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Advancing Multilingual Education with Artificial Intelligence: A Case Study on Spanish Language Education in Chinese Universities

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Abstract: While AI's impact on English education is well-documented, its role in Spanish language teaching remains understudied, despite Spanish being the world's second most spoken native language. This study explores Chinese university Spanish teachers' attitudes, usage, and AI literacy regarding Generative AI and Translation AI. Interviews with 13 teachers revealed Translation AI's greater influence, attributed to the prevalent Grammar Translation Method (GTM) in Spanish instruction, contrasting with English's Communicative Language Teaching (CLT) approach. To enhance AI integration, we propose a dual strategy: top-down institutional support (e.g., teaching grants) and bottom-up professional development using a Spanish-specific TPACK framework, bridging theory and practice in Chinese universities.

Keywords: Spanish as a foreign language; multilingual AI integration; language teaching innovation; pedagogical methodologies

1. Introduction

Teaching Spanish presents cognitive challenges compared to English due to its faster syllable rate (7.82 vs. 6.19 syllables per second) and lower information density (0.63 vs. 0.91 units per second) [1]. These factors, combined with gendered nouns, complex verb conjugations, and regional variations in syntax and pronunciation [2], demand more intensive practice for effective learning.

Spanish programs in Chinese universities aim for students to achieve C1 proficiency within four years, starting from level 0. This aggressive timeline contrasts with English programs, where students often begin with intermediate proficiency after years of prior learning. A search of the Web of Science using "AI + English language education" and "AI + Spanish language education" yielded 2771 and 119 results, respectively, with similar findings in the China National Knowledge Infrastructure (CNKI). This uneven distribution highlights a significant research gap in AI-assisted education for non-English languages, a point emphasized by Law and echoed by Yang and Li [3,4], whose study on ChatGPT found that 40 of 44 studies focused on English, with minimal attention given to other languages like Chinese and German. This uneven distribution may raise a question: How is AI-assisted non-English language education progressing?

In this study, AI refers to both Generative AI (GenAI) and Neural Machine Translation (NMT), which we refer to as translation AI. The following definitions were used: Generative AI (GenAI) is an artificial intelligence technology that automatically generates content in response to prompts written in natural-language conversational interfaces [5].

2. Literature Review

The linguistic features of Spanish present pedagogical challenges and require intensive practice due to aggressive learning timelines. In this context, similar to English, AI could profoundly impact language learning and teaching [6] with its affordances. AI enhances learning through tailored experiences, gamification, and self-regulated study [3,7,8], while aiding educators with lesson preparation, real-time feedback, and diverse teaching tools like pronunciation drills [9,10]. These innovations improve teaching efficiency and student outcomes. However, Spanish AI faces challenges, including a smaller training corpus [11], limited platforms [12,13], and language interference issues during Spanish-English interactions [14].

2.1. Spanish AI's Validity

Despite these limitations, Spanish AI performs nearly as well as English AI due to rich resources in both languages [15]. Vicente-Yagüe Jara et al. demonstrate ChatGPT's ability to aid writing and enhance students' verbal creativity [16]. Lindín further supports integrating AI in Spanish education, outlining usage strategies and emphasizing ethical considerations [17].

Huete-García and Tarp offer an empirical case study using ChatGPT in Spanish education [18]. By creating parallel corpora with correct and erroneous sentences, they show Spanish AI can simulate common learner mistakes. Pérez-Núñez presents a prompt engineering model with five steps: setting learning goals [19], creating tailored prompts, developing exercises, assessing work against standards, and providing feedback. This model generates prompts for tasks in interpretive, interpersonal, and presentational scenarios across listening, speaking, reading, and writing skills, aligned with academic goals. However, it's noteworthy that prompts were primarily generated in English, which may not align with the goal of Spanish language learning.

Current studies on AI in Spanish teaching don't emphasize specific differences between Spanish and English, treating Spanish as generically as English instruction. Moreover, the number of such studies is limited.

