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What Language Learning Apps Can Learn from Linguistics Theories

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Abstract: Language learning apps like Duolingo have become a popular way for people to study new languages. However, research shows that while these apps are good at helping users build vocabulary and basic grammar, the learners often struggle to develop fluency, cultural understanding, and real-time communication skills. This study applies linguistics and cognitive theories, such as Skinner's behavioral model, Krashen's Input Hypothesis, Vygotsky's Sociocultural Theory, and Field's and Hulstijn's psycholinguistic perspectives to assess Duolingo's learning structure and outcomes. The findings show that Duolingo focuses heavily on repetition, rewards, and habit formation, but offers limited opportunities for real conversations or complex thinking in the target language. Based on these theories, the study suggests that language apps could be improved by including more authentic language input, opportunities for social interaction, and activities that strengthen both working memory and long-term language skills. Overall, while apps like Duolingo are useful tools for beginners, deeper cognitive and social engagement is needed to help learners achieve real-world language proficiency.

Keywords: linguistic theories, Duolingo, language learning apps, language proficiency, psycholinguistic perspectives.

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INTRODUCTION

The rapid expansion of language learning apps has reshaped how people approach second-language acquisition. As of 2021, Duolingo reported over 500 million registered users, making it one of the most popular language-learning platforms [1]. However, despite their accessibility and gamification, studies suggest that these apps may not be effective for comprehensive learning mastery. For instance Metruk [2] found that while Slovak EFL students benefited in vocabulary acquisition, they struggled with fluency and real-time communication. Similarly, Chen [3] evaluated mobile language apps and concluded that they often lack cultural context and meaningful conversation practice. Vesselinov and Grego [4] found that while Duolingo users improved in vocabulary and grammar, they struggled with speaking and fluency compared to traditional classroom learners. As more people rely on technology for language learning, it is crucial to assess whether these apps can truly replace traditional methods or if they serve better as supplementary tools [3]. As the abovementioned other similar studies show, there are inefficiencies in the language learning apps compared to the traditional learning approaches. However, while Vesselinov and Grego [4] examined these comparative inefficiencies, no study has analyzed these apps from cognitive and linguistic perspectives. Understanding these strengths and limitations can help improve language education and ensure that learners achieve meaningful progress. This study aims to fill this gap, drawing on the literature on cognitive processes involved in second language acquisition. More specifically, the research questions guiding this study are: 1) How did Duolingo, the most prominent language learning app, structure the learning experiences? 2) What aspects of that learning experience can be improved, considering the perspectives of language learning theories?

The study suggests strategies that can improve the learning experience by incorporating more authentic and socially interactive learning opportunities based on the insights from the linguistic theories.

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LITERATURE REVIEW

Language learning theories

Second language acquisition (SLA) has long been a central area of study in applied linguistics, grounded in both cognitive theories and pedagogical practices that shape how languages are learned. One of the most well-known and influential models is Skinner's [5], which focused on language learning as a behavior that is acquired through conditioning. In his book "Verbal Behavior" he argued that language is learned through stimulus-response associations, imitation, repetition and reinforcement, rather than being an innate ability. Skinner's ideas form the backbone of many app-based language learning platforms, such as Duolingo, where learners engage in repetitive exercises and receive instant feedback.

Krashen's Input Hypothesis [6] offers a more progressive view on language learning. It states that learners improve their language skills when they understand input that is just beyond their current level of proficiency. Krashen called this level of input "i+1", where "i" is the learner's interlanguage, or the learner's initial language proficiency, and "+1" is the next stage of language acquisition. According to Krashen, this input allows learners to naturally understand and absorb the language without the need for explicit grammar instruction or rote memorization. While Krashen's theory has been foundational, it doesn't fully account for all the complexities of language learning, especially in today's digital age. For instance, Vygotsky's [7] Sociocultural Theory emphasizes the importance of social interaction and collaborative learning in SLA.

