

The Effectiveness and Implications of Language Localization with Machine Translation in Mobile-Assisted Language Learning

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Abstract

Mobile-assisted language learning (MALL) and machine translation (MT) as the typical language representation and processing applications in humans and machines, respectively, have garnered significant attention over the past two decades owing to the rapid advancements in artificial intelligence. However, there remains a notable absence of investigation into the relationship between MT and foreign language teaching and learning. One of the surprising absences is the investigation of the role(s) of MT beyond the language classroom—how MT can help learners actively and autonomously learn a foreign language. This study posits that MALL applications leverage MT as foundational elements of human language learning, thereby raising issues pertaining to usability and localization. In applications of this type, learning happens via translation-based activities while evaluation is performed by comparing learners' responses to a large set of human-acceptable translations. Employing a mixed-methods research approach, this study employs Duolingo as a case study to assess the effectiveness of MALL application localization with MT. The implications of the findings are discussed, offering insights for researchers and MALL developers seeking to enhance the integration of MT. This inquiry aims to contribute to the ongoing improvement and refinement of MALL applications. Meanwhile, by examining the user experiences of MALL application users, the study seeks to elucidate the impact of localization challenges on learner motivation and effectiveness.

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Introduction

In the dynamic landscape of language education, the fusion of technology and pedagogy has given rise to innovative approaches that transcend traditional classroom boundaries. Mobile-assisted language learning (MALL) and machine translation (MT) have garnered substantial attention over the past decades (Duman et al., 2015; Lee, 2023; Loewen et al., 2019). These technologies represent novel applications for both human and machine language representation and processing. While substantial efforts have been made to explore the roles that MT plays in language education, the potential of MT as a tool for autonomous learning beyond the classroom remains under-explored (Chatzikoumi, 2020).

With the increasing need for learning more languages in today's globalized world, MALL applications, such as Duolingo, have become prevalent. These applications often employ MT as foundational components in the process of human language acquisition, raising concerns related to usability and localization, which may affect the effectiveness and motivation for language learning (Loewen et al., 2019). This research aims to investigate the intricacies of MALL application localization using Duolingo as a case study. Employing a mixed-method research approach, this study scrutinizes the mechanics of MT integration and its implications on user motivation and effectiveness.

Literature Review

Mobile-Assisted Language Learning (MALL) and Machine Translation (MT)

Computer-assisted language learning (CALL) has become normalized in the realm of language learning, involving learners acquiring language skills using computer technologies (Egbert, 2005). MALL, a subset of CALL, represents the integration of mobile technology into language education. Previous studies have shown that MALL applications can be as effective as traditional face-to-face language courses (Kessler et al., 2023; Vesselinov & Grego, 2012). However, research into the effectiveness of MALL for language development has been critiqued for its limited objective, quantifiable measures of learning outcomes (Burston, 2014a, 2014b; Shadiev et al., 2017).

MT has been transforming the way students engage with language acquisition, particularly in classroom settings (Clifford et al., 2013). Despite its recognized role, there remains a gap in understanding MT's effectiveness in informal, autonomous learning contexts. This study aims to address this gap by focusing on MALL applications like Duolingo, which utilize MT as a core component.

Duolingo

Launched in 2011, Duolingo is the largest language learning platform as of February 2023, offering 95 languages to over 575 million users (UNESCO, 2007). Duolingo employs a crowdsourcing model where users help translate content, contributing to the language curriculum. This interaction suggests a symbiotic relationship between human and machine processes in language learning, similar to the training of neural machine translation (NMT) models (Caines et al., 2023).

Academic perspectives on Duolingo focus on output performance and user experience. Studies have demonstrated that Duolingo can enhance foreign language proficiency and covers a wide range of languages (Noah, 2019). However, these studies often overlook variables such as motivation, language background, and demographics (Shortt et al., 2023). Additionally, the app's user experience, closely tied to its design, is critical in assessing its effectiveness. Despite the emphasis on gamification features, comprehensive insights into the technology-teaching-learning nexus are lacking (Huynh et al., 2018).

