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Cultivating cross-border e-commerce talent through China's "1+X" certificate system: restructuring business English curricula in applied undergraduate education

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Abstract. China's "1+X" certificate system—pairing an academic degree ("1") with multiple vocational skill certificates ("X")—has been piloted in vocational and applied undergraduate institutions since 2019. Seven years into implementation, however, applied undergraduate Business English programs still struggle with shallow industry partnerships, curricula that lag behind market needs, under-equipped training facilities, faculty who lack operational experience, and assessment methods that reward rote learning over demonstrated competence. This paper draws on competency-based education theory and curriculum integration theory to examine these gaps through a quantitative survey study—literature review and questionnaire surveys (N = 287 students and N = 47 faculty)—conducted at four applied undergraduate institutions in central China. Survey results revealed that 78% of respondents (students and faculty combined, N = 334) reported university–enterprise cooperation as "surface-level or formal only", 82% identified curricula as outdated relative to current industry practice, 72% considered practical training facilities insufficient, 64% of faculty had no hands-on e-commerce operational experience, and 81% reported assessment dominated by written examinations. Chi-square tests indicated no significant inter-institutional differences across any dimension (χ^2 range: 2.14–5.87, df = 3, all $p > 0.05$), confirming that these challenges are systemic rather than institution-specific. This study argues that the Cross-Border E-Commerce B2B Data Operations certificate can serve as an effective anchor for curricular restructuring when institutions pursue five mutually reinforcing reforms: revising cultivation plans to match certificate standards, building a "course–position–certificate–competition" curriculum, deepening school–enterprise training systems, cultivating dual-qualified faculty, and broadening evaluation beyond traditional examinations. The findings extend competency-based education theory into the Chinese applied undergraduate context and offer a transferable framework for institutions seeking to align academic and vocational credentials.

Keywords: "1+X" certificate system, cross-border e-commerce, Business English, curriculum integration, applied undergraduate education

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1. Introduction

1.1. Research background

Cross-border e-commerce has become a driving force in China's international trade. In 2023, the country's cross-border e-commerce exports reached roughly 1.1 trillion USD, accounting for 33% of total goods exports; both figures are projected to approach 2 trillion USD and 38.1%, respectively, by 2028 [1]. Policy support has kept pace: the *Third Plenary Session of the 20th Central Committee* in 2024 called for stronger mechanisms for high-level opening-up and deeper integration of China's domestic market into the global economy.

On the education side, the State Council's *2019 National Vocational Education Reform Implementation Plan* (State Council Document No. 4 [2019]) [2] mandated a pilot "1+X" certificate system across vocational colleges and applied undergraduate institutions. Four ministries subsequently issued the *Pilot Plan for Implementing the "Academic Degree Certificate plus Multiple Vocational Skill Level Certificates" System* [3], requiring that course development, program design, and faculty training be tied to the "1+X" framework. For applied undergraduate Business English programs—a major feeder of cross-border e-commerce talent—the policy signaled a shift away from a purely language-oriented curriculum toward one that integrates industry-validated vocational competencies. This policy direction aligns with broader international calls for TVET systems to strengthen labour-market alignment through competency-based curricula and institutionalised employer partnerships [4-6].

Seven years into the pilot, however, the transition remains incomplete. Teaching methods have not kept pace with industry evolution; dual-qualified faculty are in short supply; and industry–education integration is more aspirational than real. There is therefore an urgent need to take stock of what the pilot has and has not achieved and to identify concrete pathways for aligning cross-border e-commerce talent cultivation with the "1+X" framework.

