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Multimodal LLM-Driven Collaborative Education between Vocational Undergraduate Foreign Language Education and the Ceramic Culture Industry

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Abstract: *The convergence of artificial intelligence, educational digitalization, and cultural-industrial transformation is reshaping talent cultivation in vocational higher education. Under these conditions, vocational undergraduate foreign language education can no longer remain confined to general language instruction or discrete skills training; it must respond more directly to regional industrial upgrading, cultural internationalization, and students' future professional adaptability. Focusing on Jingdezhen's ceramic cultural industry, this paper develops a conceptual framework for embedding multimodal large language models (MLLMs) into collaborative education. Drawing on sociocultural mediation, situated learning, multimodality, collaborative governance, and vocational education scholarship, the paper argues that MLLMs should be understood not merely as instructional tools or writing assistants, but as mediating infrastructures that connect curriculum, pedagogy, authentic industrial scenarios, multimodal resources, and the global communication of local culture. The paper proposes a four-dimensional model composed of value orientation, capability architecture, collaborative mechanism, and implementation pathways. It further explains how these dimensions interact through curriculum reconstruction, scenario-based pedagogy, localized resource development, dual-competence faculty construction, performance-oriented assessment, and ethics-based governance. The study contributes to current discussions on the educational implications of MLLMs, the reform of vocational undergraduate foreign language education, and the role of education in supporting culturally distinctive regional industries.*

Keywords: *multimodal large language models; vocational undergraduate education; foreign language education; ceramic cultural industry; collaborative education*

1. Introduction

Artificial intelligence has moved from being a supplementary educational technology to becoming a structural force in the reorganization of teaching, learning, curriculum, and governance. For vocational undergraduate education, this shift is especially significant because such education is expected to combine the employment orientation of vocational training with the broader analytical, developmental, and innovative capacities associated with undergraduate study. This dual expectation places new demands on curriculum design, pedagogy, and talent cultivation.

Foreign language education within vocational undergraduate institutions faces a particularly acute version of this challenge. In many programs, teaching still relies on textbook-centered input, fragmented language-skills training, and examination-oriented practice. Although such approaches may help students acquire basic linguistic competence, they are often insufficient for preparing learners for authentic communication in trade, tourism, exhibitions, cultural interpretation, digital media, and cross-border interaction. In regions whose pillar industries are closely tied to international exchange, foreign language competence is no longer only a disciplinary outcome; it is also a practical capability with direct relevance to regional development.

Jingdezhen provides a particularly revealing case. Recent reporting from Xinhua shows that AI-

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powered sales systems, multilingual short-video generation, and digital exhibition tools are already being used in the city's ceramic sector, indicating that Jingdezhen's industrial ecology is being reshaped by the convergence of tradition and intelligent technology [1]. The Jingdezhen Monitoring Report 2022 likewise emphasizes the city's efforts to promote ceramic culture through international exchange, cross-sector integration, and the combination of ceramic culture, tourism, and personalized experience, showing that the ceramic industry increasingly operates as both a heritage domain and a globally communicable creative industry [2].

These transformations create demand for bilingual communicators, intercultural mediators, exhibition interpreters, museum explainers, tourism service personnel, and digital content producers who can translate local cultural symbols into forms intelligible to global audiences. Yet foreign language education often remains insufficiently connected to these communicative ecologies. Students may acquire vocabulary and grammar, but still struggle to explain glaze techniques, narrate symbolic meanings, interpret workshop processes, or adapt discourse for buyers, tourists, curators, and online audiences.

Against this background, this paper argues that MLLMs create new conditions for reconstructing vocational undergraduate foreign language education as a multimodally mediated, industry-embedded, and culturally grounded collaborative education system. It addresses three questions: Why is a new collaborative model needed? What theoretical logic can support its construction? And what core dimensions and implementation pathways should define an MLLM-driven model?

2. Literature Review

2.1 From text-based large language models to multimodal large language models

The development of large language models marked a major shift in AI by enabling systems to generate coherent text, answer questions, summarize information, and support conversational interaction at scale. More recent research has moved toward multimodal systems able to process images, document layouts, charts, and other non-textual forms of information. In domains where professional competence depends on the interpretation of images, artifacts, layouts, and situated visual cues, MLLMs create the possibility of a richer relation between representation and meaning-making [3].

