

Article

Research on the Reform and Innovation of Talent Cultivation Models for Vocational Language Services in the Context of AI Empowerment

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Abstract: The rapid advancement of artificial intelligence has fundamentally reshaped the operational landscape of language services, introducing new demands for vocational talent that transcend traditional linguistic competence. This study investigates how vocational education institutions can systematically reform and innovate their talent cultivation models to align with AI-empowered industry realities. Drawing on empirical analysis of curriculum design, pedagogical practice, and competency frameworks across multiple vocational language training programs, the research identifies three critical gaps: misalignment between academic learning outcomes and real-world AI-augmented workflows; insufficient integration of human-AI collaboration competencies; and underdeveloped ethical and critical oversight capacities in technology-mediated language tasks. A mixed-methods approach was employed, combining structured curriculum audits, instructor interviews, student performance assessments in simulated AI-integrated environments, and longitudinal tracking of graduate deployment patterns. Findings indicate that successful reform hinges not on replacing human expertise but on redefining it—emphasizing contextual judgment, prompt engineering literacy, post-editing agility, cross-modal communication awareness, and responsible automation stewardship. The study further reveals that institutional capacity for sustained innovation correlates strongly with faculty development intensity, infrastructure flexibility, and industry co-design mechanisms. These insights form the basis for a scalable, phase-based implementation framework that prioritizes iterative adaptation over wholesale curriculum replacement. Ultimately, this research advances a human-centered, technologically fluent paradigm for vocational language education—one that treats AI not as a displacement force but as a catalyst for deeper professional identity formation and expanded service value.

Keywords: vocational education; AI empowerment; language services; talent cultivation; curriculum innovation

Received: 22 November 2025

Revised: 16 January 2026

Accepted: 29 January 2026

Published: 04 February 2026



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1. Introduction

1.1. The Shifting Terrain of Language Service Work

The landscape of language service work has undergone a profound structural recalibration under the influence of artificial intelligence [1, 2]. Core functions—including translation, interpretation, localization, and multilingual content creation—have migrated from predominantly manual execution toward orchestrating hybrid human-machine systems [3, 4]. This shift repositions practitioners as strategic overseers rather than sole producers, emphasizing adaptive problem-solving, contextual judgment, and rigorous quality assurance across AI-augmented workflows [2, 5]. Machine translation output now serves as a dynamic input layer requiring critical evaluation, domain-specific refinement, and cultural alignment rather than passive acceptance [2, 6]. Simultaneously, real-time interpretation tools demand new competencies in latency management, speaker intent modeling, and multimodal coherence verification. Localization processes increasingly integrate AI-driven terminology consistency engines and adaptive style-

guide enforcement mechanisms, necessitating fluency in both linguistic nuance and system configuration logic. Consequently, the professional identity of language service providers is evolving from technical executor to cognitive integrator—capable of diagnosing systemic bottlenecks, calibrating AI behavior against evolving sociolinguistic constraints, and sustaining ethical accountability within automated pipelines. This transformation fundamentally redefines the epistemic foundations of vocational language education.

1.2. The Imperative for Vocational Education Reform

Contemporary vocational language services face an accelerating structural misalignment between educational outputs and industry imperatives. Employers consistently report critical deficits among graduates—not in foundational linguistic competence, but in three interdependent domains: AI literacy, collaborative workflow navigation, and contextual decision-making under technological uncertainty. Trainees often lack fluency in interpreting AI-generated output quality, calibrating human-in-the-loop interventions, and adapting translation or localization strategies when model behavior deviates from expected patterns [7]. Moreover, traditional curricula emphasize discrete skill acquisition rather than integrated, team-based project execution across hybrid human–AI pipelines [6]. This gap intensifies as neural machine translation, large language models, and automated post-editing tools reconfigure task boundaries, value chains, and professional identity [4]. Without systemic reform, vocational programs risk producing technicians proficient in legacy workflows but ill-equipped to steward adaptive, ethically grounded, and technologically fluent language service delivery. The urgency is not merely pedagogical—it reflects a fundamental recalibration of labor-market expectations, where agility, interpretive judgment, and cross-modal collaboration now constitute core occupational competencies [8]. Addressing this imperative demands curriculum redesign anchored in real-world technological volatility and iterative industry co-creation.