2.2. Teachers' AI Literacy

Since the release of ChatGPT in 2022, AI literacy studies have progressed from discussing general concepts to analyzing specific tools. Long and Magerko define AI literacy as a set of competencies that enable individuals to critically assess AI technologies [20], interact effectively with AI, and utilize AI tools in diverse contexts such as online, at home, or in professional settings. Ng et al. reviewed 30 articles on AI literacy and proposed a framework with four aspects: knowing and understanding AI [21]; using and applying AI; evaluating and creating with AI; and addressing ethical issues related to AI. Ma et al. elaborate on AI literacy [22], indicating that ChatGPT literacy involves: Understanding the benefits of using ChatGPT; recognizing its limitations and challenges; mastering prompt engineering; critically evaluating ChatGPT's responses; incorporating ChatGPT as an assessment tool, and addressing ethical concerns. Moorhouse et al. further detail necessary skills for English language teachers with the P-GenAI-C framework (professional competency in the GenAI world) [23], which includes: GenAI technological proficiency; pedagogical compatibility of GenAI in English teaching; professional work enhancement; understanding risks, well-being, and ethical use of GenAI, and preparing students for a GenAI-influenced world.

However, there's a lack of in-depth studies on AI in Spanish language learning and on Spanish teachers' perceptions of AI, especially among non-native teachers. Given the large number of Spanish learners in China and globally, and the widespread use of AI in education, it's essential to explore how Spanish teachers perceive and utilize AI in pedagogy. This study aims to address this gap by investigating the following research questions:

How do Spanish language teachers in Chinese universities perceive Spanish AI?

How do Spanish language teachers integrate Spanish AI tools in their teaching practices?

How do Spanish teachers build the necessary skills to use AI?

3. Methodology

This qualitative study explores Spanish language teachers' perceptions, usage, and AI literacy in Chinese universities. Semi-structured interviews with instructors from tier 1 and 2 cities were conducted in June 2024.

3.1. Research Context and Participants

Semi-structured interviews were conducted in June 2024 with Spanish instructors from 13 universities in tier 1 and 2 cities across China, including public, private, and joint-venture institutions. Participants specialized in Spanish majors, interdisciplinary programs, or minors, holding master's or doctoral degrees in fields like translation, linguistics, and literature. Their teaching experience ranged from 1 to 14 years, with a majority being female, reflecting the national gender distribution among Spanish instructors. All participants have signed consent forms and have been assigned pseudonyms (generated by AI). See Table 1 for a general profile of participants.

Table 1. Profile of participants.

Participant (pseudonym)	Gender	Age	Education	Teaching experience	Institution	Experience with Spanish AI	Location (North / South)	Teaching Focus
Amelia	F	37	PhD	12	Public	yes	Beijing (North)	academic
Charlotte	F	38	PhD	7	Public	yes	Shaanxi (North)	academic
Diana	F	38	Master	10	Public	yes	Zhejiang (South)	vocational training
Elizabeth	F	37	PhD	13	Public	yes	Sichuan (South)	academic
Fiona	F	38	Master	11	Private	yes	Guangdong (South)	academic
Grace	F	39	Master	10	Public	yes	Gansu (North)	academic
Victoria	F	37	Master	14	Joint Venture	yes	Jiangsu (South)	academic
Isabella	F	34	PhD	9	Public	yes	Beijing (North)	academic
Theodore	M	36	PhD	9	Public	yes	Zhejiang (South)	academic

Juliet	F	36	PhD	10	Public	yes	Beijing (North)	academic
Natalia	F	40	PhD	16	Public	No	Tianjin (North)	academic
Olivia	F	32	PhD	1	Private	yes	Zhejiang (South)	academic
Emily	F	38	PhD	8	Public	yes	Beijing (North)	academic

3.2. Data Collection and Analysis

Semi-structured interviews (46-63 minutes) conducted in Chinese via Tencent Meeting explored three research questions (Table 2). AI-generated transcripts were supplemented with recordings and analyzed using Braun & Clarke's [24] thematic analysis. A six-phase coding process included: familiarization with data; initial coding (AI attitudes, pedagogical impact, teacher AI literacy); theme refinement within Spanish teaching contexts; team consensus on findings; member checking, and final theme validation.

Table 2. Interview questions.

No.	Questions
1	Do you use AI technology to assist you in teaching Spanish?
2	If the answer is Yes, what specific AI tools do you use (ChatGPT, Kimi, Gamma, Kahoot, DeepL, iFLYTEK, or others, which are most frequently used in Mainland China)? How do you incorporate AI into your teaching practice?
3	If the answer is No, have you used AI tools in your normal life or in other things you do?
4	In your opinion, are AI technologies impacting or influencing traditional methods of teaching Spanish? And how?
5	What do you think are the strengths and limitations of AI tools in teaching Spanish?
6	Have you encountered any difficulties in using AI tools to assist your teaching? How did you solve them?
7	Do you think there will be AI integration in teaching Spanish in the future? What will be its trend?
8	How did you acquire AI information and skills?
9	What difficulties did you encounter in building these skills?
10	Have you received any training on how to use AI tools to assist your teaching? If yes, how has this training helped you in your teaching?
11	Is your university doing enough to train (Spanish) teachers to use AI tools?
12	Is there a need for other support (policy, funding) for Spanish teachers to improve their AI skills?
13	What skills support do you think is needed for Spanish teachers to effectively use AI tools?
14	What resources or platforms do you think would be most helpful for teachers to learn AI skills?