From an educational-design perspective, the move from text-only LLMs to MLLMs can be understood as a shift from linguistic assistance toward semiotic mediation. A multimodal model can participate in artifact interpretation, visual comparison, document explanation, and audience-specific description grounded in visual input, thereby enlarging the repertoire of pedagogically meaningful activity.

2.2 MLLMs in education: empirical promise and pedagogical tension

Research on AI in education has expanded rapidly. Shahzad et al. show that LLMs are being used for tutoring, feedback generation, resource production, personalized support, and teacher assistance, while also raising concerns about hallucination, bias, privacy, overreliance, and academic integrity [4]. The implication is that AI adoption does not generate pedagogical value by itself; its significance depends on how AI is embedded in curriculum, assessment, reflection, and governance.

MLLMs intensify this tension. They make it easier to design multimodal and resource-rich tasks, but the fluency of their outputs may also conceal inaccuracies and reduce learners' incentive to observe carefully, verify claims, and construct original discourse. Educational use therefore requires a double movement: expanding the range of possible tasks while strengthening verification, reflection, and human judgement [4].

2.3 Vocational undergraduate foreign language education as professional communication education

Vocational foreign language education has long been positioned between basic language competence and occupational responsiveness. In practice, many programs still rely heavily on generalized language instruction. Such approaches remain useful, but they are insufficient for preparing students for communication in trade, tourism, exhibition, museum interpretation, livestreaming, and service interaction. For vocational undergraduate programs, the challenge is sharper because students are expected not only to be job-ready, but also to demonstrate interdisciplinary adaptability, applied

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problem-solving, and innovative capacity.

This implies that foreign language education must be reconstructed as a form of professional communication education. Its task is no longer simply to teach language forms, but to help students mediate among artifacts, work tasks, audiences, and cultural meanings. Billett argues that vocational learning must be understood in relation to occupational practices and the social organization of participation [5]. In a ceramic-industry region, foreign language competence is therefore a situated capability formed through repeated engagement with exhibition reception, product explanation, tourism narration, and intercultural exchange.

2.4 The ceramic cultural industry as a multimodal communication ecology

The ceramic cultural industry is simultaneously material, visual, procedural, aesthetic, narrative, and commercial. The Jingdezhen Monitoring Report 2022 highlights both the city's historical legacy and its contemporary role in cultural exchange and creative-city development [6]. Recent reporting also shows that AI and digital tools are being incorporated into ceramic promotion and multilingual dissemination [2].

From an educational perspective, the decisive point is that ceramic communication is intrinsically multimodal. To communicate effectively about ceramics, one must describe forms, patterns, colors, firing techniques, symbolic meanings, workshop processes, spatial display, and audience experience. Meaning emerges through the interaction of text, image, object, gesture, sound, layout, and context. Nielsen and Yeo note that contemporary meaning-making is fundamentally multimodal [7]. Ceramic-industry communication is a particularly vivid example of this principle.

2.5 Research gap

Existing literature reveals four major gaps: the pedagogical role of MLLMs in vocational foreign language education remains under-theorized; foreign language education is often peripheral in industry-education discussions; research on the ceramic industry rarely asks how education can cultivate the communicative capacities these developments require; and much work on AI in education remains abstract rather than locally grounded. This paper addresses these gaps by linking MLLMs, vocational undergraduate foreign language education, and the ceramic cultural industry within one collaborative model.

3. Theoretical Framework

3.1 Sociocultural mediation

From a sociocultural perspective, learning is mediated by tools, signs, and social interaction rather than occurring as isolated internal acquisition. Alkhudiry emphasizes that tools do not merely assist cognition; they reorganize it [8]. In this study, MLLMs are conceptualized as mediating artifacts that shape how learners observe ceramic objects, interpret visual cues, formulate explanations, revise discourse, and coordinate communication tasks.

This perspective matters because it shows that the educational value of MLLMs cannot be measured only in terms of efficiency. If a tool reorganizes what learners attend to, how they compare evidence, and how they revise expression, then its significance is cognitive and social rather than merely procedural. It also clarifies why teacher design remains central: a mediating artifact becomes educationally meaningful only when inserted into a structured activity system with clear tasks, supports, and criteria.