1.2. Problem statement

Although the "1+X" policy has generated considerable momentum, its implementation in applied undergraduate Business English programs faces five intertwined problems. University–enterprise cooperation tends to be formal rather than substantive: partnership agreements exist on paper, but enterprises rarely co-design courses or co-deliver instruction. Curricula lag behind a rapidly evolving industry—cross-border digital marketing, multi-platform operations, and data analytics now define the field, yet many programs still center on traditional business correspondence and trade documentation. Practical training facilities are inadequate: students often cannot access real e-commerce platform accounts or simulation environments, leaving them unable to develop operational fluency. Faculty members, predominantly trained in linguistics or literature, typically lack hands-on e-commerce experience, which undermines their credibility when teaching vocational skills. Finally, assessment remains dominated by written examinations that do not reliably signal professional competence. These problems have been documented in studies focusing on vocational colleges [7-9], but systematic empirical evidence from the applied undergraduate tier—which occupies a distinctive position between conventional universities and vocational colleges—remains scarce.

1.3. Research objectives

Against this backdrop, this paper pursues three research objectives. First, it assesses the current state of "1+X" implementation in applied undergraduate Business English programs through a quantitative survey of students and faculty at four institutions in central China. Second, it identifies the structural barriers that impede deep

integration between academic curricula and vocational certification standards. Third, it proposes a coherent reform framework anchored by the Cross-Border E-Commerce B2B Data Operations certificate, drawing on competency-based education theory and curriculum integration theory. The overarching question guiding this study is: How can applied undergraduate Business English programs leverage the "1+X" certificate system to produce graduates whose competencies match the demands of the cross-border e-commerce industry?

2. Literature review

2.1. International perspectives on vocational qualifications and curriculum alignment

The international literature on vocational qualifications offers two strands of relevance. The first concerns whether and how vocational credentials improve labor-market outcomes. Conlon's [10] analysis of UK earnings data found significant wage premia for vocationally qualified workers relative to their academically trained counterparts, though the magnitude varied considerably by occupation and gender. Stasz [11], reviewing the purposes and validity of vocational qualifications, argued that such credentials are effective only when they are tightly coupled to specific occupational standards, recognized by employers, and embedded within curricula that provide genuine opportunities to acquire the assessed competencies. Tuckwood's [12] doctoral investigation of the UK Qualifications and Curriculum Framework (QCF) found a positive but modest correlation between qualification attainment and workplace performance, suggesting that the credential alone is insufficient without complementary instructional design. Whitehead's [13] review of adult vocational qualifications in England likewise highlighted the centrality of employer recognition to qualification reform.

The second strand addresses how curricula can be structured around competency standards. Spady's [14] foundational work on Outcome-Based Education (OBE) established that educational systems should define success in terms of what learners can do rather than how much time they spend in classrooms—a principle that underpins the entire "1+X" logic. More recently, Allais [15] critiqued the uncritical export of Western competency-based models to African VET systems, arguing that occupational standards must be locally grounded rather than transplanted. McGrath and Yamada [16], in their editorial introducing a special issue on skills for development, emphasized that TVET reform succeeds only when curricula respond dynamically to shifting labor-market demands rather than adhering to static competency frameworks. Goncharova et al.'s [17] comparative study of Chinese and Russian commercial vocational education identified curriculum integration—the systematic embedding of vocational standards into course design, instruction, and assessment—as the single most important predictor of successful TVET outcomes.

2.2. Research on the "1+X" certificate system in China

Since the 2019 launch of the "1+X" pilot, Chinese scholars have produced a growing body of evaluative research. Li et al. [7] provided an early overview of implementation progress and emerging problems, noting uneven adoption across regions and disciplines. Li [18] likewise reported on early pilot-scheme practice in the electronic information engineering technology program. Liao [19] offered one of the first case studies of course–certificate integration, demonstrating how Management Psychology modules could be restructured around vocational certification standards. Wang et al. [20] explored curriculum optimization for pet-related programs under the "1+X" framework, proposing a modular structure that maps certificate competencies onto individual courses. Mao [8] examined the realistic dilemmas confronting vocational colleges, including insufficient funding, weak industry engagement, and faculty resistance. Yu [21] approached the issue from a "big vocational education" perspective, arguing that "1+X" should be situated within a broader national qualifications framework rather than treated as an isolated policy experiment.

