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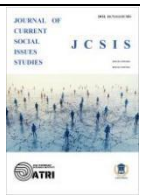

Exploring the Impact of Generative Artificial Intelligence on Chinese Language Acquisition in Tanzania

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Abstract

The growing global influence of China has elevated the importance of Mandarin Chinese proficiency in Tanzania, driven by deepening economic and cultural ties under initiatives like the Belt and Road Initiative. However, Tanzanian learners, primarily Swahili speakers, face significant challenges in acquiring Chinese due to its tonal phonology, logographic script, and cultural nuances, compounded by resource constraints and limited access to qualified instructors. This study explores the role of generative artificial intelligence (AI) tools, such as ChatGPT, DeepSeek and voice-activated chatbots, in addressing these challenges and enhancing Chinese language acquisition among Tanzanian students. Employing a mixed-methods approach, including surveys, interviews, and experimental interventions, the research examines how students use AI tools, their perceived benefits and limitations, and their impact on language proficiency, motivation, and learner autonomy. Findings reveal that AI facilitates personalized learning, improves tonal accuracy, and enhances engagement through culturally contextualized materials, such as Tanzanian proverbs integrated into exercises. However, challenges like unreliable internet access, algorithmic biases, and the risk of over-reliance on AI persist. The study underscores the need for culturally tailored AI tools, improved digital infrastructure, and ethical considerations to ensure equitable implementation. By leveraging the TPACK framework, this research highlights generative AI's potential to bridge linguistic and cultural gaps, offering scalable solutions for Chinese language education in Tanzania while advocating for balanced integration with traditional pedagogy.

Keywords: Generative Artificial Intelligence, Chinese Language Acquisition, Tanzania, AI in Education, Second Language Acquisition, Confucius Institute

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Introduction

Global and Local Context of Chinese Language Acquisition

Over the past two decades, the rapid globalization of the Chinese economy and the country's increasing diplomatic engagement have elevated Mandarin Chinese from a regional language to a global lingua franca in business, diplomacy, and cultural exchange. The strategic importance of Mandarin has been reinforced by China's Belt and Road Initiative (BRI), which links Chinese development interests with infrastructure, trade, and educational partnerships across Asia, Africa, and beyond. According to (Gou,2025), the growing presence of Chinese enterprises, workers, and investment projects globally has increased the need for mutual linguistic and cultural understanding between China and its international partners.

In the African context, and particularly in Tanzania, this global shift is mirrored through intensifying Sino-Tanzanian relations. China is now one of Tanzania's most prominent bilateral partners, contributing significantly to infrastructure development, industrial investment, and educational exchange. This cooperation has generated increased demand for Tanzanian professionals who are proficient in Mandarin Chinese, especially in fields such as international trade, tourism, diplomacy, construction, and academic research.

Responding to these demands, China has promoted language and cultural diplomacy through the establishment of Confucius Institutes (CIs) worldwide, including key Tanzanian universities such as the University of Dar es Salaam and the University of Dodoma. These institutes serve as hubs for Chinese language education, cultural engagement, and academic collaboration (Likoko & Wu, 2025). Beyond formal classroom instruction, they offer scholarships, language competitions, and

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teacher training programs that contribute to the localization of Chinese language education. As （Gou， 2025) emphasizes, such institutions are crucial in promoting culturally responsive pedagogy, enabling learners to engage with the language in both linguistic and sociocultural dimensions.

Despite these advancements, there remains a pressing need to tailor pedagogical practices to the realities of Tanzanian learners, many of whom study Chinese in environments constrained by limited educational resources, including infrastructure, qualified teachers, and teaching materials. The challenge lies in developing learner-centered, context-sensitive approaches that not only address the structural differences between Mandarin and local languages like Swahili but also motivate and support students through culturally relevant and linguistically appropriate strategies. As Chinese continues to grow in global and regional relevance, its sustainable acquisition in Tanzania will depend on innovations that harmonize global linguistic standards with local learning contexts and needs.

Challenges in Chinese Language Acquisition in Tanzania

Although Chinese language education is expanding in Tanzania, learners continue to face substantial linguistic, pedagogical, and institutional challenges. From a linguistic standpoint, Mandarin's tonal nature poses particular difficulty for Tanzanian students whose first language, Swahili, is non-tonal and uses an alphabetic writing system. The phonological complexity of Mandarin, including its four tones and numerous homophones, contrasts sharply with the relatively straightforward phonetics of Swahili, leading to persistent issues in pronunciation, tonal recognition, and listening comprehension (Likoko & Wu, 2025).

Moreover, the logographic nature of Chinese characters presents significant obstacles to vocabulary retention and literacy development. Unlike Swahili or English, where alphabetic scripts allow learners to infer pronunciation and meaning, Chinese characters require memorization of distinct forms, meanings, and pronunciations without phonetic clues. This adds to the cognitive load for learners and necessitates more time and practice for mastery. In addition, Chinese grammar, characterized by flexible word order, the use of classifiers or measure words, and topic-prominent structures, differs markedly from Swahili's subject-verb-object pattern and agglutinative morphology, further complicating syntactic comprehension.

The cultural dimension also plays a crucial role in shaping learning outcomes. Mandarin is embedded in a rich sociocultural context that includes idiomatic expressions, historical references, and cultural norms unfamiliar to many Tanzanian students. Without sufficient cultural immersion or contextual exposure, students often struggle to grasp the pragmatic uses of vocabulary and expressions, which hinders communicative competence. This aligns with research by （Gou，2025), who emphasizes the importance of integrating cultural content into language instruction to promote deeper understanding and learner engagement.

Pedagogically, challenges arise from the limited availability of qualified Chinese language instructors, especially native speakers who understand the local linguistic landscape and can adapt their teaching to Tanzanian students. Furthermore, the shortage of localized or Swahili-adapted teaching materials limits the relevance and accessibility of classroom content. Students frequently rely on generic textbooks designed for other contexts, which may not address their specific learning needs or difficulties.