Cong-Lem's account of cultural-historical activity theory further directs attention to the relations among subject, object, mediating artifacts, rules, division of labour, and community [9]. In an MLLM-supported classroom, the learner is not simply interacting with a tool, but participating in a wider activity system involving curriculum goals, cultural norms, assessment expectations, peers, teachers, and external partners.

3.2 Situated learning

Situated learning theory argues that competence develops through participation in meaningful social

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practices rather than through decontextualized transfer alone. Lave and Wenger show that learning is deeply bound up with authentic activity and communities of practice [10]. For vocational foreign language education, this means communicative competence is best developed when students engage with recognizable professional situations such as buyer consultation, museum explanation, exhibition reception, ceramic tourism narration, and product promotion.

This perspective challenges the assumption that students can first learn "general English" and only later apply it to professional settings. Much professional language competence is inseparable from contextual knowledge, genre expectations, and forms of participation. Learners develop new ways of describing, persuading, explaining, and interpreting through situated tasks; at the same time, they begin to inhabit the identity of professional communicators and cultural mediators.

3.3 Multimodality

Multimodality theory explains why ceramic communication cannot be reduced to verbal competence alone. Meaning is produced through the interaction of image, materiality, layout, gesture, sound, and spatial organization [11]. Ceramic artifacts themselves are meaning-bearing objects, while catalogues, museum displays, livestreams, e-commerce pages, and short videos further distribute meaning across multiple semiotic modes.

The pedagogical implications are substantial. Learners need to notice visual details, connect verbal explanation with material features, coordinate oral description with visual design, and adjust discourse according to whether the communicative setting is face-to-face, document-based, platform-based, or video-based. MLLMs matter here because they can mediate across modes: they can parse a product page, compare vessel forms, assist in describing glaze patterns, or help students revise bilingual scripts after examining image sequences.

3.4 Collaborative governance

Collaborative governance highlights that vocational talent cultivation depends on coordinated participation by schools, enterprises, cultural institutions, and increasingly technology actors. In ceramic-industry settings, schools alone cannot provide all the scenarios, artifacts, standards, and evaluative perspectives required for high-quality professional communication training. The governance perspective therefore explains why otherwise promising reforms often remain fragmented.

3.5 Integrated analytical logic

These four perspectives are mutually reinforcing. Sociocultural mediation clarifies the role of MLLMs as mediating artifacts. Situated learning clarifies why authentic scenarios matter for competence formation. Multimodality clarifies the semiotic complexity of ceramic communication. Collaborative governance clarifies the institutional arrangements required to sustain reform. Taken together, they allow the paper to move from a technological description of MLLMs to an educational theory of MLLM-driven collaborative cultivation, as show in Figure 1

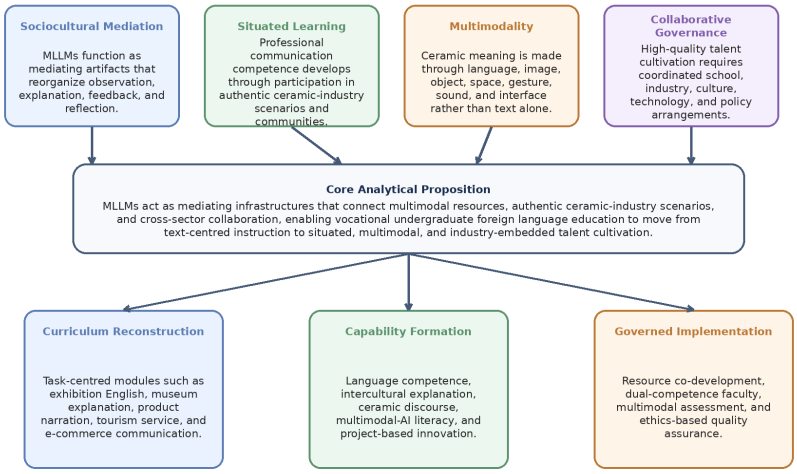

Figure 1. Theoretical framework for MLLM-driven collaborative education

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4. The Rationale for Establishing a New Collaborative Education Model

4.1 Structural mismatch between educational supply and industrial demand

A new model is needed because the gap between conventional foreign language education and the ceramic cultural industry is widening. The industry increasingly requires bilingual communicators, intercultural mediators, product narrators, exhibition assistants, museum explainers, tourism interpreters, and digital content producers. Yet many curricula remain organized around decontextualized language points and generalized communication themes. In Jingdezhen, where ceramics function simultaneously as heritage, industry, tourism resource, and creative economy, this mismatch weakens both student employability and regional communicative capacity [2,6].