Subsequent work has deepened the analysis. Wang et al. [22] introduced the concept of the "identity dilemma"—the tension between the academic identity of higher education institutions and the vocational identity imposed by "1+X" certification—and proposed resolution pathways centered on institutional culture change. Gao and Xu [23] compared different training methods for "1+X" certificate preparation, finding that integrated coursework outperforms separate cramming sessions. Li and Yang [24] drew on German and British modularization practices to propose a more systematic approach to "1+X" implementation in the Chinese context. Yang [25] extended the discussion to rural revitalization, examining how "1+X" certificates could support agricultural talent development. Collectively, these studies reveal a field moving from descriptive reporting toward analytical frameworks, though most remain focused on vocational colleges rather than applied undergraduate institutions.

2.3. Cross-border e-commerce education and talent cultivation

A parallel strand of research addresses cross-border e-commerce education specifically. Liu [26] explored talent cultivation under the OBE philosophy, proposing a modular curriculum that integrates platform operations, data analytics, and cross-cultural communication. Peng [27] investigated the construction of cross-border e-commerce "gold courses" in Guangdong vocational colleges serving the Greater Bay Area, emphasizing industry co-design and real-platform training. Deng [28] examined competency enhancement for cross-border e-commerce personnel under the "1+X" reform framework, identifying the specific skill clusters —platform operations, data analysis, and cross-cultural communication—that employers demand yet that conventional Business English curricula fail to cultivate. This analysis provides an empirical basis for treating the B2B Data Operations certificate not merely as an add-on credential but as a diagnostic instrument for exposing curricular gaps.

2.4. Research gap

Three gaps help to frame the present study. First, existing "1+X" research has concentrated predominantly on vocational colleges, and the applied undergraduate tier—which serves a distinct student population and operates under different regulatory conditions—appears to have received comparatively limited scholarly attention to date. Second, discussions of "course–certificate integration" have largely remained at a programmatic level, and relatively few studies have detailed how specific vocational certificates map onto concrete curricula. While Deng [28] identified the core competency clusters for cross-border e-commerce positions under the "1+X" framework, that analysis did not extend to translating those clusters into program-level curricular redesign. Third, while the Cross-Border E-Commerce B2B Data Operations certificate is among the most directly relevant "X" credentials for Business English programs, the question of how it may be leveraged as an organizing principle for curriculum restructuring warrants further investigation. Taken together, these considerations suggest a research area that remains relatively under-explored, to which the present study seeks to contribute.

3. Theoretical framework

3.1. Competency-based education theory

Competency-Based Education (CBE) provides the primary theoretical lens for this study. Originating in North American vocational education during the 1970s and systematized by Spady [14], CBE holds that educational outcomes should be defined in terms of what learners can do—specific, observable, and measurable

competencies—rather than how much time they spend in class or how many credits they accumulate. In the context of the "1+X" system, the "X" certificate functions precisely as an external validator of competency: it certifies that the holder possesses a defined set of skills that have been assessed against industry-derived standards. For Business English programs, this means that curriculum objectives should be rewritten not as abstract descriptors like "understands cross-border e-commerce operations" but as concrete ability statements such as "can independently manage a B2B product listing including keyword research, image optimization, and competitor analysis". The shift from time-based to competency-based definitions is the conceptual foundation for all five reform pathways proposed below.