1.3. Scope and Orientation of the Study

This study centers on mid-level vocational language practitioners—translators, interpreters, and localization specialists—who operate at the interface of linguistic expertise and technical implementation, rather than on AI researchers or software engineers. It deliberately excludes theoretical linguistics, computational modeling, and high-level policy analysis to maintain fidelity to pedagogical realities within vocational institutions. The orientation is resolutely practice-oriented: findings are designed to inform curriculum redesign, instructor training protocols, and assessment frameworks that reflect authentic workplace demands under AI-augmented conditions. Emphasis falls on observable teaching-learning dynamics—including task sequencing, feedback mechanisms, tool-integrated scaffolding, and competency progression—rather than speculative futures or macroeconomic projections [9]. Institutional actionability is prioritized: recommendations must be implementable within existing resource constraints, regulatory frameworks, and faculty development capacities. The scope encompasses both classroom-based instruction and work-integrated learning environments, with attention to how AI tools reshape role expectations, skill hierarchies, and professional identity formation among trainees [10]. No claim is made regarding universal applicability; contextual specificity—geographic, institutional, and sectoral—is treated as constitutive rather than incidental.

2. Literature Review

2.1. Evolution of Vocational Language Pedagogy

Vocational language pedagogy has undergone successive paradigmatic shifts, beginning with grammar-translation foundations that prioritized linguistic accuracy and textual fidelity [11]. Subsequent transitions embraced communicative approaches emphasizing functional proficiency and learner-centered interaction, followed by task-

based frameworks integrating authentic linguistic performance within simulated professional contexts. More recently, workplace-integrated models have sought to align curricular design directly with industry workflows, client expectations, and real-time service delivery protocols. Despite these conceptual advances, persistent structural constraints impede systemic efficacy: scalability remains limited by reliance on high-touch, instructor-dependent delivery mechanisms; assessment validity suffers from misalignment between standardized metrics and dynamic, multimodal service competencies; and industry responsiveness is hampered by institutional inertia, curriculum ossification, and lagging feedback loops between educational providers and evolving market demands [1, 12]. These limitations are now exacerbated by the accelerating integration of artificial intelligence tools across translation, interpretation, and localization ecosystems—introducing new thresholds for technical fluency, ethical judgment, and human-AI collaborative literacy that current pedagogical architectures struggle to accommodate [13, 14]. The reform imperative thus centers not merely on updating content, but on reconfiguring epistemic frameworks, assessment ontologies, and stakeholder governance structures [5].

2.2. AI Integration in Professional Language Practice

Contemporary professional language practice has undergone profound structural transformation through AI integration, shifting from predominantly human-executed tasks to hybrid human-machine workflows. Neural machine translation post-editing has emerged as a dominant paradigm, demanding practitioners to possess not only linguistic competence but also technical fluency in evaluating and refining algorithmic outputs. AI-assisted interpreting platforms now support real-time speech recognition, speaker diarization, and contextual disambiguation—introducing new cognitive loads related to latency management and multimodal attention allocation. Automated terminology management systems dynamically extract, validate, and propagate domain-specific lexicons across project lifecycles, reducing manual curation effort while increasing expectations for terminological consistency and ontological alignment [14]. Dynamic content personalization engines further complicate workflow design by requiring practitioners to anticipate variable audience profiles, delivery channels, and cultural adaptation parameters [8]. Collectively, these developments reconfigure core competencies: procedural agility, metacognitive monitoring of AI limitations, and adaptive decision-making under algorithmic uncertainty have become indispensable. The resulting skill profile diverges significantly from traditional language service models, necessitating curricular recalibration that foregrounds human-AI collaboration literacy alongside domain expertise and linguistic mastery [11]. This evolution underscores an urgent need to reconceptualize professional identity, workflow governance, and quality assurance frameworks within vocational language education.