Institutionally, Tanzania's educational infrastructure faces systemic constraints, including overcrowded classrooms, minimal instructional time allocated to foreign languages, and a lack of extracurricular opportunities for language practice. These issues are exacerbated by limited access to digital learning tools and online resources that could otherwise enhance exposure and interactivity. For many students, the absence of immersive environments or language exchange platforms restricts their ability to apply what they learn in real-life contexts, slowing down proficiency development.

Overall, while Chinese language education in Tanzania has made significant strides, it remains at a developmental stage that requires targeted interventions to improve learner outcomes. Addressing these challenges calls for a holistic approach that includes training more culturally aware instructors, developing context-appropriate curricula and materials, and incorporating language learning strategies that empower students to navigate the complexities of Mandarin acquisition. Research into learner strategies, particularly vocabulary acquisition techniques tailored to Tanzanian learners, is crucial to inform evidence-based teaching practices and policy reforms.

Role of Generative Artificial Intelligence

The emergence of generative artificial intelligence (AI) represents a paradigm shift in the field of language education, offering innovative solutions to long-standing pedagogical challenges, especially in resource-constrained contexts such as Tanzania. As digital transformation continues to influence global education systems, AI-driven language learning tools have gained traction for their ability to provide personalized, accessible, and scalable learning environments. These technologies have the potential to significantly enhance the experience and outcomes of Chinese language learners in Tanzania, where traditional instructional resources remain limited.

Generative AI tools such as ChatGPT, DeepSeek, Claude, and Bing Copilot have demonstrated effectiveness in facilitating second language acquisition by simulating human-like interaction and adapting dynamically to learner inputs. These platforms offer a range of functions highly relevant to Mandarin learners: contextual vocabulary explanations, grammar corrections, real-time conversational simulations, tone and pronunciation feedback, and culturally informed dialogues (Chen et al., 2020; Holmes & Tuomi, 2022). For Swahili-speaking learners, who often struggle with Mandarin's tonal system, complex character writing, and syntactic flexibility, the ability to receive immediate, personalized feedback through AI can significantly improve engagement, comprehension, and retention (Yingsoon, 2021; Yoshida, 2018).

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Generative AI is particularly well-suited to address the pedagogical gaps created by the shortage of qualified Chinese language teachers in Tanzania. In classrooms where learner-to-instructor ratios are high and individualized support is scarce, AI tools can function as virtual tutors available anytime, scalable to large numbers of users, and capable of tailoring content to each learner's proficiency level and pace. This is especially relevant in Tanzanian educational contexts, where institutions often lack access to updated teaching materials and immersive language learning environments. (Gou,2025) emphasizes the relevance of the TPACK framework Technological Pedagogical Content Knowledge in integrating AI into language education. Generative AI tools can support all three domains of TPACK by:

- **Technology (T):** Providing easy-to-use digital platforms for autonomous or guided learning.
- **Pedagogy (P):** Enabling differentiated instruction and interactive engagement through adaptive content generation.
- **Content Knowledge (CK):** Delivering linguistically accurate and culturally nuanced language materials tailored to learners' needs.

In practice, this could mean generating Mandarin dialogues embedded in familiar Tanzanian contexts—such as marketplace negotiations, school settings, or social gatherings, thereby fostering both linguistic relevance and cultural resonance. By incorporating Swahili idioms or Tanzanian proverbs translated into Mandarin, AI-generated content can serve as a bridge between local identities and global language competencies, increasing learners' intrinsic motivation and reducing cultural alienation.

Furthermore, AI-driven conversational agents and feedback systems allow learners to self-monitor and self-correct, promoting metacognitive awareness and language learning autonomy. Such tools can support the development of vocabulary learning strategies, including spaced repetition, semantic mapping, and usage in authentic sentence construction skills particularly critical for mastering Chinese lexicon. In environments where physical access to Chinese speakers or native instructors is minimal, AI can simulate natural language use scenarios, creating opportunities for active, contextual learning that might otherwise be unavailable.

Nevertheless, the integration of generative AI in education is not without challenges. Dong and Min (2024) caution against uncritical adoption of AI tools, highlighting ethical issues such as algorithmic bias, data security, and cultural insensitivity. AI-generated content may inadvertently reinforce stereotypes, misrepresent local cultural values, or overlook the specific linguistic challenges faced by Swahili-speaking learners if not carefully adapted. Moreover, reliance on cloud-based services raises concerns about digital inclusion, as access to stable internet and smart devices remains uneven across Tanzania's educational institutions.

Purpose of the Study

Against this backdrop, this study seeks to explore the integration and impact of generative AI in Chinese language acquisition among Tanzanian learners. Specifically, it aims to examine how students are utilizing these tools in their learning processes, what benefits and limitations they experience, and how such tools influence their language proficiency, learning motivation, and autonomous learning behavior. Additionally, this study investigates the potential of AI to bridge cultural gaps by incorporating Tanzanian cultural references into Chinese language exercises, fostering greater learner engagement, and addressing ethical considerations such as accessibility and fairness in AI implementation.

Research Questions

To achieve the stated objectives, the study is guided by the following research questions:

1. How is generative AI currently being used in Chinese language learning by Tanzanian students?
2. What are the perceived benefits and limitations of using generative AI in this context?
3. What impact does generative AI have on learners' language proficiency, motivation, and learning autonomy?
4. How can generative AI be tailored to incorporate Tanzanian cultural contexts to enhance Chinese language acquisition while ensuring accessibility and fairness?

Literature Review

Overview of Chinese Language Acquisition in Tanzania

Mandarin Chinese presents a unique and complex set of challenges for second language learners, especially for those whose native languages differ significantly in phonological, orthographic, and syntactic structure. For Swahili-speaking learners in Tanzania, acquiring Mandarin is particularly demanding due to the stark linguistic contrasts between the two languages. Mandarin is a tonal language with a logographic writing system and distinctive grammatical conventions, whereas Swahili is a non-tonal, alphabetic language with relatively transparent orthography and more straightforward syntax. These fundamental differences create multiple layers of difficulty that impede smooth acquisition of the Chinese language (Fadhili, 2024).