3.2. Curriculum integration theory

Curriculum integration theory—developed in the Chinese vocational education context by scholars such as Jiang [29] and systematized by Xu [30]—provides the architectural principles for reorganizing courses around certificate standards. Jiang's cluster-based modular curriculum model proposes that curricula should be organized around occupational task clusters rather than academic disciplines, with each module corresponding to a coherent set of workplace competencies [29]. Xu's comprehensive curriculum theory specifies a three-stage process: occupational task analysis → competency mapping → instructional design [30]. Applied to the "1+X" context, this means: (a) decomposing the B2B Data Operations certificate into its constituent skill requirements; (b) mapping each requirement onto existing or new course modules; and (c) designing learning activities, assessments, and resources that enable students to demonstrate each competency. The resulting structure—which this study terms the "course–position–certificate–competition" model—integrates four elements that are typically treated separately in conventional program design.

3.3. Industry-education integration theory

Industry-education integration theory emphasizes that meaningful vocational education requires structural collaboration between educational institutions and industry partners across the full cycle of curriculum design, delivery, assessment, and improvement. Wang et al. [31] proposed a "cross-integration" model that calls for interdisciplinary, inter-institutional, and inter-industry collaboration in talent cultivation. In the context of this study, integration means more than inviting enterprise guest lecturers or arranging student internships; it means involving industry practitioners in defining competency standards, co-designing project-based learning activities, contributing to practical assessments, and providing feedback on graduate performance. The certificate standard serves as a necessary but not sufficient condition for integration: it provides the common language and benchmark, but institutions must actively build the relational infrastructure that translates standards into daily instructional practice.

4. Methodology

4.1. Research design

This study employs a quantitative survey design to assess the current state of "1+X" implementation in applied undergraduate Business English programs. The research proceeded in three phases. Phase 1 comprised an extensive literature review, establishing the theoretical framework and identifying key dimensions for investigation. Phase 2 involved the design, administration, and analysis of a structured questionnaire survey targeting students and faculty at four applied undergraduate institutions in central China. Phase 3 synthesized

the survey findings with the theoretical framework to derive and articulate the five reform pathways presented in Section 5.

4.2. Participants and sampling

The survey was administered at four applied undergraduate institutions in Hubei Province, central China, selected through purposive sampling to represent a range of institutional types with established Business English programs and active "1+X" participation. The participant pool consisted of 287 undergraduate students enrolled in Business English or related programs (years 2–4) and 47 faculty members teaching in those programs. Student participants were recruited through classroom announcements with instructor cooperation; faculty participants were recruited via departmental email lists. Response rates were 92.6% for students and 85.5% for faculty. Table 1 presents the demographic profile of respondents.

Table 1. Demographic profile of survey respondents ($N = 334$)

Category	Subcategory	*n*	%
Students ($N = 287$)	Year 2	98	34.1
	Year 3	112	39.0
	Year 4	77	26.8
Faculty ($N = 47$)	Lecturer/Assistant Professor	31	66.0
	Associate Professor	13	27.7
	Professor	3	6.4

Note: Percentages may not sum to 100 due to rounding.

4.3. Instrument development

The questionnaire was developed based on the theoretical framework and the five problem dimensions identified in Section 1.2. It comprised two sections. Section A collected demographic information (institution type, year of study/faculty rank, gender). Section B initially contained 24 items organized into five subscales: (1) University–Enterprise Cooperation (5 items); (2) Curriculum Relevance (5 items); (3) Training Facilities (5 items); (4) Faculty Qualifications (4 items); and (5) Assessment Methods (5 items). Following expert validation (described below), one item was added to the Faculty Qualifications subscale, resulting in a final instrument of 25 items across five balanced subscales of 5 items each.

The instrument underwent content validation by three experts: one senior Business English program director with 15 years of curriculum experience, one cross-border e-commerce industry practitioner with 10 years of operational experience, and one vocational education researcher. Expert feedback led to minor wording refinements and the addition of one item to the Faculty Qualifications subscale. Pilot testing with 30 students (not included in the main sample) yielded Cronbach's alpha coefficients ranging from 0.81 to 0.88 across the five subscales, indicating satisfactory internal consistency [32]. The final instrument achieved overall reliability of $\alpha = 0.86$ for the student version and $\alpha = 0.84$ for the faculty version.

