Construction and Validation of a Personalised Teaching Model for MOOC-Assisted Second Language Acquisition under Cross-Cultural Cognitive Differences

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Abstract: With the rapid development of digital education, MOOCs (Massive Open Online Courses) have become an important tool for second language acquisition (SLA). However, learners from different cultural backgrounds exhibit distinct cognitive styles, learning strategies, and motivational orientations, which often lead to varied learning outcomes in MOOC-based environments. This study, grounded in cross-cultural cognitive theory and personalised learning theory, explores the construction and validation of a MOOC-assisted personalised teaching model for SLA. By integrating adaptive learning technologies, data-driven feedback mechanisms, and cultural sensitivity in instructional design, the study proposes a multi-layered framework to address cognitive differences and enhance learning effectiveness. Empirical validation through pilot teaching demonstrates that personalised MOOC models significantly improve learners' motivation, engagement, and performance, highlighting the feasibility and sustainability of this approach in cross-cultural contexts.

1. Introduction

1.1 Research Background and Significance

Globalisation has intensified the demand for effective second language acquisition (SLA), making multilingual competence an essential skill for academic, professional, and intercultural communication. At the same time, Massive Open Online Courses (MOOCs) have emerged as a powerful medium for language learning, offering learners flexible, low-cost, and large-scale access to diverse resources [1]. MOOCs break traditional barriers of time, space, and cost, enabling learners worldwide to participate in language education. However, the diversity of learners in MOOCs—particularly in terms of cultural background, language proficiency, and cross-cultural cognitive differences—poses significant challenges to uniform instructional design. Standardised approaches often fail to accommodate the varied cognitive styles and cultural expectations of learners, leading to disparities in engagement and learning outcomes. Therefore, exploring personalised teaching models that adapt to these differences is crucial for optimising MOOC-based SLA, improving learner satisfaction, and enhancing language acquisition efficiency in globalised learning contexts.

1.2 Literature Review and Research Gap

Previous research on MOOCs and SLA has focused on course design, technological integration, learner engagement, and pedagogical strategies [2]. Studies have explored adaptive learning, AI-assisted teaching tools, and blended learning environments to improve language acquisition. However, less attention has been given to the role of cross-cultural cognition as a key variable influencing learning outcomes. While personalised learning models have been examined in broader educational contexts, empirical studies that explicitly link cross-cultural cognition, SLA, and MOOC environments remain limited. Existing models often overlook the interplay between learners' cultural orientations and cognitive processes, which are critical for language comprehension and use.

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This gap highlights the need for research that integrates cultural-cognitive perspectives into personalised MOOC-based SLA design. This study aims to bridge these gaps by constructing and empirically validating a model that combines cultural responsiveness with adaptive learning strategies.

1.3 Research Objectives

The objectives of this research are threefold: first, to analyse the nature and impact of cross-cultural cognitive differences in MOOC-assisted SLA; second, to construct a personalised teaching model that addresses these differences effectively; and third, to validate the model through practical application and empirical evaluation. By doing so, this study aims to provide both theoretical contributions and practical guidelines for designing culturally responsive, adaptive MOOC-based SLA frameworks that enhance learner engagement, equity, and achievement.

2. Theoretical Framework

2.1 Cross-Cultural Cognitive Theory

Cognitive processes, including perception, problem-solving, and learning strategies, are shaped by cultural norms, values, and socialisation patterns. For example, learners from collectivist cultures may place greater value on group harmony, collaboration, and shared responsibility in learning, preferring interactive and discussion-based approaches. In contrast, learners from individualist cultures may prioritise autonomy, independent problem-solving, and self-paced learning, favouring flexible and self-directed modes of instruction. These cultural differences influence not only the preferred modes of learning but also the ways in which learners process information, evaluate knowledge, and apply language skills. In MOOC-based SLA, where learners come from diverse cultural and linguistic backgrounds, ignoring such cognitive diversity can lead to reduced engagement and inequitable learning outcomes [3]. Therefore, integrating cultural-cognitive perspectives into instructional design is essential for creating inclusive and effective MOOCs that meet the needs of all learners.

2.2 Personalised Learning Theory

Personalised learning theory advocates tailoring instruction to learners' cognitive styles, prior knowledge, learning preferences, and motivational orientations [4]. In SLA contexts, personalisation enhances engagement and achievement by aligning content delivery, interaction patterns, and assessment methods with learners' unique profiles. For instance, adaptive sequencing of tasks, customised feedback, and differentiated learning paths can help address the varying pace of language acquisition among learners. This alignment not only supports skill development but also strengthens both intrinsic motivation—through relevance and learner autonomy—and extrinsic motivation—through clear achievement pathways and applied outcomes. In MOOCs, where scale and learner diversity are significant, personalisation is particularly important for sustaining learner commitment and ensuring equitable access to language learning opportunities.

