Investigating Mobile-Assisted Language Learning Apps: Babbel, Memrise, and Duolingo as a Case Study

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Abstract

The market for mobile-assisted language learning (MALL) apps has experienced remarkable growth in recent years, with many learners now relying on these apps to learn languages. However, research on the effectiveness of such language learning tools remains scant. In this study, we provide an adapted app evaluation rubric to fill the gap in the literature. We evaluate three selected apps based on the standards of design, content, and pedagogy, aiming to offer teachers and learners tools and tips for selecting effective language learning apps. We employ qualitative content analysis to examine Babbel, Memrise, and Duolingo. We first analyze the selected apps based on direct contact and then evaluate them using an app evaluation tool adapted for this purpose. The findings show that although they target language learners in general and can help in simply learning basic and intermediate language, MALL apps also offer many features that are beneficial for learners, mainly regarding offline functions, app support, learning goals, learning activities, and gamification. Finally, we propose implications of such results and put forward recommendations for future research.

Keywords: mobile-assisted language learning apps (MALL), app evaluation rubric, design, content, pedagogy, qualitative content analysis

1. Introduction

According to Rouse (2020), an award-winning technology expert, a mobile application, commonly referred to as a mobile app, is a computer program designed for mobile devices such as smartphones or tablet computers, typically downloaded from platforms such as the Apple Store or Google Play Store. Supyan (2017) categorized mobile apps into four types: (i) general apps, educational apps being a subset; (ii) mobile learning apps designed for learning with minimal interaction; (iii) mobile-assisted learning apps, featuring individualized instruction and bidirectional communication, with two to four pedagogical procedures for specific subjects; and (iv) MALL apps, the focus of this dissertation, characterized by individualized instruction, bidirectional communication, and four pedagogical procedures for language subjects. Furthermore, whereas some language learning apps such as Rosetta Stone and Tandem are downloadable on devices, others like Babbel and Memrise offer both online and offline functionalities. Sweeney and Moore (2012) noted that mobile applications are often developed for independent learning rather than for in-class teaching, offering functions for personalization and recording user input. Additionally, Heil et al. (2016) argued that language learning apps can identify how often errors are made, providing valuable feedback for error correction and improvement.

In this qualitative study, we aim to investigate three of the most popular MALL applications—Babbel, Memrise, and Duolingo—analyze their primary features, and provide recommendations for evaluating and selecting language learning apps for integration into teachers' and students' resources. Therefore, we aim to achieve two primary objectives: first, to delineate the key features of the three apps under scrutiny; and second, to evaluate, utilizing a meticulously constructed analytical framework, the strengths and weaknesses of the selected mobile apps across the three dimensions of design, content, and pedagogy. Consequently, the following research questions emerge:

a. Drawing on our analysis, what are the salient features of each of the three selected MALL apps?

b. Based on an app evaluation rubric, what are the strengths and weaknesses of the three studied apps in terms of

design, content, and pedagogy?

2. Presenting MALL Apps

Before evaluating the apps, we will introduce them with a focus on two interrelated elements. First, we will discuss the issue of effectiveness concerning MALL apps; and second, we will address some key features of effective applications, drawing from the descriptors of the design and pedagogical categories.