Vygotsky argued that language acquisition is a social activity, shaped by interactions with others, and scaffolded by more knowledgeable individuals, such as teachers or peers. Field's [8] psycholinguistic perspective explains how our minds handle language, from understanding and producing speech to storing vocabulary andgrammar. He emphasizes that language use relies on both working memory and long-term memory. Working memory helps a learner hold and process information they are currently using, such as repeating a phrase to remember it. Long-term memory, on the other hand, stores the knowledge of sounds, words, and grammar. Interestingly, rather than following fixed rules, learners' brains seem to store real examples of the language heard, making learning an adaptive and experience-based process. Field also discussed how sounds (phonology), words (lexis), and grammar are mentally organized. For example, rather than having one "perfect" version of a sound, the brain collects multiple versions based on what was heard over time. This helps a learner understand different accents or pronunciations. Similarly, when accessing vocabulary, language students use a network of associations by meaning, sound, and usage, which help them recognize and produce language quickly. He also notes that common phrases or "chunks" of language are stored as units, making speech production faster and more efficient.

Hulstijn's [9] research extensively addresses the distinction between implicit and explicit linguistic knowledge, focusing particularly on how these play a role in second language (L2) acquisition. According to Hulstijn, implicit knowledge is crucial for fluent and automatic language use, operating unconsciously and rapidly in real-time communication. He characterizes implicit knowledge as being non-verbalizable and spread across various brain regions, rather than being confined to a specific area. This form of knowledge is developed through implicit learning, which occurs incidentally when information is processed receptively, such as through listening or reading. Hulstijn emphasizes that implicit learning is an automatic process that does not require conscious effort or awareness. In contrast, explicit knowledge is conscious, verbalizable, and involves a more deliberate learning process, such as through rule learning or instruction. Explicit knowledge includes the understanding of language rules and can be accessed and articulated consciously, often being represented in symbolic form. Hulstijn highlights the transformation of explicit knowledge into implicit knowledge as a key component in achieving fluency in L2 use, a process he refers to as proceduralization. This transformation occurs when learners internalize explicit rules or facts into automatic, unconscious processes, thus enabling rapid and fluent language production. Moreover, Hulstijn's work challenges traditional views of language learning, particularly in terms of the assumption that L2 acquisition is predominantly a process of explicit rule application. His research suggests that, while explicit learning is essential, it is ultimately the implicit knowledge that supports fluency and proficiency in a second language.

Hulstijn's work explored the cognitive processes involved in the four language skills: speaking, listening, reading, and writing, focusing on the role of implicit and explicit knowledge in their acquisition and processing. For speaking, Hulstijn follows the multi-

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stage model of speech production, emphasizing the role of implicit knowledge in automatic word retrieval and the use of explicit knowledge in conscious speech planning. He notes the tip-of-the-tongue phenomenon as a key example of the distinction between these two types of knowledge. In listening, Hulstijn explains that while listening might seem like speaking in reverse, it involves distinct processes. Word recognition, driven by frequency, is central to listening comprehension, and both implicit knowledge (for automatic recognition) and explicit knowledge (for syntactic and semantic understanding) are required. In reading, Hulstijn highlights that metalinguistic awareness is necessary for fluency. Difficulties in reading are often linked to problems with encoding phonetic information. Successful reading requires both word recognition and the integration of these words into larger syntactic and semantic structures. For writing, Hulstijn explained the complexity of the task, where writers must balance high-level planning (text coherence) with low-level automatic processing (word retrieval and spelling). Skilled writers use less cognitive effort on word retrieval, allowing them to focus on higher-order aspects of writing.

Language learning apps

Language learning apps are built to make learning convenient and accessible. Most of them break lessons into small chunks, use a lot of repetition, and try to keep users motivated through gamified elements like streaks, badges, and levels. The idea is that if it feels more like a game than a class, people will stick with it longer. These apps are usually great at helping with vocabulary, grammar drills, and pronunciation basics, but they can struggle to teach the kind of language skills that come from real conversation and interaction [2]. Duolingo is one of the most popular language apps out there, and it uses a mix of methods to help people learn. Its design is very much based on behaviorist ideas, i.e., it teaches through repetition and rewards. For example, when students get something right, they earn points or unlock the next lesson. It also encourages daily use through streaks and reminders, which help learners, build a habit. As Gupta's [10] review of Duolingo stated, lessons are short and structured, focusing on tasks like translating sentences, matching words, and filling in blanks. The app adjusts the level as the learner progresses, but the structure stays the same. There are some speaking and listening tasks, but they're often basic and don't feel like real-life conversations. Duolingo helps learn new vocabulary and simple sentence patterns, but it doesn't go very deep into real-world language use or cultural context. Its pedagogy leans heavily on memorization and repetition, which has a limited utility, with more benefits for beginners. But once learners move past the basics, they might find that Duolingo doesn't offer much support for becoming fluent or having natural conversations [10].