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One of the most prominent obstacles is phonological. Mandarin employs four main tones (plus a neutral tone), where changes in pitch contour alter the meaning of a syllable entirely. For example, the syllable *ma* can mean "mother," "hemp," "horse," or "scold" depending on the tone. In contrast, Swahili, like many Bantu languages, does not utilize pitch for lexical differentiation in the same way, making tonal perception and production a significant hurdle for learners (Likoko & Wu, 2025; Fadhili, 2024). This leads to frequent errors in pronunciation and difficulties in listening comprehension, as learners must not only recognize phonetic forms but also associate correct tonal patterns with meaning.

The orthographic system of Chinese adds another layer of complexity. Unlike Swahili's Roman alphabet, which represents phonemes transparently, Chinese characters are logograms that do not provide direct clues to pronunciation or meaning. Learners must memorize thousands of characters, each with unique stroke patterns, radicals, and pronunciations. This high cognitive load presents difficulties not only in reading and writing but also in vocabulary acquisition, as learners cannot rely on phonetic decoding strategies typically used in alphabetic languages. Moreover, learners often struggle to master the stroke order rules and basic stroke types of Chinese characters (Fadhili, 2024), and frequent writing errors emerge when these rules are not internalized.

Furthermore, grammatical features of Chinese differ markedly from those in Swahili. Mandarin employs structures such as measure words, which are obligatory classifiers inserted between numbers and nouns (e.g., *yī běn shū* 一本书, "one [measure word] book"), a feature absent in Swahili grammar. Additionally, particles are used extensively to indicate aspect, mood, or sentence modality (e.g., *le*, *ma*, *ba*), which lack direct equivalents in Swahili, resulting in challenges in expressing temporal and modal distinctions. The word order in Chinese, although generally SVO like Swahili, allows for more flexibility and topic-prominent constructions, requiring learners to adjust their syntactic intuitions when constructing and interpreting sentences.

Beyond linguistic issues, contextual challenges also hinder acquisition. Many learners do not receive parental support for learning Chinese and often experience discouragement at home, where the subject is undervalued (Fadhili, 2024). Additionally, students are often demotivated, viewing Chinese as a non-essential subject, which limits their effort and engagement. The language of instruction typically English is also problematic, as many students lack proficiency in it, creating a double-language barrier when English is used to explain Chinese content (Fadhili, 2024).

Another major concern is the shortage of teaching and learning materials. Many schools face a lack of multimedia tools, insufficient textbooks, and under-resourced classrooms without electricity or internet access. These issues restrict the use of audio-visual resources crucial for tone acquisition and oral practice. Students also lack exposure to native Chinese speakers and real-life language use opportunities, which are critical for developing communicative competence (Fadhili, 2024).

These linguistic and contextual disparities collectively impact key language competencies among Tanzanian learners. They contribute to errors in pronunciation, difficulties in listening comprehension, and a slow pace of vocabulary development, especially in the absence of immersive environments or sufficient exposure to native speech. The learning burden is further exacerbated by sociolinguistic and cultural differences, which influence learners' expectations, classroom behavior, and understanding of communicative contexts Fadhili, 2024).

In response to these challenges, scholars such as (Gou,2025), Likoko and Wu (2025), and Fadhili (2024) advocate for pedagogical models that are both linguistically adaptive and culturally responsive. （Gou， 2025) underscores the necessity of culturally sensitive instruction that acknowledges and integrates learners' native linguistic backgrounds, cultural frames of reference, and learning strategies. For Tanzanian learners, this includes the development of instructional materials that contextualize Chinese vocabulary and grammar through familiar cultural and linguistic analogies, thereby bridging the cognitive and affective gaps between the two languages. (Fadhili,2024) further emphasizes the need for teacher training programs that improve the proficiency and pedagogical skills of local Chinese language teachers, and for the adoption of more learner-centered methods that promote active student participation.

Moreover, technology-enhanced tools, including AI-based pronunciation trainers, visual learning aids for character recognition, and interactive grammar tutorials, have been proposed as effective means to address these acquisition difficulties. When combined with communicative teaching approaches, such tools can facilitate learner engagement and improve retention, particularly when tailored to the specific needs of Swahili-speaking students.

Generative AI in Second Language Learning

Generative artificial intelligence (AI), including advanced tools like ChatGPT, Bing Copilot, and Claude, is reshaping the landscape of second language acquisition. These tools offer powerful features such as simulated conversations, real-time grammar correction, contextual vocabulary explanations, personalized content generation, and pronunciation feedback. Such functionalities are especially vital in resource-constrained contexts like Tanzania, where limited access to qualified language instructors, insufficient teaching materials, and lack of immersive environments have traditionally hindered effective language learning.

By leveraging natural language processing and machine learning algorithms, AI-powered systems can function as intelligent tutors, adapting to individual learner needs and enabling flexible, self-paced learning. (Chen, Chen, & Lin , 2020) emphasize the role of AI in intelligent tutoring systems and automated assessment tools that not only enhance teaching efficiency but also promote learner autonomy. These systems can analyze student performance in real time, diagnose learning gaps, and offer tailored feedback—supporting both formative and summative assessment. (Fitria, 2021) highlights that AI enhances learner engagement by providing instantaneous, interactive feedback, which is a critical factor in sustaining motivation and supporting independent learning, especially outside traditional classroom settings.

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In a similar vein, (Harry, 2023) argues that AI chatbots function as virtual language tutors, particularly valuable for practicing spoken language and conversation skills. These chatbots can simulate natural dialogues and correct pronunciation or grammar without fear of judgment, encouraging increased learner participation and reducing language anxiety.

In the context of Chinese language learning, the benefits of generative AI are even more pronounced due to the tonal and logographic complexities of Mandarin. Studies by (Yingsoon, 2021) and (Yoshida, 2018) underscore the capacity of AI tools to assist with tonal accuracy, intonation, and speaking fluency, which are particularly challenging for Swahili-speaking learners unfamiliar with tonal languages. These technologies enable repetitive, individualized practice that is often unavailable in typical Tanzanian classroom environments.

