level results provide a more specific view of the reform directions most strongly endorsed by respondents. The highest mean score was recorded for Q30 (M = 4.281, SD = 1.023), which states that enterprises should establish long-term mechanisms, such as order-based classes, to identify and cultivate talent in advance. This was followed by Q17 (M = 4.000, SD = 0.984), which supports the formation of joint school-enterprise teams to develop curriculum standards collaboratively; Q14 (M = 3.969, SD = 0.933), which proposes a 6-month industrial practice semester in the third year; Q28 (M = 3.969, SD = 1.204), which calls for a special task force to oversee curriculum optimisation; and Q29 (M = 3.938, SD = 1.014), which requires specialised instructors to complete an annual internship in e-commerce companies. Taken together, these highest-ranked items indicate consistent support for institutionalized, practice-oriented, and jointly governed reform mechanisms.

By contrast, the lowest mean score was found for Q1 (M = 2.344, SD = 1.359), followed by Q6 (M = 3.156, SD = 0.808), Q3 (M = 3.250, SD = 0.916), Q2 (M = 3.375, SD = 0.793), and Q5 (M = 3.375, SD = 0.793). These lower-scoring items were concentrated mainly within the Current Curriculum Issues dimension. Descriptively, this clustering suggests that respondents were less homogeneous in identifying present curriculum problems than in endorsing reform measures. However, these lower-ranked items should not be over-interpreted as a stable diagnosis of the current curriculum, as their parent subscale performed poorly in the reliability test.

As shown in Table 5, the reliability analysis clarifies this distinction. At the full-scale level, the instrument demonstrated excellent internal consistency (Cronbach's alpha = 0.921). At the dimensional level, Safeguard Measures (α = 0.855), Teaching & Evaluation (α = 0.819), and Curriculum Optimization (α = 0.818) showed good reliability, while School-Enterprise Collaboration (α = 0.695) remained acceptable for exploratory descriptive research. The critical exception was Current Curriculum Issues, which yielded an extremely

low alpha ($\alpha = 0.038$). This result indicates that the six items in that subscale did not form a stable or coherent perceptual cluster in the present dataset.

For this reason, the findings regarding the more reliable reform-oriented dimensions can be discussed with greater confidence than those regarding Current Curriculum Issues. In the present study, no additional item-total deletion analysis was carried out for the problematic subscale. Accordingly, the source of the very weak reliability cannot be determined with certainty, but it may plausibly reflect heterogeneous item content, differences in item wording, or the limitations of a small and context-specific sample. Methodologically, the implication is clear: the study is more reliable in identifying areas of strong student support for reform than in claiming that respondents shared a stable diagnosis of existing curriculum deficiencies.

Table 4. Selected Highest- and Lowest-Scoring Items

Category	Item	Mean	SD	Brief Content
Highest	Q30	4.281	1.023	Enterprises should establish long-term mechanisms, such as order-based classes, to pre-identify talents.
Highest	Q17	4.000	0.984	Schools and enterprises should form joint teams to develop curriculum standards collaboratively.
Highest	Q14	3.969	0.933	A 6-month on-the-job "Industrial Practice Semester" should be introduced in the third year.
Highest	Q28	3.969	1.204	Schools must establish a special task force to oversee the curriculum optimization process.
Highest	Q29	3.938	1.014	Specialized instructors should complete a 3-month annual internship at an e-commerce company.
Lowest	Q1	2.344	1.359	The current e-commerce curriculum lacks courses on cross-border e-commerce and live-streaming commerce.
Lowest	Q6	3.156	0.808	The existing curriculum is out of sync with the demands of the local e-commerce industry.
Lowest	Q3	3.250	0.916	Theoretical lectures and final written exams dominate the teaching model.
Lowest	Q2	3.375	0.793	The proportion of practical courses is insufficient, currently accounting for only 30%–40%.
Lowest	Q5	3.375	0.793	The evaluation system overemphasizes theoretical scores while neglecting practical skills.

Table 5. Reliability of the Instrument

Dimension	Number of Items	Cronbach's Alpha	Interpretation
Overall instrument	30	0.921	Excellent
Current Curriculum Issues	6	0.038	Very low
School-Enterprise Collaboration	6	0.695	Acceptable
Curriculum Optimization	6	0.818	Good
Teaching & Evaluation	6	0.819	Good
Safeguard Measures	6	0.855	Good

Taken together, Tables 4 and 5 indicate that respondents showed their strongest and most consistent support for long-term, collaborative, and practice-based reform strategies.

By contrast, perceptions of current curriculum problems remained less consolidated and should therefore be regarded as exploratory and tentative in the present study.