The problem is not merely that students need more vocabulary or more speaking practice. Rather, the classroom often lacks the genres, tasks, audiences, and multimodal materials that characterize actual communication in ceramic-industry settings. What the industry needs is interpretive flexibility and audience-sensitive communication; what the classroom often provides is fragmented training detached from object, place, and purpose.

4.2 Limits of text-centred pedagogy

A second reason lies in the limitations of text-centred pedagogy. Ceramic culture is visual, material, and procedural. Students must learn to observe glazes, decorative patterns, vessel types, firing traces, workshop processes, and exhibition layouts; they must compare meanings, explain procedures, and adapt discourse to different audiences. Static textbooks and purely textual exercises can simulate only a small portion of these demands. By contrast, MLLMs make it possible to analyze images, annotate artifacts, compare objects, generate audience-specific descriptions, and support iterative multimodal revision.

4.3 Integrating AI literacy with professional communication

A third reason concerns the changing profile of professional competence. As AI becomes increasingly present in education and work, graduates need more than language proficiency; they also need the ability to use AI critically, ethically, and effectively within communication tasks. In vocational foreign language education, this means students should learn how to prompt, verify, revise, and evaluate AI-supported outputs rather than treating machine-generated discourse as automatically reliable [4].

4.4 Supporting cultural internationalization

A fourth reason is that foreign language education in ceramic regions also has a strategic cultural function. Ceramic culture is one of China's most recognizable global cultural symbols, but its international communication depends not only on institutional diplomacy or mass media. It also depends on professionals who can interpret artifacts, narrate traditions, support exhibitions, communicate with overseas buyers, and present regional culture in accessible and credible ways [12].

4.5 The Superiority of Collaboration Over Isolated Course Reform

This transformation cannot be achieved through isolated course reform alone. Without enterprise participation, students lack access to authentic communicative tasks; without cultural institutions, they lack historically grounded interpretive contexts; without governance support, cooperation remains unstable; and without intelligent platforms, the multimodal affordances of contemporary communication remain underused. The issue, therefore, is not only how a single course should be improved, but how an entire ecology of teaching, scenario access, resource construction, evaluation, and governance should be reorganized.

5. Model Construction: An MLLM-Driven Collaborative Education Framework

5.1 Overall structure

This paper proposes a four-dimensional model composed of value orientation, capability

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architecture, collaborative mechanism, and implementation pathways. The first dimension identifies the normative direction of reform; the second defines the target learner profile; the third specifies the institutional ecology required to sustain the reform; and the fourth translates the model into practice.

5.2 Value orientation

The first dimension concerns the normative logic of the model. It includes four orientations: cultural inheritance, language empowerment, industrial embedding, and digital-intelligent enhancement. Cultural inheritance means foreign language education should participate in preserving, reinterpreting, and communicating ceramic culture in contemporary contexts. Language empowerment means language is treated as an enabling resource for trade, tourism, branding, service, and intercultural communication. Industrial embedding means curriculum and student development should align with real communication tasks emerging from the ceramic industrial chain. Digital-intelligent enhancement means MLLMs and related AI tools should be integrated structurally into teaching and collaboration while remaining under ethical and pedagogical governance.

5.3 Capability architecture

The second dimension specifies the target learner profile. The model aims to cultivate five interrelated competences: linguistic competence; intercultural communicative competence; ceramic discourse competence; multimodal-AI literacy; and project-based innovation competence. These competences should not be taught as isolated modules. A bilingual museum-guide project, for example, requires linguistic competence, intercultural explanation, ceramic discourse knowledge, multimodal design, responsible AI support, and collaborative project management. The architecture therefore describes an integrated competence profile rather than a checklist of separate outcomes.

5.4 Collaborative mechanism

The third dimension concerns the institutional ecology needed to sustain the model. Vocational undergraduate colleges are responsible for curriculum design, pedagogy, and academic governance. Ceramic enterprises provide products, workplace discourse, trade scenarios, and external evaluation. Museums, heritage institutions, and exhibition centers provide artifacts, interpretive narratives, and public communication spaces. Technology platforms provide MLLM-enabled support for multimodal analysis, content generation, and formative feedback. Local governance actors provide policy support, coordination, and funding that stabilize collaboration [7,8].