For triangulation, transcripts (anonymized and noise-reduced) were analyzed by ChatGPT and Kimi (prioritized for Chinese proficiency) using inductive coding prompts. Human-identified themes were fully subsumed within AI outputs, with high consistency between models.

4. Results

4.1. RQ1: How do Spanish Language Teachers in Chinese Universities Perceive Spanish AI?

Generative AI has minimal adoption in Spanish instruction at Chinese universities, contrasting its widespread use in English education. Key constraints include concerns over detectable AI reliance, beginner learners' need for internalized acquisition, and fears of eroded language authenticity affecting employability.

Translation tools (e.g., DeepL) are indispensable, yet often not perceived as AI. Accessibility issues (e.g., VPN restrictions for ChatGPT) and limited awareness of their AI basis contribute to this preference.

60% of educators cautiously endorse generative AI's long-term potential, while skeptics emphasize its inadequacy for nuanced cultural / linguistic tasks. Low student proficiency further reduces urgency for adoption.

The structural barriers encompass three interconnected challenges: unstable VPN connectivity and legal ambiguities restricting digital access, limited availability of Spanish-compatible platforms (e.g., Kimi), and systemic payment authorization failures for services like Deeply subscriptions. These technological, linguistic, and financial obstacles collectively hinder equitable access to digital resources in Spanish-speaking environments through compounded exclusionary effects.

These findings underscore the nuanced challenges and opportunities for integrating AI into Spanish language teaching in China.

4.2. RQ2: How do they Integrate AI into Spanish Teaching?

Generative AI remains marginal in Chinese university Spanish programs due to concerns over academic integrity, foundational learning needs, and employability impacts—contrasting with its broader English education applications. Translation tools dominate, though often unrecognized as AI. Educators exhibit polarized views: 60% cautiously accept generative AI's potential, while critics highlight its cultural-linguistic limitations. Structural barriers include VPN restrictions, limited Spanish-capable platforms, and payment accessibility issues.

1) Course preparation: High impact

Generative AI serves as a valuable assistant, aiding in exercise creation, textbook optimization (addressing cultural authenticity gaps), and visual content generation for MOOCs (e.g., Isabella's case). Tools like Kimi enhance material quality while saving time.

2) Assessment: Limited use in test generation

Limited current adoption, though potential exists for automated test generation (e.g., A/B versions) to reduce workload. Most use remains prospective, focused on formative assessments.

3) Assignments: Minimal impact with specific applications on pronunciation

Niche applications in pronunciation (e.g., iFlytek transcription) and self-assessment via AI comparisons. Broader implementation remains underdeveloped.

4) Intended Learning Outcomes: No more conjugation

Debated impact: Some (e.g., Fiona) suggest reduced emphasis on conjugation, while others (Natalia) stress maintaining proficiency standards to critically evaluate AI output.

5) Guide students to use AI: Cautious for beginners

Cautious adoption for beginners to prevent over-reliance, though recognition of inevitable AI integration. Discrepancy exists between instructor hesitancy and student adoption rates.

6) Generative AI in academic writing (Graduation Thesis): A unique threat

Graduation theses present unique challenges, with AI-generated content raising detection difficulties. Responses vary from penalties (Charlotte) to resubmission requests (Fiona), highlighting policy gaps.

These findings underscore generative AI's varied impacts on teaching, highlighting its potential while revealing challenges in assessments, student guidance, and academic integrity.

4.3. RQ3: How do Spanish Teachers Build the Necessary Skills to use AI?

While most Spanish instructors in China demonstrate limited engagement with generative AI due to insufficient training and institutional support, two distinct cases illustrate successful integration when proper conditions exist.