2.1 The Issue of App Effectiveness

The effectiveness of MALL apps is a current focus in education (Hirsh-Pasek et al., 2015), with diverse designs aiming to enhance learning outcomes. These educational apps serve various purposes, among which are facilitating knowledge acquisition (Hannon, 2017), providing immediate feedback (Deb et al., 2017), and engaging students in situated learning through augmented reality (Bower et al., 2014). Factors such as learner engagement, cognitive activity, goal-oriented guidance, and scaffolded and interactive learning activities contribute to effectiveness (Hirsh-Pasek et al., 2015), with additional considerations for older learners, including motivations, expectations, and previous experiences (Salmon et al., 2016). In the same vein, mechanisms such as question-prompting, automated immediate feedback, and push notifications are effective in keeping learners engaged (Byun et al., 2014; Kudo et al., 2015; Sung et al., 2016). In addition, educational psychology factors, such as the spacing and testing effects, play a crucial role in designing MALL apps, allowing students to revisit and consolidate knowledge (Ebbinghaus, 2013). As student demand for personalized learning grows (Shah et al., 2013; Wanner & Palmer, 2015) and personal mobile devices become ubiquitous, leveraging mobile app technologies to customize educational experiences becomes crucial, as emphasized by Supyan Hussin's study (2017) on effective mobile applications incorporating central pedagogical procedures and features such as individualized instruction and bidirectional learning.

2.2 Key Features of Effective Apps

Luyi Liang (2018) classified the effectiveness of MALL apps based on three elements: pedagogy, design, and curriculum. For our study, we focus on autonomous nonacademic learning rather than classroom learning, so we excluded the curriculum element. Pedagogically, effective apps include feedback mechanisms, various levels of difficulty catering to diverse proficiency levels (Krashen, 1989), integration of social context for improved vocabulary acquisition (Heil et al., 2016), gamification elements such as leaderboards and rewards for increased engagement and retention (Pechenkina et al., 2017), and personalized options fostering learner autonomy (Al-Hashash, 2007). Design features include multimedia integration for a rich learning environment, offline functionality for improved user experience (UX), minimal and appropriate use of pop-up elements, support features such as in-device email and help centers, and addressing common technical issues to enhance learning efficiency. MALL apps, often designed as games, prioritize user engagement and motivation through an easy-to-use interface, colorful images, sounds, and gamification elements (Zichermann & Cunningham, 2011).

2.3 Evaluating MALL Apps

We present this section in three subsections. In the first subsection, we explore the positive facets of MALL apps. In the second subsection, we cover the apps' drawbacks and limitations. In the final subsection, we review the literature related to the assessment of language learning apps.

2.3.1. The Benefits of MALL Apps

Applying Illeris's three-dimensional learning theory (2009) to the practical case study of MALL apps, and considering relevant literature (Liang, 2018), in this analysis we examine language learning apps from six dimensions: cognition, emotion, society, multimedia, self-study, and inclusion. Language learning apps, through storing information on devices, impact the cognitive dimension by reducing mental effort (Pachler, 2009). Affective development is influenced positively through motivational and rewarding learning experiences (Niño, 2015). The sociocultural dimension makes learning communication accessible and meaningful (Pachler, 2009). Apps support autonomous learning, fostering adaptability and self-monitoring (Wu & Marek, 2016). The multimedia dimension enriches the educational setting through the integration of text, audio, pictures, and video (Wu & Marek, 2016). Further, apps can broaden the scope of education, benefiting learners with special needs and interests (Quick, 2014). Typically, learners demonstrate a favorable disposition regarding mobile apps, finding them valuable, motivational, convenient, and time-saving (Kim et al., 2013; Zou & Li, 2015). Despite the promising features of portability, affordability, connectivity, error detection, personalization, and multimedia use, it is essential to take into account the benefits of language learning apps for teachers and learners, offering required training and assistance (Rosell-Aguilar, 2007).

2.3.2 The Drawbacks of MALL Apps

Despite the positive affordances of MALL in language learning, researchers emphasize the importance of acknowledging their limitations. First, some apps are designed for specific systems, limiting student access to different platforms (Bárcena et al., 2015). Second, language learning apps tend to prioritize vocabulary acquisition and listening comprehension over other language skills, often targeting tertiary learners at the expense of primary and secondary learners (Burston, 2014). Third, some mobile apps lack meaningful feedback and instructional support, reflecting a knowledge gap between developers and educators, thus diminishing their pedagogical usefulness (Kim et al., 2013). Fourth, limited feedback and instructional guidance, and a primary focus on technical rather than pedagogical issues, pose challenges (Rosell-Aguilar, 2007). Furthermore, these apps focus on cognitive and receptive language skills, neglecting sociocognitive activities and productive language skills, deviating from modern MALL approaches (Kim & Kwon, 2012). Finally, MALL apps, which are predominantly second language (L2)-focused on English and geared toward adults, often replicate teacher-centered, individualized, short-term approaches with limited positive learning outcomes (Burston, 2014; Rosell-Aguilar, 2007).