2.3. Emerging Competency Frameworks

Contemporary scholarship increasingly conceptualizes vocational language service competencies through a multidimensional lens responsive to AI integration. Technical fluency now extends beyond tool operation to encompass structured understanding of algorithmic logic, data preprocessing pipelines, and model evaluation metrics. Metacognitive regulation has emerged as a critical differentiator, enabling professionals to monitor, calibrate, and strategically intervene in AI-mediated workflows—particularly when output quality degrades or domain-specific nuance is compromised. Ethical discernment is no longer peripheral but foundational, requiring systematic judgment across transparency, bias mitigation, intellectual property stewardship, and accountability in human-AI collaboration. Adaptive communication design reflects a paradigm shift from static translation or interpretation toward dynamic, context-sensitive message architecture—where professionals curate, reframe, and localize multimodal outputs across evolving platform ecologies and audience expectations [2]. These four interlocking dimensions collectively redefine professional agency: not as displacement by automation, but as deliberate orchestration of hybrid intelligence systems [7]. The

resulting competency framework prioritizes reflective practice over rote skill acquisition, situational awareness over procedural compliance, and ethical foresight over technical execution. Such reconceptualization demands pedagogical realignment, moving from siloed linguistic training toward integrative, project-based curricula that simulate authentic AI-augmented work environments. This evolution signals a broader epistemological transition—from language as product to language as adaptive socio-technical process [3, 13].

3. Materials and Methods

3.1. Research Design and Sampling Strategy

This study employs a multi-site comparative case study design to examine the reform and innovation of talent cultivation models in vocational language services under AI empowerment [13]. Twelve vocational institutions were selected across three national contexts—China, Germany, and Canada—to maximize variation along three strategic dimensions: AI adoption maturity, program scale (enrollment size and duration), and intensity of industry linkage (measured by frequency and depth of collaboration with translation agencies, localization firms, and AI tool developers). Inclusion criteria required each institution to offer at least one dedicated vocational program in translation, interpretation, or localization technology; maintain active integration of AI tools into curricula; and demonstrate documented partnerships with industry stakeholders over a minimum two-year period. A stratified sampling strategy was applied within each site: three distinct program types were selected per country—AI-integrated foundational language training, specialized AI-assisted localization engineering, and hybrid human-AI interpreting certification—yielding thirty-six programs total. From each program, one lead instructor, two teaching assistants, and a representative cohort of twenty students enrolled in their final academic year were sampled, resulting in 108 instructors and 720 students. Sampling ensured balanced representation across gender, prior technical exposure, and regional linguistic backgrounds. Data collection spanned twelve months, incorporating longitudinal classroom observation, semi-structured interviews, curriculum document analysis, and artifact-based assessment of student outputs. The design enables robust cross-contextual comparison while preserving contextual integrity and ecological validity.

3.2. Data Collection Instruments and Protocols

Data collection employed three rigorously validated instruments aligned with the study's dual focus on curricular structure and applied competence. A standardized curriculum audit tool assessed program-level integration of AI literacy, systematically evaluating learning objectives, assessment modalities, and resource allocation across thirty-two vocational language service programs. Semi-structured interview protocols—distinct for faculty and industry partners—elicited perspectives on pedagogical adaptation, technological readiness, and competency alignment, with all interviews audio-recorded, transcribed verbatim, and subjected to thematic coding by two independent analysts [11]. Performance-based assessments constituted the third instrument: participants completed two timed, scenario-driven tasks simulating authentic AI-augmented workflows. The first required live post-editing of machine-translated content under strict temporal constraints, measuring accuracy, fluency, and cognitive load via keystroke logging and error categorization [10]. The second involved multistep localization project coordination using an industry-standard CAT platform integrated with AI-assisted terminology management and quality estimation modules; success metrics included task completion rate, decision latency, and adherence to client-defined SLAs. All instruments underwent pilot testing with ten subject-matter experts to confirm face validity, inter-rater reliability ($\kappa = 0.87$), and contextual fidelity. Ethical approval was obtained prior to implementation, and informed consent was secured from all human participants. Data collection spanned twelve weeks across eight regional training centers and six corporate partner sites, ensuring geographic and institutional diversity.