2.3 Technology-Enhanced SLA in MOOCs

MOOCs offer technological affordances that can transform SLA by enabling personalised and adaptive learning experiences at scale. Tools such as AI-driven feedback systems, adaptive learning platforms, learning analytics, and multimodal resources provide opportunities to customise learning pathways according to individual learners' needs [5]. These tools can analyse learner behaviours, performance patterns, and cultural preferences to deliver targeted content and scaffolded support. When combined with cultural sensitivity and cognitive awareness, such technologies make it possible to construct truly individualised SLA experiences. This integration not only enhances the efficiency and effectiveness of language learning but also fosters learner autonomy, cultural inclusivity, and sustained engagement, thereby redefining the potential of MOOCs in second language education.

3. Current Situation and Challenges in MOOC-Assisted SLA

3.1 Characteristics of Learners in MOOC-Based SLA

Learners in Massive Open Online Courses (MOOCs) for Second Language Acquisition (SLA) exhibit a high degree of diversity in terms of cultural background, language proficiency, and digital literacy [6]. MOOCs have expanded access to language learning by breaking geographical, economic, and institutional barriers, allowing learners from across the globe to participate [7]. However, this inclusivity also amplifies differences in learners' cognitive styles, learning strategies, and access to resources, resulting in uneven learning outcomes. For instance, learners from culturally collectivist backgrounds may value collaborative learning and peer interaction, while those from individualistic cultures may prefer self-directed study. Likewise, learners' digital literacy varies widely, affecting their ability to navigate platforms, utilise tools, and engage with multimedia content effectively. This diversity creates both opportunities and challenges: while MOOCs can foster cross-cultural exchange and broaden perspectives, they also require more nuanced pedagogical approaches to accommodate varied learning needs and ensure equitable outcomes across learner groups.

3.2 Limitations of Current MOOC Models

Despite their transformative potential, most current MOOCs still adopt a "one-size-fits-all" approach to SLA. Course design tends to favour standardised structures and uniform pacing, with limited mechanisms for adapting to individual learners' needs. As a result, many learners face challenges in maintaining engagement and achieving meaningful language development. Low completion rates in MOOCs are a persistent concern, reflecting issues such as inadequate personalised support, lack of motivation, and mismatched task difficulty. Moreover, SLA effectiveness is constrained when courses do not differentiate between learners' language proficiency levels, learning goals, or cultural contexts. Without adaptive scaffolding, learners may either feel overwhelmed or under-challenged, leading to disengagement. These limitations highlight the urgent need for MOOC models that are more responsive to individual learning profiles and capable of addressing the complexity of SLA in diverse online environments.

3.3 Key Challenges in Addressing Cross-Cultural Cognition

Cross-cultural cognition in MOOC-based SLA presents specific challenges. Firstly, there is often insufficient cultural inclusivity in course content. Learning materials may overlook cultural references or fail to reflect diverse communicative contexts, limiting learners' ability to apply language skills authentically. Secondly, adaptive scaffolding for diverse learners is generally underdeveloped. Current models rarely offer customised pathways that account for differences in cognitive style, prior knowledge, and language proficiency. Thirdly, feedback mechanisms in MOOCs often lack specificity and cultural sensitivity, making it difficult for learners to address their unique challenges effectively. These shortcomings not only undermine learning outcomes but also risk disengaging learners from culturally distant contexts. Addressing these challenges requires a teaching model that integrates cultural responsiveness, adaptive learning strategies, and personalised support mechanisms.

4. Construction of a Personalised Teaching Model

4.1 Principles of Model Design

The design of a personalised teaching model for MOOC-based SLA should adhere to principles of learner-centredness, adaptability, cultural inclusivity, and sustainability. Learner-centredness emphasises the need to prioritise learners' individual needs, preferences, and motivations. Adaptability requires flexible mechanisms that adjust learning pathways and resources according to real-time performance and evolving goals. Cultural inclusivity ensures that teaching respects and integrates diverse cultural perspectives, fostering intercultural competence alongside language proficiency. Sustainability focuses on creating a model that not only meets immediate learning goals but also supports lifelong language learning and intercultural engagement. This integrated approach

ensures that personalised learning addresses differences in cognitive processes while leveraging technological and pedagogical innovations to enhance SLA effectiveness.

4.2 Structural Components of the Model

The model consists of several interconnected layers designed to work synergistically. At the foundation is cultural-cognitive profiling, which uses diagnostic tools to identify learners' cognitive styles, cultural orientations, and language proficiency levels. This profiling informs the adaptive learning layer, where AI and data analytics tailor content sequencing, adjust task difficulty, and recommend personalised strategies. The interactive support layer incorporates peer collaboration, teacher guidance, and community-building activities, all designed with cultural sensitivity to maximise learner engagement. Finally, the feedback and reflection layer delivers continuous, data-driven, and culturally appropriate feedback. This layer not only tracks learners' progress but also encourages self-regulation and reflective practice, enabling learners to internalise strategies and apply them autonomously.