3.4 Discussion

The findings suggest that students generally perceive the optimization of the e-commerce curriculum system as a meaningful reform agenda within the vocational education context under study. However, their responses were not evenly distributed across all dimensions. Students showed stronger alignment with reform-oriented and implementation-oriented aspects than with the direct diagnosis of existing curriculum weaknesses. This pattern indicates that student support is less focused on critique alone and more on visible, actionable proposals for change [23].

The strongest support was found in the Safeguard Measures dimension. This suggests that students perceive curriculum reform as more credible when it is supported by visible institutional commitment, organizational coordination, and long-term implementation mechanisms. The prominence of Q30, Q28, and Q29 reinforces this interpretation, as these items emphasize enterprise-linked talent cultivation, dedicated reform structures, and teacher-industry engagement. In other words, students do not appear to view curriculum optimization as a minor technical revision, but as a structural reform process that requires formal support and sustained implementation. The strong position of Curriculum Optimization further indicates that students favor practice-based restructuring, stronger industry relevance, and deeper integration between curriculum design and workplace realities [24].

At the same time, the interpretation of the results must be differentiated according to measurement strength. The findings for Safeguard Measures, Curriculum Optimization, and Teaching & Evaluation are more strongly supported, as these subscales showed substantially higher internal consistency. By contrast, the Current Curriculum Issues dimension yielded an extremely low alpha value, indicating that its items did not form a stable, coherent cluster in the present dataset. For this reason, the lower mean of this dimension should not be interpreted as firm evidence that the current curriculum is already adequate or that students share a consistent diagnosis of its shortcomings. A more defensible reading is that respondents were less unified in identifying current problems than in supporting proposed reform directions. Thus, the study is methodologically stronger at mapping perceived reform priorities than at diagnosing the existing curriculum definitively.

A further point is that student support for reform may reflect both actual educational experience and aspirational expectations. On the one hand, students respond to their direct encounter with curriculum delivery, practical learning, and assessment arrangements. On the other hand, their strong support for industrial practice, joint curriculum development, and long-term support mechanisms may also express what they believe a more credible and relevant curriculum should look like, even if such arrangements are not yet fully realized in practice. Taken together, the findings suggest that optimizing the e-commerce curriculum system is best understood as a multi-layered reform project involving enterprise-linked curriculum development, practical immersion, institutional coordination, and long-term

safeguard mechanisms, although this conclusion is strongest for reform priorities and more tentative for claims about current curriculum deficiencies [25].

4. CONCLUSION

This study examined student perceptions of e-commerce curriculum optimization from the perspective of industry-education integration in a Chinese vocational education setting. Overall, the findings suggest that students place greater emphasis on reform measures that are institutionally supported, practice-based, and visibly connected to enterprise participation than on the direct diagnosis of current curriculum weaknesses. In this sense, meaningful curriculum reform is perceived less as a matter of isolated content revision and more as a structured process involving implementation support, practical immersion, and coordinated school-enterprise engagement.

The study has two main implications. First, curriculum optimization in vocational e-commerce education should be understood as a broader institutional reform project rather than a narrow pedagogical adjustment. Second, student perceptions can serve as a useful descriptive lens for identifying which reform directions appear most credible and meaningful in actual curriculum delivery.

At the same time, the study has clear limitations. It is based on a small sample from a single institution and should therefore be interpreted as exploratory and context-specific. In addition, the Current Curriculum Issues subscale's very low reliability limits strong claims about the exact weaknesses of the existing curriculum. This means that the study is more robust in identifying areas of support for reform than in offering a stable diagnostic assessment of current curricular shortcomings.

Future research should involve larger and more diverse vocational settings, refine the problematic diagnostic subscale, and incorporate additional perspectives from teachers, administrators, and enterprise partners. Overall, the study provides exploratory evidence for prioritizing institutionalized and practice-based reform in vocational e-commerce curricula.

5. PRACTICAL IMPLICATIONS

Based on the exploratory evidence of this study, higher vocational institutions should prioritize curriculum reform mechanisms that are institutionally supported, practice-based, and sustained through long-term school-enterprise cooperation. In particular, curriculum redesign should move beyond isolated content revision and place greater emphasis on workplace exposure, industrial practice arrangements, joint curriculum development, and formal implementation structures that make reform visible and credible to students.

In pedagogical terms, teaching and evaluation should be aligned more closely with applied competence development. This may include greater use of project-based learning, practical simulations, enterprise case analysis, and performance-oriented assessment, alongside stronger opportunities for teachers to engage directly with industry through internships or collaborative training. Such measures are likely to strengthen the practical credibility of curriculum reform and improve the alignment between vocational learning and workplace realities.

At the same time, these recommendations should be interpreted within the boundaries of the present study. Because the evidence is exploratory and based on a single institutional setting, future research is needed to test the robustness of these priorities across broader vocational contexts and to refine the measurement of current curriculum issues, which remained unstable in the present dataset.

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