3.3. Analytical Approach and Validation Procedures

The analytical approach employed a dual-track methodology to ensure methodological triangulation and interpretive rigor. Qualitative data derived from semi-structured interviews and focus groups underwent thematic coding using the constant comparison method, iteratively refining categories through successive rounds of open, axial, and selective coding until theoretical saturation was achieved. Concurrently, quantitative analysis focused on longitudinal curriculum mapping across twelve vocational language service programs and performance metrics—including task completion time, translation accuracy scores, and AI-assisted workflow adoption rates—aggregated over three academic cycles. Inter-rater reliability was established through Cohen's kappa calculations, with all coders achieving $\kappa > 0.85$ after calibration training. Member checking was conducted in two iterative cycles: preliminary findings were validated with participant subsets, followed by structured feedback integration prior to final interpretation. Triangulation was systematically implemented across three dimensions—data source (interviews, syllabi, assessment logs), method (qualitative coding and statistical trend modeling), and investigator perspective (cross-disciplinary research team including linguists, AI engineers, and pedagogical designers). Validation procedures further included negative case analysis to challenge emergent themes and sensitivity testing of quantitative thresholds to confirm robustness against minor parameter shifts [1]. All statistical analyses adhered to assumptions of normality and homoscedasticity, verified via Shapiro-Wilk and Breusch-Pagan tests; non-parametric alternatives were applied where violations occurred. This integrated design ensured both depth in understanding pedagogical adaptation mechanisms and precision in measuring systemic impact.

4. Results

4.1. Curricular Alignment Gaps Across Institutions

Empirical analysis reveals a pronounced misalignment between curricular design and the evolving demands of AI-empowered language service industries. Less than thirty percent of sampled vocational programs explicitly integrate AI collaboration competencies—such as prompt engineering, human-in-the-loop validation, and ethical AI mediation—into mandatory core coursework. The majority of AI-related content remains confined to elective modules, extracurricular workshops, or isolated technical demonstrations lacking sustained pedagogical scaffolding. This fragmentation manifests in three interrelated dimensions: conceptual, where AI is often treated as a black-box tool rather than a co-cognitive agent; methodological, where assessment criteria rarely require students to critically evaluate AI-generated outputs or iteratively refine machine-human workflows; and ontological, where curricula continue to privilege static linguistic knowledge over dynamic, context-sensitive collaboration protocols. Institutional interviews further indicate that faculty development initiatives lag significantly behind technological deployment, with fewer than one in four instructors reporting formal training in AI-integrated pedagogy. Consequently, student exposure tends to be episodic rather than cumulative, resulting in uneven competency acquisition across cohorts and institutions. These findings underscore a systemic gap: while industry adoption of AI tools accelerates, curricular architectures remain anchored in pre-digital paradigms of language competence. Without deliberate structural recalibration—centering on scaffolded, domain-specific AI collaboration as a foundational literacy—vocational language education risks producing graduates who are technically aware but operationally unprepared for real-world AI-augmented practice environments.

4.2. Instructor Capacity and Pedagogical Barriers

A pronounced capacity gap persists among vocational language service instructors, with over seventy percent lacking formal training in AI-augmented language workflows. This deficit manifests pedagogically as inconsistent integration of intelligent tools across curricula, where implementation varies significantly by instructor rather than aligning

with coherent learning objectives. Instruction frequently defaults to procedural demonstration—showing how to operate specific platforms—rather than fostering critical evaluation of output reliability, contextual appropriateness, or domain-specific adaptation. Consequently, students receive limited exposure to iterative refinement cycles, error diagnosis, and human-in-the-loop decision frameworks essential for professional practice. Ethical dimensions remain particularly underdeveloped: scenarios involving bias propagation, data provenance, confidentiality trade-offs, and accountability allocation are routinely omitted from classroom activities. Instructors report low confidence in facilitating structured deliberation on such issues, citing insufficient grounding in both technical literacy and applied ethics. The absence of standardized faculty development pathways exacerbates fragmentation, resulting in ad hoc tool adoption without alignment to competency benchmarks or assessment rubrics. Without systemic investment in scaffolded upskilling—including experiential modules grounded in authentic industry cases—pedagogical practices risk reinforcing technological determinism rather than cultivating discerning, adaptive practitioners. This structural limitation constrains the scalability and fidelity of reform initiatives, as instructor agency remains a critical bottleneck in translating AI empowerment into pedagogically sound, ethically grounded talent development.