At a joint-venture university, Victoria's international curriculum and communicative teaching approach are enhanced through regular AI workshops and unrestricted access to tools like ChatGPT. She effectively incorporates CANVA for visual materials and Kahoot for gamified learning, noting her institution actively encourages such innovation. Similarly, Diana's vocational program showcases AI's potential for practical skill development. She leverages ChatGPT to: generate simplified business documents; update course content with current e-commerce applications; source Latin American market data-addressing previously unmet needs in her specialized curriculum.

These examples suggest that beyond the prevailing challenges of AI adoption, targeted institutional support and curriculum flexibility can enable meaningful technological integration in language education. The variance in adoption patterns highlights how structural factors mediate AI's educational potential.

Top-down AI literacy initiatives, exemplified by programs like the "101 Plans" and "Digital Education Special Action Plan", prioritize funding for AI-integrated curricula and academic-industry partnerships. These efforts link grant acquisition to faculty evaluation criteria, noted by Elizabeth to carry research-equivalent weight in assessments, thereby incentivizing institutional engagement and advancing technological competency through structured resource allocation.

Additional efforts include Theodore's anticipated university project for AI in Spanish instruction and Isabella's participation in the Ministry's "AI Plus Concept Mapping" initiative. Teaching competitions further incentivize innovation, offering mentorship opportunities for educators to develop AI-integrated lesson plans. As Elizabeth observes, such competitions demonstrate AI's growing role across disciplines while fostering pedagogical adaptation.

5. Discussion

5.1. RQ1 and 2: How do Spanish Teachers Perceive and Integrate AI into Spanish Language Teaching?

This study identifies limited generative AI integration in Chinese university Spanish programs, contrasting with its established role in English education. Instructors primarily employ AI for translation rather than content creation, reflecting distinct adoption patterns explained by the Technology Acceptance Model (TAM).

Cross-cultural comparisons reveal Chinese educators prioritize accessibility over perceived utility [25], unlike their U.S. counterparts [26]. VPN restrictions, platform limitations, and subscription barriers collectively inhibit adoption, suggesting implementation strategies must first address these fundamental accessibility challenges before pedagogical applications can be effectively pursued.

The limited adoption of generative AI in Spanish instruction reflects the dominance of the Grammar-Translation Method (GTM), which prioritizes translation skills over communicative competence. This pedagogical approach naturally favors translation AI tools, while rendering generative AI peripheral. In contrast, English language programs employing Communicative Language Teaching (CLT) demonstrate more extensive generative AI integration, highlighting how pedagogical frameworks shape technology adoption patterns.

Notably, exceptions emerge in international and vocational Spanish curricula, where generative AI has been successfully implemented to develop teaching materials and enhance interactivity. These cases mirror adoption levels seen in English programs, reinforcing the bidirectional relationship between pedagogical approaches and AI utilization. The findings suggest that curricular reforms emphasizing communicative competence may facilitate greater generative AI integration in Spanish language education.

The study reveals a significant disparity in generative AI integration between Spanish and English language education in China. Spanish instruction, predominantly rooted in the Grammar-Translation Method (GTM), demonstrates limited AI adoption primarily for basic course preparation and translation tasks. In contrast, English programs employing Communicative Language Teaching (CLT) showcase advanced applications including AI-assisted assessment design, VR / AR integration, and writing feedback systems. Notably, six key dimensions highlight this gap:

Course preparation: Spanish teachers utilize AI mainly for elementary exercises, while English educators employ AI for sophisticated curriculum customization;

Assessment innovation remains minimal in Spanish versus emerging AI literacy frameworks in English [27];

Assignment integration is restricted to speech recognition in Spanish, compared to critical thinking applications in English [28];

Learning outcomes in Spanish maintain traditional focus, whereas English incorporates AI collaboration competencies;

Student guidance in Spanish lacks systematic AI instruction, unlike structured approaches in English [29];

English educators actively employ AI with sophisticated prompt engineering and follow institutional guidelines for ethical use [27]. Conversely, Spanish instructors demonstrate ambivalent acceptance — recognizing student AI use but lacking systematic guidance — resulting in inconsistent oversight of AI-generated content.

The findings suggest that while Spanish's beginner-dominated context presents unique challenges, the pedagogical orientation (GTM vs CLT) significantly influences AI adoption patterns. A blended approach combining GTM's accuracy focus with CLT's communicative emphasis, supported by targeted AI literacy training, could facilitate more meaningful integration.