（Gou, 2025) extends these discussions by applying the TPACK framework (Technological Pedagogical Content Knowledge), demonstrating how generative AI can seamlessly integrate technology (T), pedagogy (P), and content knowledge (CK) to create adaptive, culturally relevant teaching materials. (Wang & Zhang ,2024) also highlight AI's capacity to generate localized content, ensuring that the vocabulary, topics, and examples align with learners' cultural and linguistic backgrounds—an important consideration for Swahili-speaking students in Tanzania, who often struggle with culturally unfamiliar Chinese teaching materials.

Despite these advancements, critical concerns remain. (Harry, 2023) & (Dong & Min, 2024) caution against overreliance on AI without considering its ethical implications, particularly regarding algorithmic bias, data privacy, and digital access. These concerns are particularly pertinent in the African context, where technological infrastructures may be uneven and digital literacy varies widely. There is also the risk that AI-generated content may reflect cultural assumptions or linguistic norms that are not aligned with African learners' realities.

Notably, a significant research gap exists regarding the application of generative AI in African second language learning contexts, particularly for Swahili-speaking learners. Most existing studies focus on East Asia, North America, and Europe, leaving African voices underrepresented in both AI development and pedagogical discourse. This underscores the urgent need for region-specific research to explore how generative AI tools can be optimized for Tanzanian educational settings and to ensure that emerging technologies support equitable, inclusive, and culturally responsive language education.

Methodology and Procedures

Research Methodology

This research focuses on the emerging topic of the application and impact of generative artificial intelligence (AI) on Chinese language acquisition among Tanzanian university learners. Drawing from a mixed-methods research paradigm, the study comprehensively integrates quantitative and qualitative approaches to obtain both broad statistical patterns and in-depth experiential insights. By employing multi-dimensional data collection strategies such as questionnaire surveys, focus group interviews, pre- and post-language learning tasks, and experimental analysis, the study aims to explore the effectiveness, challenges, and pedagogical implications of generative AI in language education. The triangulated approach enhances the scientific rigor, validity, and applicability of the research findings, offering both theoretical contributions and practical recommendations.

Literature Research Method

The study begins with a systematic and comprehensive review of existing literature related to artificial intelligence in education, second language acquisition, and Chinese language learning in the African context. Relevant academic materials including peer-reviewed journal articles, dissertations, policy documents, project reports, and conference proceedings are collected and categorized. Particular attention is paid to the development history, core conceptual frameworks, and current research hotspots concerning the application of generative AI tools (e.g., ChatGPT, DeepSeek, Claude, Bing Copilot) in language instruction. Through a meticulous process of sorting, comparison, and synthesis, the study extracts key theoretical perspectives, identifies existing gaps particularly regarding African learners and constructs a solid academic foundation for subsequent sections. This method also aids in tracing the transformation of Chinese vocabulary acquisition models in the digital era and clarifies the role AI plays in shifting from teacher-centered to learner-centered approaches.

Survey Research Method

Quantitative data will be primarily obtained through structured questionnaires distributed to Chinese language learners across selected Tanzanian universities offering formal Chinese instruction, such as the University of Dodoma and the University of Dar es Salaam. The questionnaire is designed to collect detailed information on learners' awareness, frequency of use, types of AI tools accessed, and their perceived usefulness in enhancing skills such as vocabulary retention, grammar understanding, pronunciation, and overall comprehension. Statistical analysis (e.g., descriptive statistics, correlation analysis) will be conducted to identify usage trends and determine the relationship between AI use and perceived language improvement. The survey results provide a macro-level overview of the role generative AI currently plays in learners' academic lives.

Interview Method

To complement the quantitative data and enrich the interpretation of findings, qualitative interviews and focus group discussions will be conducted with a purposive sample of learners and teachers. Student participants of varying language proficiency levels, genders, and academic years will be selected to ensure a representative cross-section. Interview questions

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will explore their personal experiences with generative AI tools, motivations for use, encountered challenges, and reflections on how these tools have influenced their language learning behavior and autonomy. In addition, several Chinese language instructors will be interviewed to assess their observations on students' engagement and academic performance following AI integration.

Case Analysis Method

As part of a pilot study, the research will design and implement an experimental intervention using AI-generated learning materials tailored with Tanzanian cultural references. These culturally contextualized materials will be compared with standard AI-generated content in terms of their impact on learner engagement, comprehension, and motivation. The pilot will involve pre- and post-task performance assessments focusing on vocabulary acquisition, grammatical accuracy, and oral expression. This case-based experimental approach enables the research to evaluate not only the pedagogical effectiveness of generative AI but also its adaptability and fairness across cultural contexts, in line with ethical standards (Harry, 2023).

Comparative Analysis Method

To broaden the analytical perspective, the study will also adopt a comparative lens to evaluate the differences in generative AI usage and impact across institutions. Comparisons will be drawn between Tanzanian universities with varying levels of digital infrastructure and AI integration, as well as between learners at different proficiency stages. The aim is to uncover patterns of digital inequality, identify best practices, and offer scalable recommendations tailored to diverse educational contexts. Furthermore, insights from international studies will be referenced to contextualize Tanzanian findings within the broader global discourse on AI and language learning.

Results and Discussion

Patterns of AI Usage

The study reveals that Tanzanian learners of Chinese as a foreign language are increasingly integrating generative AI tools into their daily language learning routines. Among the most commonly used tools are ChatGPT, DeepSeek, Google Translate, Grammarly, and voice activated virtual assistants like Siri and Google Assistant each serving distinct yet complementary functions in the acquisition process.

These tools assist learners in expanding their vocabulary, understanding grammatical structures, and improving oral fluency. For instance, students frequently use ChatGPT to generate context-rich example sentences that incorporate Tanzanian proverbs or everyday scenarios, such as:

- **"Maji hufuata mkondo" (Water follows the channel) being translated and integrated into a Chinese sentence to illustrate the concept of adaptability:**
  水总是顺着沟渠流 (Shuǐ zǒng shì shùn zhe gōuqú liú).

Such cultural translation not only enhances learners' understanding of new Chinese vocabulary but also improves semantic retention by anchoring new content in familiar concepts. This finding supports Gou's (2025) research on the TPACK framework, which emphasizes the need for culturally adaptive content in second language education.