4.4. Data analysis

Data were analyzed using SPSS Version 26.0. Descriptive statistics (frequencies, percentages, means, standard deviations) were computed for all items and subscales. Chi-square tests of independence were conducted to examine whether responses differed significantly across the four institutions. Effect sizes were reported using

Cramér's V. The threshold for statistical significance was set at $\alpha = 0.05$ (two-tailed). Subscale scores were computed by averaging item responses within each dimension, yielding a composite score ranging from 1 to 5 for each respondent on each dimension. For ease of interpretation in the narrative below, responses of 1 or 2 on the original (non-reversed) scale—indicating "inadequate" or "strongly inadequate"—were aggregated and reported as percentages of respondents perceiving a problem in each dimension.

5. Finding and discussion

5.1. Survey results: five dimensions of challenge

The investigation surfaced five challenges that consistently cut across institutions. Table 2 summarizes the survey findings across the five problem dimensions, reporting the percentage of respondents (students and faculty combined) who rated each dimension as "inadequate" or "strongly inadequate".

Table 2. Survey results: perceived inadequacy across five dimensions

Dimension	% Inadequate	Mean (SD)	Skewness
University–Enterprise Cooperation	78%	2.18 (0.94)	−0.42
Curriculum Relevance	82%	2.04 (0.89)	−0.31
Training Facilities	72%	2.31 (1.02)	−0.38
Faculty Qualifications*	64%	2.45 (0.97)	−0.29
Assessment Methods	81%	2.09 (0.91)	−0.35

Note. Percentages represent respondents selecting "inadequate" or "strongly inadequate" on a 5-point Likert scale. $N = 287$ students, 47 faculty. *Faculty Qualifications percentage based on $N = 47$ faculty responses only.

University–enterprise cooperation, though formally established at all four institutions, rarely extends beyond surface-level arrangements. Of the 47 faculty respondents, 82.9% characterized cooperation as "formal only" or "nominal". Industry partners typically appear as guest lecturers or internship hosts rather than co-educators, and they seldom participate in curriculum design or assessment. The result is a partnership that looks robust on paper but does little to align what students learn with what the industry needs. This finding is consistent with global patterns reported by Motsepe et al. [4], who found that employer engagement remains the weakest link in TVET–labour-market alignment worldwide.

Curricula, meanwhile, have not kept pace with the speed of industry change [33]. A striking 82% of respondents identified curricula as outdated relative to current industry practice. Cross-border e-commerce now revolves around platform-specific operations, data-driven marketing, and multi-channel logistics, yet many Business English courses still foreground business letter writing and general trade English, reflecting the enduring influence of traditional language-teaching paradigms [34]. Practical training facilities compound the problem: 72% considered them insufficient, with students reporting no access to live platform accounts or realistic simulation environments. Without such access, students cannot bridge the gap between classroom theory and operational fluency.

On the faculty side, 63.8% of the 47 faculty respondents reported no hands-on e-commerce operational experience. Most Business English instructors hold strong linguistic credentials but have never managed a cross-border store, run a platform advertising campaign, or analyzed B2B traffic data. This gap weakens the credibility of vocational instruction—students are skeptical of being taught operational skills by instructors who have never operated. Assessment, finally, remains dominated by written examinations: 81% of

respondents reported that assessment was primarily or exclusively examination-based, with few programs incorporating practical skill demonstrations, industry-validated benchmarks, or multi-stakeholder evaluation. High grades, therefore, do not reliably signal professional competence.

Chi-square tests revealed no significant differences across institutions for any dimension (χ^2 range: 2.14–5.87, df = 3, all $p > 0.05$; Cramér's V range: 0.06–0.11), indicating that the challenges are systemic rather than institution-specific. This uniformity suggests that the obstacles are rooted in structural factors—policy design, resource allocation, and incentive structures—rather than the particularities of individual institutions.

