Creative Education, 2026, 17(11), 2236-2247
https://www.scirp.org/journal/ce
ISSN Online: 2151-4771
ISSN Print: 2151-4755

Teachers' Technological Overload and Its Mitigation Strategies amid Digital Transformation in Vocational Education

—Empirical Evidence from Vocational Institutions in Guangxi, China

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How to cite this paper: Li, P. Y. (2026). Teachers' Technological Overload and Its Mitigation Strategies amid Digital Transformation in Vocational Education. *Creative Education, 17,* 2236-2247.
https://doi.org/10.4236/ce.2026.1711124

Received: October 9, 2026
Accepted: November 23, 2026
Published: November 26, 2026

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Abstract

Digital transformation in vocational education reshapes hands-on training scenarios, curriculum frameworks and industry-academia collaborative mechanisms via digital tools. For Guangxi, this represents a critical strategic move to align local industrial development with ASEAN-oriented cooperation and strengthen regional talent pipelines for skilled technical professionals. As front-line implementers of digitally-enhanced instruction, vocational educators are increasingly subject to technological overload stemming from piled-up duties: platform maintenance, custom digital learning asset development, administrative data reporting, and adaptive deployment of AI-enabled teaching utilities. Distinct from general occupational workload, such overload arises from structural frictions between digital infrastructure, institutional evaluation regimes, educators' digital readiness, and limited educational resources within ethnic-minority regions. Drawing on semi-structured interviews and questionnaire data collected from instructors across multiple higher-vocational establishments in Guangxi, this paper identifies four major manifestations of technology-driven strain. It further unpacks root-cause mechanisms from four analytical dimensions: sociotechnical embedding, institutional governance, regional resource endowment, and individual educator cognition. Empirical findings reveal region-specific traits in Guangxi: uneven burden distribution across geographic zones, disproportionate stress borne by dual-competency instructors, and routine displacement of hands-on teaching time by bureaucratic digital chores. Moving beyond the conventional remedy of offering digital-literacy workshops alone, this research puts forward a holistic mitigation framework featuring "streamlined digital infrastructure, institutional deregulation, cross-regional capacity-building collaboration, and individual psychosocial adjustment". Tar-

geted institutional instruments are proposed, including eligibility screening for digital systems deployed at ethnic-region vocational schools, cross-institutional consortia for shared digital learning-asset creation, and real-time monitoring systems for educator technological strain. These policy instruments help reframe digital transformation around instructional missions rather than procedural compliance, delivering theoretical insights and actionable measures for high-quality digital advancement of vocational education in border ethnic locales.

Keywords

Vocational Education, Digital Transformation, Technological Overload, Industry-Academia Collaboration

1. Introduction

Driven by China's national digital-oriented education initiative, Guangxi capitalizes on its geostrategic position as a gateway to ASEAN and accelerates the rollout of smart campuses, immersive virtual-training facilities, and provincial-level repositories for vocational digital learning materials. Digital solutions have evolved from auxiliary informatization utilities into foundational architecture revamping practical training delivery, school-enterprise partnerships, and specialty-subject construction. Local vocational programs serve key regional industrial sectors: port-centered industries around the Beibu Gulf, red-cultural tourism in Baise, specialized agriculture in western Guangxi, and cross-border commerce along frontier zones. Numerous higher-vocational majors rely heavily on virtual-simulation suites, remote hands-on-training portals and digitized course materials to deliver integrated industry-academia curricula (Wang & Chen, 2026). Top-level digital-construction mandates filter through administrative hierarchies and land on individual subject instructors and practical-training supervisors.

Within on-the-ground policy implementation, empowering potentials of digital technologies coexist alongside unintended side-effects of heightened educator technological strain. Existing scholarship mostly addresses digital-related workload pressures within nationwide macro-education frameworks, while giving insufficient attention to contextual constraints unique to border-region ethnic-minority vocational education. Guangxi hosts a large cohort of vocational institutions with diverse teacher profiles, many of whom lack systematic digital-skill development. Several campuses run parallel, disconnected digital ecosystems: instructional portals, government reporting dashboards, competition-oriented resource platforms, and student-performance monitoring systems operate in silos. Repetitive data entry, multi-account toggling, and redundant file uploading have become commonplace. Additionally, developing cross-border curricula for ASEAN-focused talent development and digitizing indigenous craftsmanship syllabi impose extra content-creation burdens absent in inland Chinese institutions.