ANALYSIS AND DISCUSSION

Even though Duolingo is fun and motivating, there are a few key ways it could be improved to help people become fluent in a language. Based on Krashen's Input Hypothesis, which says learners need to be exposed to slightly more advanced language ("i+1"), Duolingo doesn't always provide that kind of challenge. A lot of the lessons feel repetitive and isolated from a real-world context. Therefore, from Krashen's perspective, adding more stories, real conversations, or themed situations could help users absorb the language more naturally and effectively use it outside the app environment. Also, from Vygotsky's Sociocultural Theory, which emphasizes learning through social interaction, Duolingo falls short by not incorporating such elements. Students mostly learn alone, clicking through exercises. Language isn't just about vocabulary; it's about using it in academic, professional, or social environments. Duolingo could significantly improve its effectiveness if it had features like conversation practice with other learners as part of its basic learning experience. That kind of interaction would help people feel more confident using the language in real situations. While the platform has live chat with AI characters or tutors, these features are paid ones and are not freely available.

Finally, from a psycholinguistic perspective, argued by Field [8] and Hulstijn [9], learners need lots of real-time speaking and listening to build fluency. Duolingo's tasks are usually slow-paced and don't require much thinking on one's feet. The app could push users to practice more by including longer listening passages, quick-response speaking tasks, or even writing prompts that make learners create language instead of just choosing suitable answers from a list. This way, in Hulstijn's [9] view, by increasing the complexity of the language communication task, the learners will employ high-level planning (text coherence) with low-level automatic processing (word retrieval and spelling), instead of only filling in gaps in exercises. Moreover, according to Fied [8], structuring Duolingo's learning experience in a way that engages both the working and long-term memory will increase the learners' fluency. Because working memory helps process information

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that is currently being used, such as repeating a phrase to remember it, long-term memory works with real examples of language heard, making learning an adaptive and experience-based process.

While Duolingo is a valuable tool for introducing learners to a new language and supporting consistent study habits, it could be significantly enhanced by integrating deeper, more interactive, and context-driven learning opportunities. These improvements would help bridge the gap between basic proficiency and real-world communication. For example, for a Spanish learner on Duolingo, the app cannot effectively prepare them for interaction with diverse Latin American or European Spanish speakers because it falls short in teaching the cultural nuances and regional dialects.

Therefore, in line with Chen's [3] argument, language apps like Duolingo serve better as supplementary tools and not a replacement for traditional learning methods.Conclusions The main goal of this study was to critically evaluate Duolingo's language learning structure through the lens of linguistic and cognitive theories of second language acquisition to understand both the strengths and limitations of app-based learning experiences. The analysis found that Duolingo's teaching approach is heavily grounded in behaviorist principles proposed by Skinner [5], using repetition, instant feedback, and gamification to encourage consistent study habits. With their small and manageable chunk lessons, the apps are focused primarily on vocabulary and grammar recognition, with limited emphasis on real-time conversation or cultural context. Therefore, based on the insights gleaned from the linguistic theories, language learning app creators can improve the learning experience by incorporating more authentic and socially interactive learning opportunities. For instance, drawing from Krashen's Input Hypothesis, the app needs to offer more "i+1" input, such as real-world dialogues and storytelling. Based on Vygotsky's Sociocultural Theory, Duolingo would benefit from enabling peer interaction and collaborative tasks to mirror real-life language use. Finally, applying Field's and Hulstijn's cognitive frameworks, the platform could improve by integrating activities that challenge both working and long-term memory, as well as encourage proceduralization of language knowledge through spontaneous speaking and writing exercises.

Study limitations include its concentration on one language learning app experience and not accounting for specific language experiences. First, the exclusive focus on Duolingo did not consider how other language apps structure learning, which might have provided a broader comparative analysis and more specific improvement recommendations. Second, a lack of users' experiences with different target languages (e.g., Spanish, French, Japanese) may not account for the effectiveness and challenges that vary based on the language being learned.

Future research could explore how various apps differ in applying cognitive and sociocultural learning principles. Additionally, studies could focus on learners' real- world outcomes after using language learning apps, including Duolingo, particularly in terms of speaking fluency, cultural competence, and long-term retention. Expanding research across different demographic groups and language pairs would also offer a more comprehensive understanding of the effectiveness of app-based language learning.

Abbreviations

SLA: Second Language Acquisition
L1: First Language
L2: Second Language
EFL: English as a Foreign Language

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