5.2. RQ3: How do Spanish Teachers Build the Necessary Skills to use AI?

5.2.1. Top-Down Approach: A Distinctive Path

Chinese Spanish teachers' limited AI literacy necessitates a structured top-down implementation strategy, contrasting with English education's organic bottom-up development. This approach leverages two key mechanisms: First, Teaching Development Grants serves as a strategic mechanism for AI integration in Chinese universities. Government-funded grants provide institutional incentives for AI integration, offering faculty collaboration opportunities with AI developers through scaffolded experiential learning. This formalized support system proves more effective than peer-based models for Spanish instruction in China's context. Second, Teaching Competitions. Competitions serve as catalysts for innovation, helping teachers gain promotions [30], providing resources (training, coaching, funding) and fostering interdisciplinary learning communities. Participants develop their Technological Pedagogical Content Knowledge (TPACK) through collaborative lesson design and reflection with STEM educators [31].

China's education system employs a top-down model for technological integration, characterized by centralized policy directives from the Ministry of Education that prioritize systemic implementation over individual teacher autonomy [32,33]. This approach contrasts with market-driven systems like Hong Kong's and has historically proven effective in adopting innovations such as blended learning [34,35].

The nationwide implementation of MOOCs exemplifies this model's efficacy. Initiated in 2013 through government-supported platforms and mandated by the 2015 Ministry policy, China's top-down strategy mobilized institutional stakeholders to develop structured implementation frameworks [36,37]. This coordinated effort among policy-makers, administrators, and pedagogical experts demonstrates how centralized systems can rapidly scale educational innovations through policy alignment and resource allocation.

5.2.2. Bottom-Up Approach: Professional Development

While top-down approaches establish essential infrastructure for AI adoption, effective implementation requires complementary bottom-up professional development initiatives that build practical competencies. Current generic workshops prove inadequate, whereas teacher-led programs centered on authentic applications demonstrate greater efficacy. Advanced peers who have successfully integrated AI can facilitate communities of practice, sharing concrete strategies for curriculum design, assessment creation, and pedagogical adaptation. Such collaborative environments enhance both AI literacy and self-efficacy through experiential learning and peer coaching.

Furthermore, university-industry partnerships can support discipline-specific professional development through a TPACK framework tailored to Spanish language education [38]. Unlike English-focused models, this Spanish TPACK adaptation accounts for unique linguistic and pedagogical requirements, as systematically compared in Table 3. These collaborative efforts bridge the gap between technological possibilities and classroom implementation while respecting disciplinary particularities.

Table 3. Spanish TPACK.

Comparison Aspect	Spanish AI TPACK	English AI TPACK
AI Limitations	TK: Select Spanish-capable AI with awareness of algorithmic bias TCK: Identify AI tools specific advantages for integration into Spanish teaching	No significant limitations
Teaching Methods	GTM-focused: PCK for written and oral translation exercises, flipped classroom, students' work to compare the translation results by several AI platforms	CLT-focused: PCK Chatbots for oral practice, generative AI for feedback on writing. Flipped classroom to practice speaking and presentation skills.
Content Focus	Trade / socioeconomics with AI generated regional content	Business / technical scenarios
Pronunciation	TPK: Speech recognition for trilled "r"	TPK: Fluency / accent modification
Language Variations	TCK: Address regional variations (e.g., vosotros / ustedes)	Focus on neutral English
Grammar Complexity	TPK: Conjugation / gender agreement exercises	TPK: Writing improvement
TPACK Development	Blended GTM / CLM with AI-adapted materials	AI-driven core skill resources

6. Conclusions

This study examines AI adoption in Spanish language education at Chinese universities, challenging prevailing assumptions about generative AI's transformative role. Findings reveal Spanish instructors predominantly utilize translation AI, reflecting their reliance on Grammar Translation Methods (GTM), while English educators employing Communicative Language Teaching (CLT) demonstrate greater generative AI integration. The research highlights how pedagogical approaches shape technology adoption rather than vice versa. Despite generative AI's potential, implementation remains limited in Spanish programs due to institutional and access barriers. The study proposes a dual implementation strategy combining China-specific top-down policy initiatives with bottom-up professional development, including a specialized Spanish AI TPACK framework addressing unique linguistic and pedagogical requirements often overlooked in English-centric discourse. Methodological limitations include sample size constraints and the rapid evolution of AI technologies. Future research directions emphasize longitudinal tracking of institutional interventions, development of discipline-specific AI literacy frameworks, and empirical evaluation of AI's pedagogical integration in Spanish language education contexts.

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