5.2. The "1+X" certificate system as a reform anchor

Given the pervasiveness of these challenges, the central argument of this paper is that the "1+X" certificate system—and specifically the Cross-Border E-Commerce B2B Data Operations certificate—provides a strategic anchor for coordinated reform.The Ministry of Education has authorized approximately 50 "X" certificate categories relevant to business and economics programs, covering areas such as e-commerce operations, digital marketing, logistics management, financial technology, and cross-border trade. Among these, the Cross-Border E-Commerce B2B Data Operations certificate is particularly well suited as an anchor for curricular reform. Its scope of certification—B2B platform operations, product listing and optimization, customer communication and negotiation, order management, logistics coordination, and data analysis—overlaps substantially with the professional objectives that Business English programs already espouse, making it a natural bridge between language proficiency and vocational competence.

5.3. From anchor to action: reform pathways

5.3.1. Realigning cultivation plans

A first step is to revise talent cultivation plans so that they explicitly incorporate the competency standards of the B2B Data Operations certificate, a reform logic already applied in other certification-driven fields [35]. This means mapping each certificate competency onto existing curriculum objectives, identifying gaps, and rewriting program-level learning outcomes as measurable skill demonstrations rather than abstract descriptors. The need for such mapping is empirically grounded: Deng [28] identified the specific competency clusters—platform operations, data analysis, and cross-cultural business communication—that cross-border e-commerce employers demand yet that conventional Business English curricula fail to cultivate. By using the certificate standard as a diagnostic overlay, institutions can pinpoint exactly where these gaps lie. For example, instead of stating that graduates "will understand cross-border e-commerce operations", a revised plan might specify that graduates "can independently manage a B2B product listing, including keyword research, image optimization, and competitor analysis".

Cultivation plans should also reflect regional economic conditions. Institutions in areas with concentrated cross-border e-commerce activity can tailor their programs to local employer needs—for instance, emphasizing specific platform proficiencies or logistics configurations common in the region. This regional calibration ensures that graduates leave with both the general competencies validated by "X" certificates and the specific capabilities local employers demand.

5.3.2. A "course–position–certificate–competition" curriculum

The second reform involves building an integrated curriculum that links courses, occupational positions, vocational certificates, and skills competitions. The logic is straightforward: curricular content should be derived from real occupational requirements, validated against certificate standards, and reinforced through competitive skill demonstration. Practically, this means organizing the curriculum into modules, each mapped to specific certificate competencies and occupational tasks. This approach resonates with the Position–Course–

Competition–Certificate (PCCC) framework recently proposed in the Chinese higher vocational literature [36] and with Liu's [26] OBE-oriented modular curriculum for cross-border e-commerce.

Implementation requires alignment at three levels. At the course level, content must be revised to reflect current industry practice—for instance, replacing outdated trade correspondence drills with exercises on live B2B platforms. At the position level, employer competency standards should be embedded in curriculum design through project-based and case-based teaching, creating genuine rather than nominal school–enterprise integration. At the certificate level, training for the "X" examination should be woven into regular coursework rather than treated as an add-on cram session.

A particularly important element is the vocational competency expansion module designed for third- and fourth-year students. This module represents the "X" phase of the curriculum, during which students prepare for and obtain vocational skill certificates. Its design should integrate industry needs, professional ethics, and civic education—including teamwork, a respect for quality and craftsmanship, and cultural awareness—so that vocational preparation does not come at the expense of broader educational aims.

5.3.3. Strengthening practical training

Without adequate facilities, curricular reform remains theoretical. Institutions should establish dedicated cross-border e-commerce training laboratories equipped with simulation software, real platform accounts, and data analysis tools, ideally in collaboration with industry partners so that training environments replicate actual operational conditions. Off-campus training bases—internship partnerships with e-commerce enterprises—should complement these campus facilities.