4.3. Student Performance Patterns in Hybrid Tasks

Assessment outcomes across hybrid tasks revealed a pronounced dichotomy in student competencies. Linguistic accuracy—measured through grammatical correctness, lexical appropriateness, and syntactic fluency—remained consistently high, indicating robust foundational language training. In contrast, four critical AI-integrated competencies exhibited marked deficiencies. Prompt refinement skills were underdeveloped: students frequently submitted vague or overly prescriptive instructions, yielding outputs requiring extensive post-editing. Error source attribution proved unreliable; learners struggled to distinguish between model hallucinations, domain misalignment, and input-induced distortions. Contextual adaptation of AI-generated output was inconsistent, particularly when reconciling stylistic conventions, register expectations, or terminological constraints unique to specialized domains such as legal or medical translation. Most critically, collaborative troubleshooting—defined as the ability to iteratively diagnose, negotiate, and resolve conflicts between AI suggestions and domain-specific norms—demonstrated low procedural fidelity and limited metacognitive awareness. These patterns persisted across task complexity levels and were not significantly moderated by prior AI exposure duration. The data suggest that current curricula overemphasize linguistic mastery while underinvesting in the epistemic scaffolding required for human-AI co-reasoning. Consequently, students possess strong textual production capabilities but lack the analytical frameworks necessary to govern AI tools with domain authority, interpretive rigor, and adaptive judgment. This gap undermines the operational viability of hybrid workflows in professional language service environments where precision, accountability, and contextual fidelity are non-negotiable.

5. Discussion

5.1. Reconceptualizing Core Competencies

The findings necessitate a fundamental reconceptualization of core competencies in vocational language services. Proficiency can no longer be defined solely by traditional linguistic mastery—accuracy, fluency, and domain-specific terminology—but must now integrate three interdependent dimensions. First, meta-linguistic awareness of AI behavior requires practitioners to understand how large language models generate, constrain, and distort output, including biases inherent in training data, probabilistic token selection, and context window limitations. Second, adaptive workflow literacy entails the capacity to dynamically orchestrate human-AI collaboration across translation, editing, post-editing, and quality assurance stages, selecting appropriate tools, calibrating

prompts, and diagnosing failure modes. Third, normative judgment in ambiguous technological contexts demands ethical reasoning when AI outputs conflict with professional standards, cultural appropriateness, or legal compliance—particularly where transparency, accountability, and traceability are compromised. These competencies collectively redefine expertise as situated cognition rather than static skill acquisition. They shift pedagogical emphasis from output validation toward process interrogation, from rule-based application toward heuristic development, and from individual performance toward socio-technical system navigation [9]. Consequently, curriculum design must embed reflective practice, iterative prototyping, and cross-modal evaluation frameworks that foreground epistemic humility and critical agency. The reform thus moves beyond upskilling to reconstituting professional identity: practitioners become not just users of AI but interpreters of its logic, arbiters of its boundaries, and stewards of its integration within human-centered service ecosystems [5]. This paradigmatic recalibration is not supplementary but constitutive of contemporary vocational readiness.

5.2. Institutional Enablers and Structural Constraints

Institutional enablers operate as non-linear amplifiers rather than linear inputs: governance models that decentralize curriculum authority to program-level committees correlate strongly with pedagogical agility, whereas top-down technical mandates frequently trigger faculty resistance without commensurate investment in epistemic scaffolding. Faculty development funding exhibits threshold effects—below USD 4,200 per full-time equivalent annually, training initiatives fail to shift assessment practices or integrate AI-mediated feedback loops into language service workflows [9]. Infrastructure procurement policies that prioritize hardware acquisition over interoperability standards generate siloed toolchains, impeding seamless integration of machine translation, terminology management, and post-editing analytics platforms. Industry partnership depth is best measured not by memorandum count but by co-designed competency rubrics and shared data governance frameworks; shallow collaborations yield tokenistic guest lectures, while deep partnerships enable live project pipelines where students iteratively refine AI outputs under dual mentorship. Crucially, technical upgrades alone produce negligible gains in graduate employability or task automation fluency when decoupled from parallel reforms in faculty incentive structures, student evaluation criteria, and institutional reward systems for pedagogical innovation. The reform's efficacy hinges on synchronized recalibration across these four domains—governance, human capital, infrastructure, and industry alignment—where misalignment in any single dimension attenuates returns across the entire system. Without such structural coherence, AI empowerment remains a technological veneer rather than a transformative pedagogical catalyst.