Additionally, learners use Google Translate for quick translations and pronunciation support, particularly during homework or when engaging in mobile-based self-study. A common practice observed among learners was copying Chinese text from textbooks into Google Translate to hear tone-accurate audio—especially helpful for tonal distinctions like between *mā (妈 – mother)* and *mǎ (马 – horse)*.

AI-powered chatbots like ChatGPT and DeepSeek also serve as virtual conversational partners, offering learners the opportunity to engage in simulated dialogues that mirror real-life interactions. For example, a student preparing for an oral exam might ask ChatGPT:

"Pretend you are my teacher. Ask me five questions in Chinese about my family, and correct my answers."

In response, the AI provides immediate, adaptive feedback, identifying errors in grammar and tone. These self-directed interactions allow students to practice spoken Chinese in a low-pressure, self-paced environment, helping to reduce language anxiety and increase speaking fluency over time. This aligns with Harry's (2023) findings, which highlight AI chatbots' potential to serve as virtual tutors by offering real-time, personalized feedback.

Learners also use Grammarly to polish Chinese to English or English to Chinese translations in their assignments, especially when writing comparative cultural essays. While Grammarly is not built for Chinese, its integration into bilingual writing practices helps learners refine their English expressions while cross-referencing meanings with AI-powered Chinese translation tools.

Furthermore, students report using Google Assistant to ask quick questions like:
"How do I say 'I'm going to school' in Mandarin?"
and receive an immediate response:
我去学校 (Wǒ qù xuéxiào), often followed by spoken pronunciation.

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This shows how voice-activated AI tools complement textual ones, enabling multimodal learning experiences that address various learning styles auditory, visual, and kinesthetic.

The integration of technology (T) and content knowledge (CK) observed in these practices highlights the unique ability of generative AI tools to bridge both linguistic and cultural gaps, thereby making the language learning process more personalized, immersive, and relevant to the learner's context. In Tanzania, where access to qualified Chinese instructors is limited, such tools effectively replicate elements of individualized tutoring, offering scalable support that traditional classroom settings often cannot provide.

Perceived Benefits of AI Integration

Tanzanian learners report a wide range of benefits resulting from the integration of AI into their Chinese language studies. Chief among these are the provision of instant feedback, personalized learning support, and a heightened sense of autonomy and confidence in the learning process. AI tools offer learners immediate corrections and suggestions, which are crucial in helping them understand language errors and avoid fossilization of incorrect usage. This real-time feedback, often unavailable in traditional classroom settings due to high student-teacher ratios, significantly enhances the quality of language input and output.

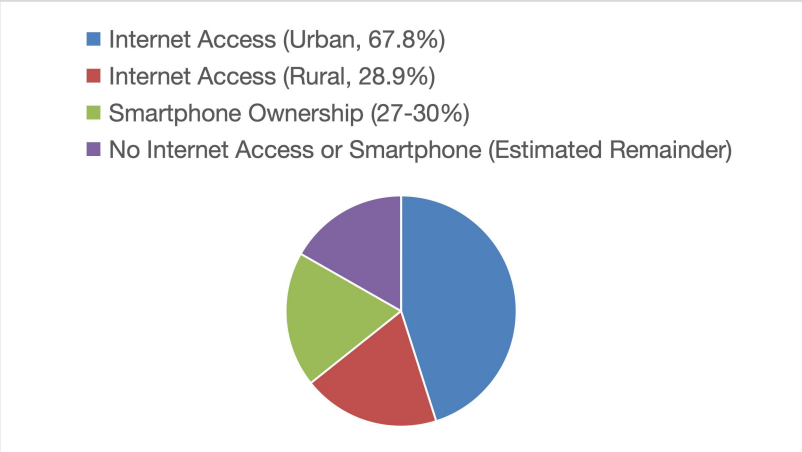
Additionally, learners note that AI tools extend learning beyond the constraints of the physical classroom. This is particularly important in the Tanzanian context, where limited educational infrastructure and resources often hinder access to quality language instruction. By offering 24/7 access to AI-driven assistance, students are empowered to continue their studies independently, at their own pace and convenience. The use of culturally contextualized AI-generated materials such as vocabulary exercises and reading passages that reference Tanzanian customs, daily life, and idiomatic expressions further enriches the learning experience. These materials foster greater learner engagement and promote deeper cognitive connections, making the language acquisition process more meaningful. Gou's (2025) emphasis on the importance of culturally sensitive instructional materials in international Chinese language education strongly supports this observation.

Furthermore, AI tools often include features that gamify the learning process, such as quizzes, progress tracking, and interactive dialogues, which contribute to increased learner motivation and sustained engagement. Harry (2023) highlights the positive impact of such gamified, interactive experiences on student participation and enthusiasm for language learning. These benefits align with the TPACK framework's emphasis on the synergy between technology and pedagogy (TPK), illustrating how thoughtful integration of AI can enhance not only content delivery but also the overall learning experience. As a result, AI tools are not merely supplementary aids but have become essential components of a more dynamic, responsive, and culturally inclusive approach to Chinese language education for Tanzanian university students.

Limitations and Challenges

While the integration of AI technologies offers promising advantages for Chinese language acquisition, several significant limitations and challenges hinder its full potential in the Tanzanian educational context. One of the most persistent barriers is infrastructural: inconsistent internet connectivity and limited access to digital devices, especially in rural or underfunded institutions, restrict regular and equitable use of AI tools. These challenges mirror Gou's (2025) concerns regarding the implementation of technology-based learning in resource-constrained environments, where basic technological infrastructure is often lacking or unreliable. Infrastructural barriers, such as unreliable internet in rural schools, limit AI use. Empirical data highlights Tanzania's digital divide: according to the Tanzania Communications Regulatory Authority (TCRA) 2023 report, internet access reached 67.8% in urban areas and 28.9% in rural areas by mid-2023, suggesting a national penetration below 50% given the population distribution. Device ownership is similarly constrained, with less than a third of Tanzanians (approximately 27-30%) owning smartphones, as noted in GSMA and TCRA data, and rural schools often lacking computers or tablets. These statistics underscore significant barriers to consistent AI tool usage, especially in underserved regions.