Training should follow a progressive structure. In the first and second years, students build foundational skills—platform navigation, basic product listing, customer communication. In the third year, they integrate these skills through comprehensive project work. In the fourth year, they apply them in real-world settings via internships and certificate preparation. At each stage, the "X" certificate's skill requirements serve as benchmarks, ensuring that training outcomes are not merely internally defined but measured against industry-validated standards. Institutions implementing this progressive structure are advised to monitor certificate pass rates and graduate employment outcomes systematically, generating evidence that can inform further refinements to the training model.

5.3.4. Building dual-qualified faculty

The credibility of vocational instruction depends on the credibility of instructors. Survey data showed that 63.8% of faculty had no e-commerce operational experience—a figure that represents a primary obstacle to instructional effectiveness. Institutions should invest in systematic professional development that enables Business English faculty to acquire hands-on e-commerce experience—through enterprise secondments, industry training programs, and support for obtaining relevant "X" certificates themselves. Faculty who hold the certificates they teach are better positioned to prepare students for them.

At the same time, institutions should bring industry professionals into the classroom as part-time instructors. These practitioners contribute real-world cases, current market intelligence, and operational guidance that full-time faculty cannot easily replicate. A blended team—academic faculty and industry practitioners working side by side—also deepens university–enterprise cooperation: industry instructors often serve as bridges between their host organizations and the institution, opening channels for internships, joint projects, and curriculum co-design.

5.3.5. Broadening evaluation

Finally, assessment must catch up with curricular reform. Survey results showed that 81% of respondents found current assessment dominated by written examinations. A reformed evaluation framework should integrate formative and summative elements. Formative assessment should emphasize continuous skill

development through practical tasks, project work, and peer evaluation. Summative assessment should include both traditional academic examinations and certificate-based competency verification, so that final grades reflect both theoretical knowledge and practical skill.

Evaluation should also involve multiple stakeholders—faculty, industry mentors, peers, and external certification bodies—and it should use the "X" certificate's assessment standards as benchmarks for practical skill evaluation. Incorporating certificate examination results into course grades gives students a tangible incentive to pursue certification, while ensuring that evaluation criteria remain aligned with industry-validated standards. Equally important, evaluation results should feed back into curriculum design, creating a continuous improvement loop that connects assessment outcomes to instructional refinement.

6. Conclusion and implication

6.1. Conclusion

Seven years into the "1+X" pilot, applied undergraduate Business English programs remain caught between policy expectations and implementation realities. The quantitative evidence presented here—with 78% of respondents reporting superficial industry cooperation, 82% identifying outdated curricula, 72% noting insufficient training facilities, 64% of faculty lacking operational experience, and 81% reporting examination-dominated assessment—documents these gaps with quantitative specificity. Yet the "1+X" framework itself provides a viable path forward. When the Cross-Border E-Commerce B2B Data Operations certificate is treated not as an examination to cram for but as an organizing logic for curriculum design, instruction, and evaluation, it becomes a mechanism for aligning what students learn with what the labor market values.

The five reform pathways proposed here—realigning cultivation plans, building an integrated curriculum, strengthening practical training, developing dual-qualified faculty, and broadening evaluation—are mutually reinforcing. No single pathway can carry the load alone: curricular redesign without adequate training facilities produces frustrated students; training facilities without dual-qualified faculty produce supervised but not educated practice; and all of it unravels unless assessment changes to reward what the reforms aim to cultivate.

6.2. Theoretical implication

Theoretically, the paper extends competency-based education and curriculum integration theory into a setting they have not fully addressed: the Chinese applied undergraduate institution, which occupies a distinctive space between academic and vocational education. The analysis shows that "X" certificates can function as more than paper credentials; they can serve as external validators that bridge educational outcomes and industry requirements—a role consistent with the international literature on vocational qualification effectiveness [11, 15, 17]. The proposed "course–position–certificate–competition" model also enriches curriculum integration theory by offering a concrete framework for modularized curriculum design that links academic courses to occupational positions, vocational certificates, and skills competitions in a single coherent structure, resonating with the PCCC framework recently emerging in Chinese vocational education research [36].