2.3.3 The Evaluation of MALL Apps

The growing interest in MALL applications requires a critical examination of both their potential benefits and limitations. Despite the increasing popularity of these apps, caution is urged because they are often developed by individuals outside the field of L2 pedagogy, raising concerns about their effectiveness (Nushi & Jenabzadeh, 2016). Teachers and learners face challenges in selecting suitable language learning apps, with learners relying on friends, media, and app descriptions that may misalign with the actual user experience (Chik, 2014; Larkin, 2013). Many researchers have proposed various frameworks for evaluating education apps, including criteria such as technical aspects, design, curriculum relevance, authenticity, navigation, support, accessibility, security, multimedia quality, usability, price, feedback, interaction, and instructions (Chen, 2016; Kim & Kwon, 2012; Martin-Monje et al., 2014; Rosell-Aguilar, 2017). However, most app evaluation frameworks have been teacher-oriented, and a lot of scholars have argued that autonomous users need tools to assess app suitability for their learning needs. Some academics have also highlighted app smashing, using multiple apps in conjunction for learning, as a common practice, emphasizing the need for a more comprehensive approach to app evaluation (Heil et al., 2016; Nisbet & Austin, 2013; Rodríguez-Arancón et al., 2013; Rosell-Aguilar, 2017; Sweeney and Moore, 2012).

3. Research Method

The research method in this study is predominantly qualitative. As highlighted by Creswell (2007), qualitative research involves examining text or images to elucidate the key aspects of the subject matter being investigated, contrasting with reliance on statistical methods. Findings are conveyed via themes and overarching categories. Overall, in this study, we employed qualitative investigation to understand the attributes of mobile applications. We conducted both data collection and analysis through content analysis.

3.1 Sampling Units

The research sample comprises three mobile language learning applications: Babbel, Memrise, and Duolingo, chosen from the Android platform, because it is utilized by nearly half of smartphone users (Kim & Kwon, 2012). The selection process involved a Google Play store search, focusing on free language learning apps for L2 learning designed for adults. We chose each app based on its availability in the Google Play store and specific criteria, including being free, mobile, designed for adult language learners, and offering services across various language learning domains. We further narrowed down the top six apps to three—a four-skill app, a vocabulary app, and a grammar app—based on factors such as popularity, price, age-appropriateness, and content variety. The following steps involved categorizing the apps into language skills, vocabulary, and grammar groups, followed by a detailed description, analysis, and evaluation of each app's strengths and weaknesses. With the selection process, we aimed to provide a comprehensive sample for studying different aspects of language learning, including vocabulary, grammar, reading, writing, speaking, and listening skills. The research methodology is guided by a combination of research questions and the need for a well-rounded sample in the MALL context. The following table shows the selected apps, along with their logos, ratings, and categories.

Table 1. Selected Apps, Ratings, and Categories

App Set	App Logo	App Name	Google Play Rating	Language Area
MALL Apps		Babbel	4.5 stars (900,967 reviews)	Four skills
		Memrise	4.5 stars (1,428,840 reviews)	Vocabulary
		Duolingo	4.6 stars (20,482,024 reviews)	Grammar

Note: We obtained all ratings on February 5, 2024.