Field investigations confirm that many dual-competency instructors report digital administrative tasks eating into time reserved for practical-training preparation, corporate site visits, and one-on-one student skill coaching. Senior educators exhibit sustained tech-related distress; some engage in token compliance, carrying out digital procedures merely for procedural formality. Misalignment thus emerges between high-level digital-transformation objectives and day-to-day instructional realities (Davis et al., 2025).

Much current literature conflates technology-induced strain with insufficient digital proficiency, advocating skill-training sessions as the primary intervention. Such perspectives fail to explain observable realities in Guangxi's vocational sector: even younger teachers with baseline digital competencies endure substantial technological strain. The core challenge is not limited to whether educators can operate software, but structural pressures generated by flawed system design, skewed performance appraisal, rigid administrative workflows, and insufficient local resource provision. Technological overload is not an individual competency gap; it constitutes a sociotechnical by-product once digital systems penetrate organizational routines of vocational schooling.

Given the above context, this study samples front-line instructors from higher-vocational colleges covering all fourteen prefecture-level jurisdictions of Guangxi. Research methodologies combine semi-structured interviews, questionnaire surveys, and classroom ethnographic observations. Analytical focus falls on vocational-education-specific scenarios: hands-on practical training, virtual-simulation project prototyping, and digitally-mediated industry-academia linkages. This paper delineates tangible symptoms of technological strain, untangles multi-factor causal pathways, and formulates context-adapted governance mechanisms tailored for Guangxi's ethnic-minority context and ASEAN-targeted vocational outreach. The ultimate objective is to prevent digital-reform mandates from morphing into extra bureaucratic obligations for teaching staff, ensuring digital innovations genuinely support skilled-talent cultivation.

2. Manifestations of Technological Overload among Vocational-Education Instructors

Within vocational-education contexts, educator technological overload describes cumulative adverse outcomes—excessive time expenditure, operational friction, psychological distress, and distorted instructional priorities—triggered by ill-adapted digital infrastructure, task saturation, and misaligned performance metrics in digital teaching, learning-asset development, system maintenance, mandatory data reporting, and technology-linked performance evaluation. Empirical data from Guangxi identifies four interrelated categories of strain, which disproportionately affect practical-training supervisors and older-generation instructors (Yang & Rahman, 2025).

First, procedural-operational overload: redundant workflows and maintenance burdens caused by fragmented disjointed systems. Digital-construction projects

across Guangxi's vocational campuses are rolled out in separate batches. Provincial learning-resource hubs, campus smart-teaching modules, virtual-training workbenches, educational-administration reporting interfaces, and digital portals for vocational-skill contests operate without interoperable application-programming interfaces or unified identity-management frameworks. Instructors must re-input student rosters, course documentation, and teaching journals across isolated platforms; identical instructional packages require repeated re-uploading, format conversion, and layout readjustment to satisfy heterogeneous system specifications. Within practical-training settings, educators themselves handle virtual-simulation hardware calibration, instructional video recording, fault diagnosis for training equipment, and archiving of remote-training process logs. Many vocational schools are understaffed for dedicated information-technology maintenance roles. When platforms lag, file transfers fail, or simulation modules crash, classroom instructors bear troubleshooting responsibilities. Significant working hours are consumed by non-instructional technical chores. Survey evidence indicates that educators at certain Guangxi vocational campuses devote excessive weekly hours to form-filling, content uploading, and system debugging. Administrative digital workflows crowd out hands-on student mentoring and corporate-sector field research, creating a predicament where technical housekeeping supposes core instructional responsibilities.

Second, curriculum-redesign overload: prohibitive resource-development costs and misaligned tech-pedagogical integration. Unlike general academic education, vocational education centers on hands-on skill acquisition and workplace-simulated practice. Digital transformation demands that instructors translate manual craft workflows, hardware-operation protocols, and occupational standard procedures into micro-lecture segments, virtual-simulation modules, and interactive training courseware. Indigenous specialty disciplines widespread in Guangxi—sugar-cane processing, sericulture, cross-border frontier logistics, and ethnic handicraft production—lack off-the-shelf standardized digital teaching repositories. Instructors therefore must independently produce training footage, diagram operational workflows, and draft scripts for three-dimensional simulation units. This content creation far exceeds conventional courseware editing: it requires simultaneous familiarity with industry occupational benchmarks, audiovisual production techniques, and simulation-scenario scripting. Development cycles are lengthy and labor-intensive. Most instructors lack formal media-production backgrounds and endure iterative trial-and-error cycles. Once digital assets are finalized, evolving industrial standards necessitate ongoing revisions and updates. Digitizing vocational education is not merely migrating offline lectures online; it entails reconstructing practical-training workflows and designing data-informed individualized skill-building activities. Such pedagogical paradigm shifts impose persistent cognitive burdens, generating curriculum-redesign-related overload. Some educators submit superficially adapted materials (repurposed lecture slides, raw lecture recordings) to satisfy administrative deadlines, resulting in low-quality digital outputs and cosmetic digitization.