Figure 1: Tanzania's Digital Divide (2023)



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Another critical challenge lies in the quality and appropriateness of AI-generated content. Learners occasionally encounter inaccuracies in translations, grammatical constructions, or culturally insensitive examples, which can lead to confusion or reinforce misconceptions. (Dong & Min, 2024) attribute such issues to algorithmic biases embedded in large language models, which are often trained on datasets that do not adequately represent African linguistic or cultural contexts.For example, an AI tool mistranslated the Swahili proverb Pole pole ndio mwendo (slowly but surely is the way) as "slow is the way" in Mandarin (慢慢是路), missing the nuanced meaning of steady progress, which confused learners attempting to apply it in context.

As a result, AI tools may generate responses that are either misaligned with Swahili linguistic patterns or overlook relevant cultural references, thereby limiting the tools' effectiveness and relevance for Tanzanian learners.

Moreover, excessive dependence on AI-generated content can lead to a reduction in fundamental learning skills, such as rote memorization, problem-solving, and creative thinking. (Dong & Min, 2024) caution that over-reliance on automated assistance may diminish learners' cognitive engagement and hinder the development of autonomous language production skills. This concern is particularly salient in language learning, where active use, memorization, and mental association are vital components of vocabulary retention and sentence formation.

Another structural issue is the lack of AI tools specifically designed with Swahili-speaking users in mind. Most existing platforms operate primarily in global lingua francas such as English or Mandarin, resulting in generic outputs that may not align with the learners' linguistic backgrounds. （Gou， 2025) highlights the need for culturally and linguistically localized AI tools to ensure effective scaffolding for learners from diverse language communities. The absence of such tools not only reduces learning efficiency but also risks alienating students from the learning process. As emphasized by both Harry (2023) and (Dong & Min, 2024), addressing algorithmic inequity and ensuring inclusive access must be central to the future development of AI-assisted language learning systems, particularly in multicultural and multilingual settings like Tanzania.

Impact on Language Skills Development

AI-assisted tools have shown a demonstrable impact on the development of core language skills among Tanzanian learners of Chinese. One of the most frequently cited benefits is the improvement in speaking proficiency, particularly in mastering tonal pronunciation—a common difficulty for Swahili-speaking learners of Mandarin. AI chatbots provide learners with opportunities for repetitive oral practice in a stress-free, interactive environment, helping to reduce the fear of speaking and reinforcing tonal accuracy. (Yingsoon, 2021) underscores the importance of this type of AI-supported pronunciation training, noting its role in overcoming one of the most challenging aspects of Chinese language acquisition.

Writing skills also benefit significantly from AI integration, especially through tools like Grammarly and ChatGPT that offer immediate feedback on grammar, sentence structure, and coherence. Learners use these tools not only for error correction but also to explore various writing styles and syntactic constructions, leading to a more sophisticated and nuanced command of written Chinese. Personalized correction mechanisms help prevent fossilization of errors and encourage learners to internalize correct forms over time.

Vocabulary acquisition is particularly enhanced through AI's capacity to present new words within culturally familiar contexts. Learners report better retention when new terms are embedded in example sentences or scenarios reflective of Tanzanian life, such as references to local customs, food, or idiomatic expressions. This approach aligns with Gou's (2025) emphasis on integrating content and cultural knowledge within the TPACK framework, particularly the synergy between technology and content knowledge (TCK). The contextualization of vocabulary not only improves memory retention but also deepens comprehension and applicability.

Listening comprehension is similarly bolstered by AI-generated audio materials. Tools offering synthesized speech or pre-recorded dialogues provide learners with consistent auditory exposure, a crucial element for developing listening skills in tonal languages. When these materials include references to culturally relevant topics or daily Tanzanian life, learners report increased engagement and comprehension. Harry (2023) supports this, noting that culturally adaptive audio content fosters both linguistic and emotional accessibility. Additionally, personalized feedback mechanisms embedded in many AI tools allow learners to track their progress and receive targeted support, promoting incremental and individualized development across all language domains.

Influence on Learning Attitudes

The integration of AI technologies has also had a profound influence on learners' attitudes and motivation toward Chinese language learning. One of the most significant shifts observed is the enhancement of learner autonomy. AI tools, with their capacity for real-time feedback and adaptive learning paths, empower students to take greater control of their own learning process. As a result, learners demonstrate stronger self-regulation skills and increased confidence in navigating the complexities of the Chinese language independently. Holmes and Tuomi (2022) argue that such personalized learning environments are key to fostering sustained motivation and academic persistence, especially in self-directed language learning contexts.

Furthermore, the inclusion of Tanzanian cultural references in AI-generated content has a notable motivational effect. Students report feeling a stronger emotional and intellectual connection to learning materials that reflect their own cultural realities. This relevance boosts not only engagement but also a sense of ownership over the learning process. Gou's (2025) research supports this, emphasizing the role of culturally responsive pedagogy within the TPACK framework as a driver of meaningful and sustained learning experiences.

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Interactive AI features, such as gamified exercises, voice-based simulations, and personalized challenge levels, also contribute significantly to learner engagement. (Harry, 2023) highlights the role of these features in maintaining motivation, particularly in settings where traditional classroom instruction may be limited in interactivity, personalization, or student-centeredness. In resource-scarce environments like Tanzania, where teacher-student ratios are often high and instructional materials limited, such AI-driven personalization is not merely a supplement but a transformative force that redefines the learner experience.

Taken together, these changes in learner attitude suggest that AI not only supports skill development but also reshapes the affective and behavioral dimensions of language learning. By offering a more adaptive, responsive, and culturally grounded learning environment, AI fosters a more empowered, engaged, and motivated learner base in the context of international Chinese education in Tanzania.