This mechanism performs three functions. First, it distributes resources. Second, it distributes authority, since industry and cultural institutions can validate authenticity while schools translate domain knowledge into pedagogy and assessment. Third, it distributes feedback, because external partners can comment on the usefulness, professionalism, and credibility of student performance.

5.5 Implementation pathways

The fourth dimension translates the model into practice through six interconnected pathways: curriculum reconstruction, scenario-based pedagogy, localized resource co-development, faculty development, assessment reform, and governance and ethics.

Curriculum reconstruction should organize courses around authentic ceramic communication tasks such as museum explanation, ceramic exhibition English, ceramic tourism service, product storytelling, and cross-border e-commerce communication. Scenario-based pedagogy should use MLLMs to scaffold image-based observation, artifact explanation, role-play dialogue, and genre adaptation. Resource co-development should create localized corpora of ceramic images, bilingual glossaries, process videos, guide scripts, product narratives, and case libraries. Faculty development should build dual-competence teams able to combine language pedagogy, ceramic-industry knowledge, and AI literacy.

Assessment should move beyond grammar-dominant testing and isolated oral performance. Appropriate forms may include bilingual product narration, museum-guide simulation, ceramic-brand storytelling portfolios, multimodal project reports, and external feedback from enterprises or cultural institutions. Rubrics should assess not only linguistic accuracy, but also cultural interpretation, audience adaptation, multimodal design, collaboration, and reflective AI use [13]. Because MLLMs are

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powerful but imperfect, governance and ethics must address transparency of AI use, plagiarism boundaries, fact-checking procedures, image and document rights, data privacy, and cultural accuracy [14]. As show in Table 1 and Figure 2

Table 1. Core dimensions and operational logic of the MLLM-driven collaborative education model

Dimension	Core focus	Educational function
Value orientation	Cultural inheritance; language empowerment; industrial embedding; digital-intelligent enhancement	Defines the normative direction of collaborative cultivation
Capability architecture	Language; intercultural communication; ceramic discourse; multimodal-AI literacy; project innovation	Specifies the target competence profile
Collaborative mechanism	College, enterprise, cultural institutions, technology platforms, local governance	Builds a cross-sector support ecology
Implementation pathways	Curriculum, scenarios, resources, faculty, assessment, ethics	Operationalizes the model in teaching practice

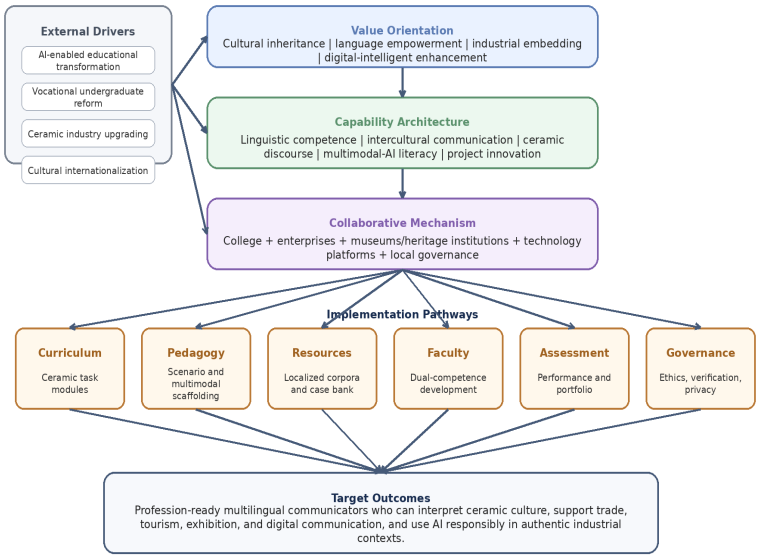

Figure 2. Detailed MLLM-driven collaborative education model

6. Discussion

6.1 Theoretical implications

This study makes several theoretical contributions. First, it reframes MLLMs as pedagogical mediators rather than generic productivity tools. In much current discourse, AI in education is treated mainly as a means of accelerating writing, simplifying instruction, or automating feedback. By contrast, this paper argues that in vocational cultural-industry settings, the more significant role of MLLMs is to mediate between artifacts, visual information, discourse, cultural meaning, and situated communication.