Third, appraisal-driven formalization overload: box-ticking digital documentation induced by quantitation-biased evaluation. Regimes for digital-transformation audits, institutional teaching reviews, open-online-course accreditation, and digital-teaching-case competitions prioritize quantifiable proxy indicators: system login durations, volume of uploaded learning assets, student online-check-in percentages, and completeness of submitted datasets. Evaluation frameworks treat digital-tool utilization itself as an assessment target, rather than as a means toward improved skill-building instruction (Brailovskaia et al., 2024). Subject to appraisal pressure, educators at several Guangxi institutions prioritize hitting platform-metric benchmarks over selecting digital interventions according to genuine curricular needs. Instructors are compelled to compile screenshots, archival footage, and process-tracking datasets solely for inspection purposes. This yields a dysfunctional dynamic where procedural documentation outweighs substantive educational outcomes. Digital instruments shift from pedagogical aids into administrative-compliance devices, converting proactive instructional design into reactive target-chasing work and amplifying workload strain. This appraisal-originated burden is most acute for educators competing in teaching-competition circuits or applying for prestigious online-course certifications, who expend substantial labor polishing submission materials and optimizing platform statistics, drifting away from core talent-cultivation missions.

Fourth, psychocognitive overload: tech-related apprehension and role-identity conflicts stemming from rapid technological flux. Technological overload encompasses not only temporal and practical burdens but also deep-seated mental stress. On one hand, constant upgrades to AI teaching utilities and virtual-simulation software oblige educators to continuously master unfamiliar systems. Persistent worries over operational mishaps or system breakdowns disrupting in-person practical-training sessions foster chronic tech-related anxiety. Older dual-competency educators accustomed to demonstration-centered hands-on instruction feel heightened intimidation by sophisticated digital ecosystems. On the other hand, evolving role expectations generate identity friction: traditional practical-training instructors function as skill demonstrators, yet digital-era expectations assign additional roles as content producers, system administrators, and student-data analysts. Multi-role demands surpass original occupational role boundaries. At frontier-zone campuses in Guangxi, instructors additionally manage bilingual instruction and culturally localized curriculum adaptation for ASEAN-targeted teaching. Combined requirements of ethnic-language translation and cross-border instructional adaptation further inflame psychological pressure. Sustained tech-related apprehension erodes instructors' digital self-efficacy, dampens voluntary pedagogical innovation with digital instruments, and in severe cases contributes to occupational burnout.

3. Causal Mechanisms behind Instructors' Technological Overload

Educational-technology-driven workload strain is a structural outcome shaped by

four interlocking logics: sociotechnical embedding, institutional administrative governance, regional resource allocation, and individual educator cognition. Within Guangxi's ethnic-minority vocational-education landscape, constrained regional resources plus extra obligations for ASEAN-oriented training exacerbate cross-factor tensions, producing causal dynamics distinct from inland Chinese jurisdictions.

3.1. Sociotechnical Embedding: One-Sided System Expansion Lacking Context-Aware Human-Centered Design

Digital-construction initiatives are predominantly commissioned from commercial information-technology vendors. System specifications prioritize data-aggregation capacities and project-delivery key-performance indicators, rather than authentic on-site instructional realities of vocational practical training. This yields a "technology-first, pedagogy-second" embedding pattern. Commercial off-the-shelf platforms are optimized for general classroom contexts and poorly accommodate vocational-specific requirements: hands-on laboratory training, site-based instruction, and multi-stakeholder school-enterprise collaboration. Different campuses procure simulation and smart-teaching suites from disparate vendors without unified provincial interoperability standards, resulting in information silos. Platform developers keep stacking reporting, statistical-analysis and attendance-tracking modules while rarely eliminating obsolete features. User interfaces grow increasingly convoluted, lengthening operational workflows. Front-line dual-competency instructors possess minimal input during project initiation and requirement-definition phases; top-down technical roll-outs frequently disregard local infrastructure constraints such as unstable network bandwidth, aging hardware, and uneven baseline digital literacy across teaching cohorts. Standardized digital infrastructures are superimposed onto highly diverse ethnic-region vocational-education contexts. Misalignment between technical capabilities and real-world teaching conditions directly generates procedural operational burdens.