Theoretical Frameworks

Language Transfer

Language transfer plays a vital role in MALL applications' design which are normally ignored. Language transfer theory posits that learners' native language influences the acquisition of a new language, transferring linguistic elements at various levels (Kellerman, 1983). This study considers how learners' first and second languages affect the acquisition of a third language, which can inform what language pairs might present more significant challenges and require more tailored MT support to enhance learning efficiency (Odlin, 1989), thus helping design challenging and pedagogically sound translation tasks.

Technology Acceptance Model (TAM)

The technology acceptance model (TAM) explains how users come to accept and use technology, focusing on perceived ease of use and usefulness

(Moore & Benbasat, 1991). This study applies TAM to assess the acceptance of MALL applications, emphasizing the role of localization in influencing user attitudes and motivation (Abbasi et al., 2015).

Language Localization

Localization involves adapting software to meet the linguistic, cultural, and functional requirements of specific locales. Effective language localization in software, like Duolingo, offers multiple learning options, allowing users to choose their native and target languages. This process goes beyond translation, involving the adaptation of interface instructions and feedback to the user's language (Pym, 2001; Sandrini, 2008).

Methodology

Data Collection

This study employs a mixed-method approach, utilizing a questionnaire and semi-structured interviews to investigate the impact of localization on the effectiveness of Duolingo. The questionnaire, adapted from Rosell-Aguilar (2018), included multiple-choice, Likert scale, and open-ended questions. It was distributed online in English and simplified Chinese, collecting 66 valid responses. Semi-structured interviews with three participants provided qualitative insights into their experiences with Duolingo's localization. Participants' L1s, target language, medium of instruction and their using experience of Duolingo were varied.

Results and Discussion

From 71 respondents, the data revealed that Duolingo's localization is generally effective but faces challenges when used in non-native languages as the medium of instruction (language learning profile can be seen in Table 1). Most users preferred learning through their native language for better clarity and motivation, aligning with TAM's emphasis on ease of use. Participants using English as the medium for typologically distant languages reported confusion and decreased motivation. This was echoed in interviews, where structural differences between languages caused difficulties. Participants expressed a preference for learning through their native language, underscoring the need for improved localization in MALL applications. Proper localization, considering linguistic and cultural contexts, enhances user engagement and learning effectiveness.

Table 1. Language learning profile

L1s		Target language(s)		Medium of instruction	
Mandarin Chinese	51	Czech	1	English	68
Dutch	6	Dutch	20	Chinese	18
English	4	Spanish	15	Dutch	6
German	1	French	12	German	3
Estonia	1	Italian	9	French	2
Irish	1	Norwegian (Bökmal)	4		
French	3	Japanese	5		
Spanish	4	German	7		

The thematic analysis of the interviews identified three themes in terms of MT and LLM integration:

- **Language translatability:** Duolingo offers courses considering language transfer, making learning easier for languages with high translatability (e.g., German-Dutch).
- **Training humans as machines:** MT systems and human learning both rely on extensive language data exposure, with Duolingo effectively aiding vocabulary acquisition.
- **Language rights:** Proper localization respects linguistic human rights, ensuring equitable access to language resources. Insufficient localization can exclude learners with low proficiency in the instructional language, emphasizing the need for improved MALL localization.

The study's findings indicate that while MT can facilitate language learning by providing immediate translations and feedback, its effectiveness is significantly influenced by the degree of localization. Proper localization, considering both linguistic and cultural contexts, can enhance user engagement and motivation, making the learning process more effective.

Conclusion

This study highlights the critical role of localization in the effectiveness and user experience of MALL applications like Duolingo. By integrating MT and emphasizing language transfer and TAM frameworks, the research provides valuable insights for developers and researchers. The findings show that users'

proficiency in the instructional language and the typological distance between languages significantly impact their learning experience and motivation. Future studies should explore broader contexts and diverse language pairs to further understand the impact of localization on language learning outcomes.

The implications of this research extend to the design and development of MALL applications, suggesting that developers should prioritize comprehensive localization strategies. This includes not only linguistic translation but also cultural adaptation to ensure that learners from various backgrounds find the content relatable and engaging. Such approaches can significantly enhance the effectiveness of language learning technologies, ultimately contributing to more accessible and efficient language education in a globalized world.

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