Second, the paper repositions vocational undergraduate foreign language education as a core component of industry-education integration. In many discussions, foreign language education is treated as auxiliary to "real" vocational subjects. This paper argues that in globally oriented cultural industries, language is itself a productive force because it enables trade, branding, tourism, exhibition, service, and cultural dissemination.

Third, the paper contributes to the theorization of multimodal vocational pedagogy. Ceramic communication makes visible a broader issue: many forms of professional communication are not purely textual. The integration of multimodality into foreign-language education is therefore not a superficial technological upgrade but a conceptual correction. Fourth, the paper contributes to regionally embedded educational innovation by showing how AI-supported reform can be anchored in

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local cultural and industrial conditions rather than treated as placeless technological universalism.

6.2 Practical implications

At the institutional level, the model offers vocational undergraduate colleges a pathway for repositioning foreign language education as a strategic rather than marginal component of talent cultivation. At the curriculum level, it provides a basis for reorganizing teaching around authentic communication tasks and multimodal resource ecologies. At the faculty level, it clarifies the need for new professional-development strategies that combine pedagogy, industry understanding, and AI competence. At the regional level, it offers a route by which educational institutions can contribute more directly to ceramic cultural communication, industrial upgrading, and international visibility.

The model also suggests a practical design principle: AI should amplify authenticity rather than replace it. The best use of MLLMs in this context is not to generate large amounts of generic language, but to support closer attention to authentic artifacts, scenarios, audiences, and purposes. When used in this way, AI deepens situated learning rather than bypassing it.

6.3 Risks and implementation challenges

Despite its promise, the model faces several challenges, including technological unevenness, epistemic reliability, institutional coordination, pedagogical balance, and cultural representation. These challenges should be treated as design constraints rather than reasons for rejection. The aim is not to build an AI-centered classroom, but a pedagogically governed collaborative ecology in which AI plays a bounded and accountable role.

6.4 Transferability and broader significance

Although the model is developed with Jingdezhen in mind, its logic may be transferable to other regionally distinctive cultural-industrial settings such as tea culture, textile heritage, traditional medicine communication, local museum interpretation, or craft-based tourism economies. What can travel from one region to another is not a ready-made curriculum, but an analytical structure: value orientation, capability architecture, collaborative mechanism, and implementation pathways.

7. Limitations and Future Research

This study is primarily a conceptual and model-building inquiry rather than an empirical intervention study. Its claims therefore require validation through classroom experimentation, fieldwork, and longitudinal program evaluation. In addition, although the analysis is grounded in Jingdezhen's ceramic cultural industry, the paper does not compare specific MLLM platforms in terms of performance, cost, accessibility, or governance burden. Future research may use design-based research, comparative pedagogy, and mixed-method evaluation to test the model across different modules, learner groups, and regional settings.

8. Conclusion

The transformation of vocational undergraduate foreign language education requires more than incremental curriculum adjustment. In regions where cultural industries are increasingly tied to global communication, digital media, tourism service, and industrial upgrading, foreign language education must be repositioned as a core mechanism of professional and cultural mediation. Jingdezhen's ceramic economy makes this need particularly visible [2,6].

MLLMs provide a new technological basis for this transformation because they allow educational interaction to extend beyond text into images, artifacts, layouts, and multimodal task ecologies. Yet their value depends on pedagogy, collaboration, and governance. The model proposed here therefore treats MLLMs as mediating infrastructures within an ecosystem composed of colleges, ceramic enterprises, cultural institutions, technology platforms, and regional governance actors. At the center of this ecosystem are five interrelated capacities: linguistic competence, intercultural communicative competence, ceramic discourse competence, multimodal-AI literacy, and project-based innovation competence.

ISSN 2663-8169 Vol. 8, Issue 2: 47-55, DOI: 10.25236/IJNDE.2026.080207

Ultimately, the significance of this model lies in connecting three transformations that are often discussed separately: the rise of multimodal AI, the reform of vocational undergraduate education, and the global-facing development of regional cultural industries. By bringing these together, the paper offers a conceptual basis for reimagining foreign-language education as a site where local culture becomes globally communicable, industrial needs become educationally meaningful, and AI becomes pedagogically productive without displacing human judgement.

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