3.2. Institutional Governance: Top-Down Pressure-Transfer Administrative Chains and Misaligned Incentive Structures

Digital-advancement in vocational education is steered by top-level policy directives. Performance benchmarks set by provincial and municipal education authorities cascade downward to institutional leadership, then further devolve to departmental teaching-research units and individual educators, forming pressure-transmission hierarchies. Metrics tracking digital-project completion, content output volume, and platform activity feed into institutional accreditation and specialty-subject evaluation reviews, compelling schools to escalate digital-task requirements. Incentive arrangements remain inadequate: labor-intensive long-cycle work such as virtual-simulation module creation and specialized digital-curriculum development receives insufficient recognition in teaching-hour conversion, research

output weighting, and performance remuneration. Much digital-reform-related labor constitutes unfunded add-on duties. Moreover, many campuses lack centralized oversight mechanisms for digital-related mandates. Separate administrative divisions independently dispatch reporting and content-creation assignments without consolidated deduplication. Within such institutional arrangements, educators bear implementation accountability for digital transformation without matching staffing allocations, working-time allowances, or project budgets. Administrative compliance imperatives overshadow pedagogical priorities. Fundamentally, technological overload represents governance costs of digital-reform implementation shifted downward onto front-line teaching personnel through bureaucratic transmission channels.

3.3. Regional Resource Allocation: Spatially Uneven Vocational-Education Provisions and Gaps in Supporting Infrastructure

Guangxi covers vast geographic territory. Vocational establishments in major hubs such as Nanning and Guilin enjoy comparatively ample resources, while campuses in western-, northern-, and border-zone Guangxi grapple with under-resourced IT support, budget shortfalls, and outdated equipment stockpiles, creating stark regional disparities in technical backup capacity. Many institutions rely on part-time IT staff unable to provide campus-wide troubleshooting services; consequently, fault-remediation obligations are passed onto classroom teachers. Commercially available digital learning materials predominantly serve industrial-oriented majors developed for eastern-Chinese contexts. Indigenous Guangxi specialties (sugar-industry technology, sericulture, ethnic-handicraft craftsmanship, frontier cross-border commerce) have scarcely any ready-to-deploy digital curricular packages, forcing educators to build learning resources entirely from scratch and drastically raising workload burdens. Vocational-education partnerships targeting ASEAN markets additionally demand bilingual curriculum localization, bringing further workload increments. The absence of formal cross-campus consortia for shared content development leads to redundant parallel resource-building efforts across institutions, wasting human capital and compounding individual-level educator strain (Jaeho et al., 2022).

3.4. Individual Educator Cognition: Skewed Digital-Competency Profiles and Distorted Value Perceptions Amplifying Mental Pressure

Technological overload does not equate to low digital competence; it emerges from mismatches between educator skill sets and evolving instructional demands. Dual-competency teaching staff in Guangxi originate from heterogeneous backgrounds. Some practitioners transition from industry sectors with robust hands-on expertise yet limited capabilities in digitally-enhanced curriculum design, audiovisual editing, and student-dataset interpretation. Younger educators master

basic office-software suites but often lack practical experience adapting hands-on vocational syllabi for digital environments. Prevailing professional-development offerings focus dominantly on tool-operation lectures, emphasizing instrumental know-how rather than immersive pedagogical design training rooted in industry-academia practical-training contexts. Training agendas therefore remain decoupled from day-to-day instructional realities. Meanwhile, two opposing cognitive biases prevail among some instructors regarding digital transformation. One group treats digitization as mere box-ticking (online attendance logs, bulk content uploads) and complies passively with mandates. A second group holds overly optimistic expectations for digital interventions and attempts full-scale tech deployment across every practical-training module, only to experience acute frustration when learning outcomes fail to meet inflated projections. Skill-set mismatches compounded by cognitive distortions heighten subjective stress during technology adoption, producing psychologically-perceived technological strain.