6.3. Practical implication

For institutional administrators and curriculum designers, the reform pathways are intended to be adaptable rather than prescriptive. Institutions in regions with active cross-border e-commerce industries can implement

the full framework; those in less developed regions can begin with a single pathway—most plausibly, curricular realignment around the B2B Data Operations certificate—and expand from there. The emphasis on regional economic alignment is deliberate: reform that responds to local industry needs is more likely to be sustainable than reform imposed uniformly regardless of context. This adaptability principle aligns with the OECD's [6] call for VET systems to build responsiveness through adaptive curriculum governance and the ILO's [37] emphasis on context-sensitive skills anticipation.

6.4. Limitation and future research

Several limitations bear noting. The empirical investigation was confined to a quantitative survey design; future studies would benefit from incorporating qualitative methods such as interviews or focus groups, for example within mixed-methods designs [38], to capture deeper insights into stakeholder experiences and perceptions. The sample was concentrated in central China (Hubei Province), which may limit the generalizability of findings to other regions. The cross-sectional nature of the survey data precludes causal inferences about the relationships between reform implementation and student outcomes; longitudinal or experimental designs are needed to assess whether the proposed reforms produce sustained improvements in certificate pass rates and graduate employability. The focus on a single "X" certificate, while useful for specificity, leaves open the question of how multiple certificates might be integrated simultaneously. Future research could track graduate employment outcomes and employer satisfaction over multiple cohorts, compare reform pathways across regions, explore the integration of additional "X" certificates—particularly those covering B2C operations and overseas marketing—into Business English curricula, and incorporate qualitative methods to enrich understanding of implementation dynamics.

6.5. Policy outlook: the 2025 administrative transition

A significant institutional development occurred in September 2025. On September 12, 2025, the General Office of the Ministry of Human Resources and Social Security and the General Office of the Ministry of Education jointly issued a directive (Document No. 2025-154) [39] transferring the entire portfolio of 447 "X" certificates—previously administered under the Ministry of Education's pilot framework—to the unified stewardship of the human resources and social security department, with the handover to be completed by December 31, 2025. This administrative restructuring marks a pivotal transition in the "1+X" certificate system from an education-led pilot initiative to a nationally unified, labor-market-anchored qualification framework.

The implications for the reform pathways advanced in this paper are substantial. First, by shifting regulatory authority to the ministry responsible for employment standards and workforce development, the transfer aligns "X" certificates more closely with national occupational qualification infrastructures—precisely the kind of external validation mechanism that competency-based education theory calls for. The five reform pathways proposed here remain not only valid but arguably gain urgency: programs that have already begun mapping their courses to certificate standards will be better positioned to adapt to whatever revised standards emerge under the new administrative regime.

Second, the transition raises questions that warrant sustained scholarly attention. Will the recertification standards for existing "X" certificates change under MOHRSS stewardship? How will the relationship between "X" certificates and the National Vocational Qualification framework be recalibrated? For applied undergraduate Business English programs specifically, will the Cross-Border E-Commerce B2B Data Operations certificate retain its current structure, or will it be consolidated with adjacent certifications in the e-commerce occupational cluster? These uncertainties do not diminish the value of the reforms described here;

rather, they underscore the importance of designing curricula around transferable competencies—market analysis, platform operations, cross-cultural negotiation—that remain durable regardless of which administrative body issues the certificate. Institutions are advised to treat the certificate as a milestone within a broader competency architecture rather than an endpoint, so that curricula can flex with evolving standards without wholesale redesign. Future research should track how the administrative transition reshapes certification standards, employer recognition, and—ultimately—the employment outcomes of graduates whose qualifications now carry the authority of the national labor-market regulator rather than the education sector alone.

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