Case Analysis

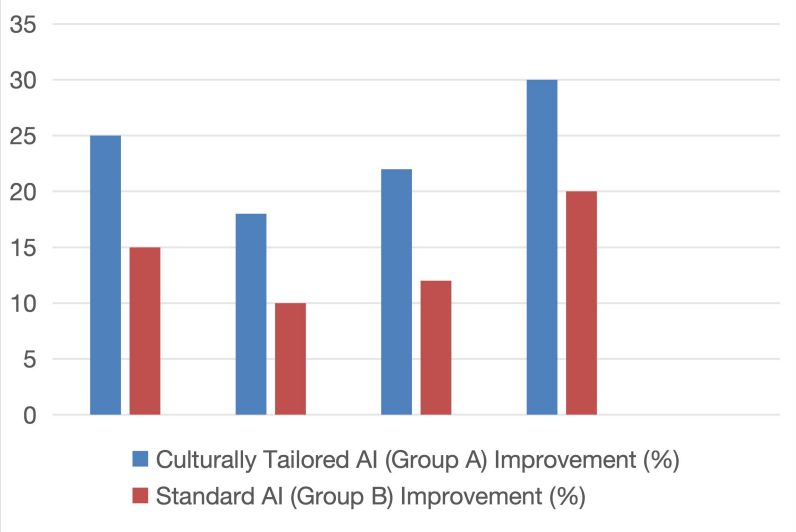
Case Analysis Outcomes

The pilot study compared the effectiveness of AI-generated learning materials tailored with Tanzanian cultural references against standard AI-generated content. Two groups of 20 students each from Tanzania participated in a two-week intervention. Group A used culturally tailored materials (e.g., Mandarin dialogues incorporating Swahili proverbs like Maji hufuata mkondo translated as 水总是顺着沟渠流 in a marketplace scenario), while Group B used standard Mandarin dialogues without cultural context. Pre- and post-task assessments measured vocabulary retention, grammatical accuracy, and oral expression, with motivation assessed via a Likert-scale survey.

Results:

- **Vocabulary Retention**: Group A showed a 25% improvement in recalling 20 target vocabulary items (e.g., *市场*, market; *适应*, adapt) compared to a 15% improvement for Group B ($p < 0.05$, t-test).
- **Grammatical Accuracy**: Group A achieved an 18% reduction in errors in measure word usage (e.g., *一本书* vs. *一书*) compared to 10% for Group B.
- **Oral Expression**: Group A's oral fluency scores, measured by correct tone usage in dialogues, improved by 22% compared to 12% for Group B, as assessed by native Mandarin instructors.
- **Motivation**: Group A reported a 30% higher motivation score (mean = 4.2/5) than Group B (mean = 3.3/5), citing cultural relevance as a key factor.

Figure 2: Impact of Culturally Tailored vs. Standard AI Materials



Suggestion

Development of Culturally Tailored AI Tools

A key recommendation is to invest in the development of AI tools specifically designed for Swahili-speaking learners of Chinese. These tools should be embedded with Tanzanian cultural references and sensitive to the linguistic nuances of Swahili,

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thereby addressing the current gap in localized AI educational resources. （Gou， 2025) emphasizes the significance of cultural adaptability in cross-cultural learning contexts, advocating for the integration of culturally relevant content within AI systems to enhance engagement and contextual understanding. To achieve this, developers should utilize multilingual corpora and few-shot learning techniques to train AI systems that can generate accurate and culturally resonant instructional materials. Such targeted development would greatly improve the relevance, relatability, and pedagogical effectiveness of AI-assisted Chinese language education for Tanzanian students.

Enhancing Infrastructure and Accessibility

Technological barriers remain a major constraint in the Tanzanian educational landscape. Therefore, it is crucial to enhance digital infrastructure by expanding affordable and reliable internet access, especially in rural and underserved regions. Provision of low-cost, education-specific digital devices through government or institutional subsidies can also help bridge the digital divide. （Gou，2025) proposes a hybrid deployment model combining cloud-based services with localized, on-premise solutions as a viable strategy for ensuring AI tool functionality in low-bandwidth or offline environments. This dual approach could help mitigate connectivity issues while promoting equitable access to AI technologies across diverse educational settings in Tanzania.

Ensuring Content Accuracy and Cultural Sensitivity

AI-generated materials must undergo rigorous validation to ensure accuracy, cultural appropriateness, and pedagogical relevance. Both Dong and Min (2024) and （Gou，2025) underscore the risks of algorithmic bias and culturally insensitive outputs, which can hinder language learning and perpetuate stereotypes. To address this, developers and educators should collaboratively establish a high-quality, diverse linguistic corpus enriched with Tanzanian cultural and linguistic data. This corpus would serve as a foundation for training and fine-tuning AI systems, ensuring they produce materials that are both contextually accurate and culturally inclusive. Involving local language experts and educators in this process is essential to maintaining authenticity and educational integrity.

Promoting Balanced AI Integration

While AI offers valuable support for language learning, it should complement rather than replace traditional teaching methods. Dong and Min (2024) warn against the risk of over-reliance on AI, which may weaken learners' memory retention, critical thinking, and creativity. A hybrid instructional model is therefore recommended one that integrates AI tools with teacher-led activities and human interaction. Educators should guide students to critically analyze AI-generated content, reflect on its accuracy, and apply it through creative exercises. For instance, analyzing AI-produced sentences in Tanzanian cultural contexts or comparing chatbot dialogues with authentic speech can help reinforce learning and support long-term pedagogical goals, as advocated by （Gou，2025).

Strengthening Teacher Capacity Building

To ensure effective AI integration, teacher training must be prioritized. Educators need to be equipped with knowledge of AI fundamentals, operational skills, and culturally responsive teaching strategies. This aligns with the TPK (technological-pedagogical knowledge) dimension of the TPACK framework emphasized by （Gou,2025), which highlights the importance of aligning technology use with pedagogical practices. Professional development programs should include workshops, seminars, and case-based training modules that focus on how to utilize AI tools effectively within cross-cultural classrooms. Such initiatives will empower teachers to integrate AI meaningfully, adapt materials to local contexts, and better meet the needs of Tanzanian learners.