4. Mitigation Strategies for Educators' Technological Overload in Vocational Digital Transformation

Addressing technology-driven workload strain requires moving past the simplistic policy response of expanding digital-literacy workshops. Comprehensive intervention should implement upstream burden containment, ongoing workload moderation, multi-faceted capacity building, and inter-institutional collaborative support. Governance interventions must intervene at early procedural stages: digital-system procurement, mandate issuing, and performance-metric formulation. Solutions need to accommodate regional specificities of ethnic-minority vocational education in Guangxi, reconciling burden alleviation with capacity empowerment.

4.1. Digital-Infrastructure Governance: System Admission Screening and Integrated Consolidation for Upstream Procedural-Burden Reduction

First, formulate admission-and-retirement checklists governing digital-tool adoption within Guangxi's vocational-education sector. Provincial-level vocational-education administrations should standardize criteria for instructional platforms and administrative digital utilities entering campus environments. During public-procurement bidding cycles, solicit evaluation input from practicing dual-competency instructors and practical-training pedagogy specialists. Block systems characterized by feature bloat, closed data interfaces, and cumbersome user workflows from campus deployment. Rigorously distinguish digitally-enhanced teaching necessities from purely administrative-trace-keeping functions; eliminate mandatory attendance-logging and hollow system-duration-tracking features. Institutionalize the guiding principle that genuine instructional requirements take precedence over procedural metrics. Second, pursue cross-system data interoperability and unified single-sign-on frameworks for provincial vocational-education

platforms. Dismantle data silos separating Guangxi's vocational-education resource repositories, virtual-training modules, and student-administration databases. Enable single-time data entry reusable across multiple connected subsystems to eliminate repetitive form-filling and file submission. Promote "unified network-governance and consolidated-form workflows" to cut redundant multi-portal operations. Third, establish sustainable technical-support ecosystems. Recruit full-time IT-maintenance personnel scaled according to institutional enrolment size. Introduce cluster-shared technical-support mechanisms: IT teams from well-resourced anchor vocational colleges deliver outreach assistance to neighbouring smaller-scale establishments. Deploy online work-order ticketing portals, allowing instructors to submit fault-repair requests for platform malfunctions or simulation-software glitches, with remediation performed by dedicated technical staff. This frees classroom educators from troubleshooting chores and refocuses their energy on hands-on practical-training pedagogy.

4.2. Institutional-Policy Governance: Overhaul Appraisal Frameworks and Introduce Coordinated Mandate-Management Mechanisms

To begin with, revise digital-focused appraisal rationales and de-emphasize over-quantified performance indicators. Shift evaluation weight away from countable proxies (content quantity, platform activity metrics) toward qualitative outcome measures: measurable student-skill advancement, practical-training instructional efficacy, and tangible industry-academia cooperation outputs. Remove assessment requirements tied to non-essential digital chores. Clarify that digital tools constitute optional pedagogical aids rather than universal mandates (Ames et al., 2020). Instructors retain autonomy to select appropriate technological interventions; fully hands-on practical-training formats remain permissible without enforced digital-coverage requirements. Next, implement joint-review workflows and task-inventory management for digital-related mandates. Each vocational campus should assemble a cross-functional task-coordination panel. All externally-imposed online-reporting, content-creation, and document-submission mandates converge for centralized screening. Duplicative and non-essential digital assignments get consolidated or revoked; ad-hoc reporting requirements issued unilaterally by individual departments are prohibited. This blocks uncontrolled accumulation of digital-related obligations at institutional-policy levels. Finally, refine incentive safeguards and working-boundary protections. Provide fair teaching-hour recognition for labor-intensive outputs such as virtual-simulation module construction and indigenous-specialty digital-curriculum development; incorporate these achievements within performance reviews and professional-promotion evaluation criteria to reward high-quality digital-pedagogical work. Explicitly delineate boundaries between instructional duties and digital-administrative chores. Restrict off-hours digital-mandate notifications to safeguard work-life demarcation and mitigate perpetual-connectivity-induced chronic stress.