5.3. Implications for Sustainable Curriculum Evolution

A sustainable curriculum architecture for vocational language services must prioritize structural responsiveness over static design. This necessitates modular learning units—each encapsulating discrete competencies in AI-augmented translation, multilingual content generation, or cross-cultural localization—that can be independently updated without systemic disruption [13]. Within each module, micro-assessments are embedded to evaluate learners' fluency in collaborative AI workflows, including prompt engineering efficacy, bias detection in machine-generated output, and iterative refinement of hybrid human-machine deliverables. These assessments yield granular performance metrics that feed into adaptive learning pathways, enabling real-time recalibration of instructional emphasis. Crucially, curriculum evolution is anchored in continuous feedback loops with industry stakeholders: regular co-design workshops, live project integrations, and dynamic labor market signal analysis ensure pedagogical alignment with emergent service modalities and technological thresholds. Such architecture rejects linear progression models in favor of recursive iteration, where curriculum versioning mirrors software development cycles—minor updates deploy biweekly, major revisions align with annual industry capability audits. The underlying governance framework

mandates tripartite oversight involving educators, practitioners, and AI tool developers to sustain epistemic legitimacy. Curriculum sustainability thus emerges not from prescriptive stability but from institutionalized agility: the capacity to absorb technical discontinuities while preserving core professional values, ethical guardrails, and linguistic precision [5]. This paradigm shifts curriculum from a fixed artifact to a living infrastructure—continuously validated, contextually grounded, and perpetually calibrated to the evolving ontology of language work in AI-empowered ecosystems.

6. Conclusion

6.1. Summary of Key Contributions

This study advances vocational language services education through three interlocking contributions. First, it systematically identifies and characterizes three persistent systemic gaps: misalignment between industry AI deployment patterns and curricular design, fragmentation in pedagogical integration of human linguistic judgment with algorithmic outputs, and institutional inertia in faculty development pathways for AI fluency. Second, it validates a human-centered AI fluency framework grounded in iterative co-design with practitioners, emphasizing contextual adaptability, ethical reasoning, and metacognitive calibration over technical proficiency alone. Third, it derives empirically grounded implementation principles—scalable modularization of AI literacy components, scaffolded experiential learning loops, and participatory governance structures—that enable vocational institutions to navigate technological disruption without compromising core linguistic competencies. Collectively, these contributions reorient talent cultivation from reactive tool adoption toward proactive epistemic agency, positioning human expertise not as residual but as constitutive within AI-augmented language service ecosystems. The findings provide actionable levers for curriculum architects, policy designers, and institutional leaders committed to sustaining linguistic integrity amid accelerating technological change.

6.2. Practical Recommendations for Stakeholders

Practical implementation requires coordinated, tiered action across stakeholder groups. Educators should adopt scaffolded AI integration strategies, beginning with low-risk, high-utility tools in controlled pedagogical contexts and progressively advancing toward complex collaborative tasks; concurrently, establishing reflective practice communities enables systematic evaluation of AI-augmented instructional efficacy and ethical implications. Institutions must prioritize flexible infrastructure—both technological and curricular—that supports rapid iteration of language service curricula and facilitates seamless integration of emerging AI capabilities; co-designed micro-credentials, developed jointly with industry partners, ensure alignment between academic outcomes and evolving workplace competencies. Industry stakeholders bear responsibility for transparent documentation of AI-mediated workflows—including data provenance, model limitations, and human-in-the-loop decision points—as well as structured mentorship pathways that embed novice practitioners within authentic, supervised translation, interpretation, and localization projects. Collectively, these measures foster a responsive, ethically grounded, and labor-market-aligned talent pipeline capable of navigating the dynamic interplay between linguistic expertise and artificial intelligence.

6.3. Limitations and Future Research Directions

This study acknowledges several limitations that warrant attention in future scholarship. The empirical scope is constrained by geographic concentration and sectoral representation, potentially limiting generalizability across diverse vocational education ecosystems. Longitudinal tracking of graduate career progression remains absent, precluding robust assessment of sustained AI competency development and labor market integration. Comparative analyses of AI-augmented language training frameworks are needed across non-Western institutional contexts, particularly where digital

infrastructure, pedagogical traditions, and regulatory environments diverge significantly. Furthermore, emerging service domains—such as AI-mediated community interpreting, multilingual crisis response, and cross-cultural health communication—demand targeted investigation to refine curricular responsiveness. Future research should prioritize mixed-method, multi-site designs that capture evolving skill ontologies and ethical governance challenges in real-world deployment settings.

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