3.2 Research Procedure

In this section, we outline the study materials and research procedure employed for data access, exploration, and storage in the research project. We used the Huawei Y9 smartphone and Google Play store to access data from the three selected language learning apps. We recorded data through screenshots and documents during the study, emphasizing the importance of this method in creating lasting documentation of temporary occurrences. Following Krippendoff's (2004) insights, data recording offers benefits such as bridging gaps between texts and interpretations, enabling temporal comparisons, and facilitating replication by other researchers. We downloaded and explored the selected apps, recording experiences in detail through Word documents and storing them locally. The screenshots captured app activities, including app descriptions and content. The selection process involved a search for "language learning apps" on the Google Play store, narrowing down to free, popular apps in language areas, and eventually selecting three age-appropriate language learning apps. We thoroughly investigated each app to ensure legitimacy and relevance for adult learners, resulting in the final three apps being chosen as the study's sampling units.

3.3 Research Design

The study's design is bidimensional, examining three selected language learning apps from the perspectives of both the app producer and the researcher (the app user). The analysis begins by exploring the "app info" and detailed descriptions, presenting the app from the app developer's standpoint, followed by a comprehensive description/representation of the app's layout and content, offering the researcher's viewpoint. In the evaluation phase, we use an adapted 24-item app evaluation rubric, initially developed based on a literature review and later modified during the analysis. The evaluation framework includes three overlapping categories—app design (AD), app content (AC), and app pedagogy (AP)—each with four criteria and standards. The scoring system ranges from low (0) through medium (1) to high (2), assessing the presence of specific criteria in the studied apps. The evaluation process involves considering each app individually (phase 1) before comparing and contrasting the apps (phase 2). The 24-item framework is essential for systematically assessing and comprehensively evaluating the three apps under study.

4. Analysis

In dealing with the three language learning apps of this study, we move on from reading about the apps (theory) to studying them (practice). The apps under scrutiny are Babbel, Memrise, and Duolingo. The analysis of the three apps consists of two components: app description and app content. First, in the "app description" segment, we present the app from the viewpoint of the app developer, relying on two elements: an "app info" format, and the description of the app by its developers. Second, in "app content," we provide a comprehensive analysis, supported by illustrative screenshots extracted from the apps, detailing our firsthand experience exploring both the layout and the substance of each of these three applications.

4.1 Babbel

4.1.1 Babbel Description

Babbel, a subscription-based language learning application, prioritizes academic methods and proven strategies to facilitate efficient language acquisition. Offering 14 learning languages, it promises a rapid progression toward practical conversation skills. Whereas the free version includes a few lessons, the premium subscription unlocks a

comprehensive learning experience. With 12 years of existence, Babbel ranks among the most downloaded language apps, available on both Google Play and the Apple Store. Its tailored courses, designed by language experts, aim to enable users to speak confidently and effectively in a new language. Bite-sized, interactive lessons accommodate busy schedules, covering various contexts such as travel, work, and daily life. The app targets all language skills (a four-skill app) and employs speech recognition technology for enhanced pronunciation. Furthermore, Babbel stresses retention through review features. Supported by evidence of its efficacy from Yale University and Michigan State University, where participants demonstrated significant progress in oral proficiency, grammar, and vocabulary, Babbel asserts its effectiveness in language learning.

4.1.2 Babbel Content

Babbel claims that without being expert learners, or having much free time to dedicate to learning, "Babbelonians" can start speaking a language after 3 weeks of using the app. As such, Babbel commits itself to helping users achieve three goals: (a) to speak with confidence, in that users get talking from lesson one, with conversation-based learning; (b) to learn at their pace via building a learning habit and making it part of their day; and (c) to undertake lessons that work for them, enabling them to learn with a mix of learning styles.

Upon downloading the app on Android or iOS devices, users are prompted to select their first language (L1) and target language (TL), along with their proficiency level or the option to take a placement quiz. Each course within the app comprises 12 lessons lasting 10–15 minutes, categorized into beginner, intermediate, and advanced levels. The lessons systematically introduce vocabulary through images, progressing to phrases and dialogues tailored to the learner's level to enhance conversational skills. Unlike community-driven platforms like Duolingo, Babbel relies on its in-house language experts for course materials.