4.3. Regional Collaborative Governance: Build Cross-Institutional Shared Digital-Asset Ecosystems Grounded in Local Industrial Realities

Responding to uneven regional resources and shortages of indigenous-specialty digital materials, develop a provincially orchestrated cluster-based consortium for vocational-education digital-resource co-development. Organize cross-campus working groups clustered around local industrial-specialty groupings: Beibu-Gulf heavy-industry training, western-Guangxi specialized agriculture, cross-border frontier commerce, and ethnic-handicraft vocational programs. Pool teaching expertise from multiple campuses to co-produce practical-training digital assets, avoiding duplicated independent development efforts across separate schools. Operate shared-repository protocols where jointly-produced resources are collectively owned and freely accessible for all Guangxi vocational-education institutions, drastically lowering individual-instructor content-creation burdens. Leverage Guangxi's geographic proximity to ASEAN to centrally coordinate bilingual training-material development, assembling cross-border vocational-education curriculum packages collectively and easing individual-teacher localization workloads. Apply differentiated digital-construction benchmarks for frontier-zone campuses: relax rigid hardware-deployment and content-production quotas, prioritize stable network infrastructure and functional practical-training equipment, reject mechanical replication of metrics used for well-resourced urban vocational colleges, and advance digital-reform measures tailored to local contextual conditions to prevent harm from one-size-fits-all mandates.

4.4. Individual-Educator Governance: Differentiated Capacity-Building Integrating Technical-Skill Advancement and Psychosocial Support

Teacher-capacity interventions must depart from generic software-training formats and adopt tiered, context-embedded professional-development schemes. Customize training tracks for distinct educator cohorts. For dual-competency instructors with industry backgrounds, prioritize hands-on workshops on virtual-simulation-oriented instructional design and practical-training-video production tightly linked to real-world occupational practices. For early-career educators, emphasize data-driven student-performance diagnosis and pedagogical integration between AI utilities and hands-on training modules. For senior-generation instructors, deploy peer-mentoring pairings and bite-sized micro-learning units to reduce skill-acquisition barriers. Professional-development curricula should draw authentic local-specialty practical-training projects (sugar-cane processing, sericulture, cross-border logistics) as case materials, ensuring workshop outputs transfer directly to classroom practice. Furthermore, deploy real-time monitoring instruments tracking educator technological-overload status alongside holistic wellbeing mechanisms. Conduct regular surveys mapping technology-related stress levels; organize peer-support counselling sessions addressing digital-work-related burnout; establish formal feedback channels for instructors to report usa-

bility barriers and unreasonable task requirements. Guide educators toward balanced instrumental perspectives on digital technology, dispel the misconception that "greater digital penetration automatically yields superior teaching", and encourage selective, purpose-driven technology adoption, fostering human-centered tech-pedagogical synergies serving skilled-talent cultivation objectives.

5. Conclusion

Digital transformation within vocational education goes far beyond hardware procurement. It constitutes systemic reform touching instructional delivery, institutional governance, performance evaluation, and resource-distribution architectures. As a border-region ethnic-minority jurisdiction undertaking talent-development missions targeting ASEAN partners, Guangxi inevitably grapples with educator technological-overload challenges amid vocational-education digitization. Such strain seldom originates from intrinsic teacher resistance toward digital innovation. Instead, it emerges as structural friction stemming from imperfect technical systems, distorted administrative-compliance pressures, and inequitable resource allocation. Policy interventions confined merely to boosting individual digital literacy cannot resolve root-level strain; in some circumstances, superficial skill-training may even exacerbate performative, formalistic digitization.

Mitigating technological overload hinges on resetting hierarchical relationships between technical instruments and educational missions, putting instructional-cultivation objectives at the centre of digitally-oriented institutional design. Integrated interventions—infrastructure streamlining, institutional-evaluation deregulation, cross-regional resource pooling, and differentiated educator-capacity building—can free instructors from repetitive portal-maintenance chores, redundant reporting workflows, and metric-chasing documentation tasks. Educators may then redirect energies to core pedagogical obligations: hands-on practical-training coaching, student-skill mentoring, and corporate-sector field engagement. Guangxi's vocational-education digital-advancement agenda must escape the trap of "prioritizing construction metrics over real-world application, prioritizing quantifiable outputs over workload alleviation". Balancing burden reduction with capacity-building, policymakers should nurture context-adapted vocational-education digital ecosystems suited for ethnic-minority border regions and aligned with ASEAN-focused collaborative outreach. Digital innovations ought to substantively empower skilled-talent development and facilitate high-quality advancement for border-region vocational education.

Funding

Research Project on Vocational Education Teaching Reform in Guangxi: Reform and Practice of the "Three Stages and Five Dimensions" Higher Vocational Education Training Model for Forestry Specialties Driven by the Community of Industry and Education Integration (GXGZJG 2026B122).

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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