Addressing Ethical Considerations

As AI becomes more embedded in educational systems, ethical concerns surrounding data privacy, algorithm fairness, and transparency must be addressed. Dong and Min (2024) advocate for the implementation of advanced security measures, such as encryption technologies and blockchain-based data management systems, to protect learners' personal data. In addition, the establishment of independent ethics and oversight committees is recommended to monitor and audit AI algorithms for potential biases and inequities. These structures are essential for ensuring that AI systems uphold educational fairness and accountability, especially in culturally and linguistically diverse environments like Tanzania.

Fostering Action Research and Community Collaboration

Encouraging educators to engage in action research can significantly enhance the pedagogical application of AI tools. Teachers can utilize AI-generated learning analytics to evaluate and refine their instructional strategies, thereby contributing to a more data-informed teaching approach. As proposed by （Gou， 2025), the establishment of professional learning communities and cross-institutional workshops can facilitate the exchange of best practices and innovation in culturally responsive pedagogy. Such collaborative ecosystems will not only promote continuous improvement but also empower educators to play a central role in shaping the responsible and effective use of AI in language education.

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Integrating Ethical and Cultural Education

Lastly, it is essential to integrate ethical and cultural literacy into both teacher training programs and student curricula. Modules focusing on data privacy, digital citizenship, and intercultural competence should be embedded in educational content to cultivate awareness of responsible AI use. Dong and Min's (2024) emphasis on ethical AI education highlights the need for learners and educators alike to understand the implications of AI technologies. Tahiru (2021) and （Gou， 2025) further stresses the role of cultural sensitivity in international education. Embedding these values into the curriculum will foster a generation of ethically aware and culturally competent AI users, ultimately supporting more inclusive and socially responsible language education.

Conclusion

The integration of generative artificial intelligence (AI) into Chinese language acquisition in Tanzania represents a transformative approach to addressing the unique challenges faced by learners in a cross-cultural context. This study demonstrates that AI tools, such as ChatGPT, Google Translate, Grammarly, and voice-activated bots, significantly enhance vocabulary acquisition, grammar clarification, oral practice, and cultural engagement by delivering instant feedback, personalized learning experiences, and culturally relevant content. These findings align with （Gou， 2025), who highlights generative AI's capacity to dynamically generate tailored teaching materials and support cross-cultural instruction, thereby reducing teachers' workload and fostering learner autonomy. The incorporation of Tanzanian cultural elements, such as proverbs and scenarios, into AI-generated content has proven particularly effective in increasing learner motivation and engagement, corroborating Harry's (2023) emphasis on interactive and gamified AI-driven learning.

However, the study also identifies critical challenges that mirror those outlined in Dong and Min (2024) and （Gou， 2025). Technological barriers, including unreliable internet connectivity and limited device access, hinder consistent AI utilization, especially in resource-constrained settings like Tanzania. Ethical concerns, such as data privacy risks and potential cultural biases in AI outputs, echo Dong and Min's (2024) warnings about algorithmic fairness and data security in educational applications. Additionally, the lack of AI tools tailored for Swahili-speaking learners and the risk of over-reliance on AI, which may diminish memorization and creativity, parallel Gou's (2025) concerns about cultural adaptation and pedagogical misalignment. Despite these challenges, AI's positive impact on speaking, writing, vocabulary retention, and listening comprehension underscores its potential to foster individualized learning progress, as supported by both Harry (2023) and （Gou， 2025). By leveraging the TPACK framework (Gou, 2025), this study highlights the need for a synergistic integration of technology, pedagogy, and content knowledge to maximize AI's benefits in culturally diverse settings. Ultimately, generative AI offers a promising pathway for enhancing Chinese language acquisition in Tanzania, provided that technological, ethical, and pedagogical challenges are systematically addressed to ensure sustainable and equitable implementation.

Addressing Ethical Considerations

Ethical concerns, including data privacy, algorithmic fairness, and transparency, must be prioritized in AI integration. To protect learners' data, developers should implement encryption technologies and explore blockchain-based systems for secure data management, as suggested by Dong and Min (2024). To address algorithmic bias, AI tools should be trained on diverse, Swahili-inclusive corpora curated with input from Tanzanian linguists and educators. For example, involving local experts in validating AI outputs can prevent culturally insensitive translations, such as misrepresenting Swahili proverbs. Establishing independent ethics committees to audit AI algorithms for bias and inequity is also critical. Additionally, partnerships with local communities to co-design AI tools can ensure cultural relevance and foster trust, aligning with Dong and Min's (2024) call for equitable AI development in education.

Theoretical and Practical Contributions

Theoretically, this study extends the TPACK framework by demonstrating how generative AI integrates technological (T), pedagogical (P), and cultural content knowledge (CK) to enhance Chinese language acquisition in a non-Western, resource-constrained context. It advances culturally responsive pedagogy by showing how AI-generated materials, embedded with Tanzanian cultural references, bridge linguistic and cultural gaps, enriching learner engagement and motivation. This contributes to the global discourse on AI in second language acquisition, particularly for underrepresented African contexts.

Practically, the findings provide actionable strategies for educators, policymakers, and AI developers. For educators, the study offers a model for integrating culturally tailored AI tools into curricula to improve proficiency and autonomy. For policymakers, it underscores the need for investments in digital infrastructure to ensure equitable access. For developers, it highlights the importance of localized AI training data to enhance content relevance, offering a blueprint for scalable, inclusive language education solutions in Tanzania and similar contexts.

Future Research Directions

To build on this study, future research should address the following specific questions:

1. **Long-term Impact on Autonomy**: How does sustained use of generative AI over one academic year affect learner autonomy and self-regulation in low-resource Tanzanian universities? A longitudinal study tracking proficiency and motivation could provide insights.

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2. **Cross-Linguistic Adaptability**: Can AI tools be adapted to support Mandarin acquisition for speakers of other African languages, such as Shona or Amharic? Comparative studies across African contexts could identify scalable localization strategies.
3. **Regional Comparisons**: How does AI's impact on Chinese language learning differ across African nations with varying digital infrastructures? Cross-country case studies, using mixed-methods approaches, could highlight best practices for equitable AI integration.

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