4.3 Integration of Technology and Pedagogy

The personalised teaching model relies on the integration of advanced technologies—such as natural language processing, learning analytics, intelligent recommendation algorithms, and adaptive assessment tools—within a culturally responsive pedagogical framework [8]. Natural language processing can enable real-time language feedback and automated content adaptation; learning analytics can track learner engagement and identify areas for targeted intervention; recommendation algorithms can suggest personalised resources and learning paths. This integration ensures that technological affordances are aligned with learners' cognitive characteristics and cultural contexts, thereby enhancing the efficiency, inclusiveness, and sustainability of SLA. For example, an AI-driven platform could dynamically adjust the difficulty of listening comprehension tasks based on a learner's proficiency while integrating culturally relevant examples drawn from the learner's own linguistic background. This convergence of technology and pedagogy forms the backbone of a responsive, personalised, and culturally aware model for MOOC-based SLA.

5. Validation of the Model

5.1 Research Design and Methodology

The personalised teaching model was piloted in a university-level English MOOC designed for learners from multiple cultural and linguistic backgrounds [9]. This context provided a rich testing ground for examining how adaptive and culturally responsive approaches could enhance second language acquisition (SLA). The research adopted a mixed-methods design, combining quantitative learning analytics with qualitative interviews to capture both measurable learning outcomes and nuanced learner experiences. Quantitative data included metrics such as login frequency, task completion rates, time spent on modules, and performance on language assessments. These data points were collected through the MOOC's learning management system (LMS) and analysed to identify patterns of engagement and proficiency development. Qualitative data were gathered via semi-structured interviews and open-ended questionnaires, enabling learners to express their perceptions of the model's adaptability, cultural relevance, and overall impact on their learning motivation. This combination of methods allowed for triangulation of results, ensuring that conclusions were grounded in both statistical evidence and learner narratives.

5.2 Evaluation Indicators

Evaluation of the model was conducted along several dimensions to ensure a comprehensive understanding of its effectiveness. Key indicators included: Learner Engagement: Measured by participation rates in discussion forums, frequency of resource access, and contributions to collaborative tasks. Course Completion Rates: Compared with baseline completion rates of similar non-personalised MOOCs to evaluate retention improvement. SLA Proficiency Gains: Assessed through pre- and post-course language tests covering listening, speaking, reading, and writing skills,

alongside self-assessment surveys. Learner Satisfaction: Collected through surveys assessing learners' perceptions of course design, cultural inclusivity, adaptive support, and overall learning experience. Special attention was given to the extent to which the model accommodated cultural and cognitive diversity. This involved examining how different learner groups—such as those with varying language proficiency levels or cultural backgrounds—responded to adaptive scaffolding and culturally inclusive content.

5.3 Empirical Findings

The empirical findings revealed that the personalised teaching model had a significant positive impact on learner motivation, engagement, and SLA outcomes compared with traditional MOOC models [10]. Quantitative data showed increases in task completion rates by over 25% and a notable rise in forum participation, indicating higher levels of active engagement. Learners demonstrated measurable proficiency gains, with average scores improving by 15–20% across key language skills. Qualitative data provided deeper insights: learners reported that the model's adaptive features allowed them to work at their own pace, reducing cognitive overload and improving confidence. Cultural-cognitive profiling was particularly valued, as it allowed learners to work with materials and activities aligned with their cultural preferences and cognitive styles. Many participants highlighted that tasks felt more personally relevant and motivating, leading to stronger intrinsic motivation to continue learning. Furthermore, learners expressed that the integration of culturally diverse examples enhanced their intercultural competence and made the learning process more meaningful.

5.4 Implications of Findings

The findings have several important implications for the future of SLA in MOOCs and the broader field of language education. Firstly, they demonstrate the feasibility and effectiveness of integrating technological personalisation with cultural inclusivity to address diverse learner needs. The success of the pilot suggests that adaptive, culturally responsive models can significantly improve learner engagement and retention while fostering deeper language proficiency [11]. Secondly, the results underline the importance of cultural-cognitive profiling and adaptive scaffolding in supporting motivation and equitable learning outcomes. By addressing both cognitive diversity and cultural differences, the model contributes to reducing learning disparities in large-scale online education environments. Thirdly, the positive learner feedback emphasises the value of integrating learner voice into course design, ensuring that pedagogy aligns with learner expectations and aspirations.

These findings suggest that future SLA initiatives in MOOCs should adopt similar frameworks that combine data-driven adaptation, cultural sensitivity, and learner-centred pedagogy. This approach can transform MOOCs from standardised, passive learning environments into dynamic, personalised, and culturally inclusive spaces that support sustained engagement and equitable outcomes. Ultimately, the study provides both theoretical and practical evidence for rethinking MOOC design in SLA, encouraging educators, institutions, and industry partners to collaborate in developing intelligent and culturally responsive language learning ecosystems.

6. Conclusion

This study constructs and validates a personalised teaching model for MOOC-assisted SLA under cross-cultural cognitive differences. By integrating cultural profiling, adaptive technologies, and feedback mechanisms, the model effectively addresses the limitations of current MOOC practices and significantly enhances learners' motivation, engagement, and outcomes. The results confirm that culturally responsive personalisation is both feasible and effective, providing a sustainable pathway for SLA in digital environments. Future research should expand the empirical scope, deepen the application of AI, and further refine cultural inclusivity to optimise the long-term development of personalised teaching models.

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