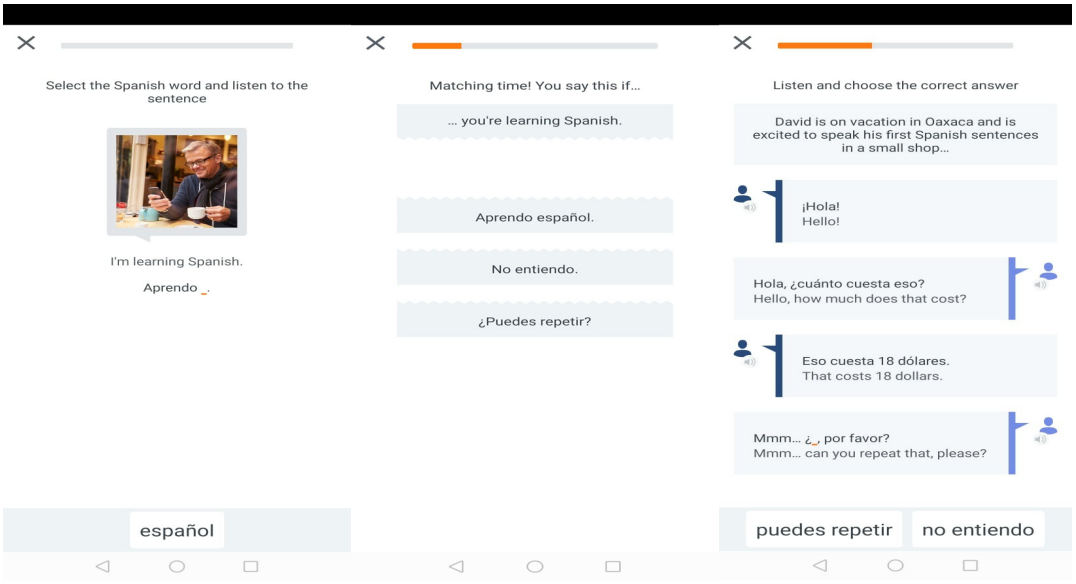

Figure 1. Babbel's Screenshots: Types of Exercises

For the sake of this review, we chose English as our L1, and Spanish as our TL. The beginner course covers fundamental topics such as greetings, self-introduction, and nationality, with the first lesson demonstrating word usage via interactive activities (see Figure 1, left). In the next stages of the course, the learner progresses to matching Spanish and English phrases while hearing native pronunciation, followed by recall exercises without visual aids, including spelling tests (see Figure 1, middle). Stage three introduces real-life conversations in Spanish, prompting learners to fill in blanks with previously learned phrases, allowing for repeated listening and response (see Figure 1, right). Stage four challenges learners to reorder words in Spanish phrases, with visual and auditory feedback indicating correctness. The final stage presents exercises without translations, offering multiple-choice options and allowing for repeated listening for comprehension. When they finish the lesson, learners receive scores and can proceed to the next lesson or review vocabulary through listening, speaking, flashcards, and writing, with textual feedback provided after each attempt. Besides, in the speaking review, learners are prompted to repeat Spanish words or phrases spoken by a native speaker, receiving feedback and a final score.

Upon completion of the first course comprising 12 lessons, learners can progress to the second course, also consisting of 12 lessons, with only the initial lesson accessible for free. The first lesson, titled “Cómo estás”? (How are you?), introduces various activities. To begin with, a “listen and repeat” exercise requires learners to reproduce Spanish phrases, facilitated by the voice recognition system with accompanying textual feedback.

The following activities include choosing correct translations from provided options, arranging words to form correct translations, and completing dialogues with appropriate words, dynamically engaging learners in context-based language use. In addition, explicit grammar instruction focuses on verb conjugation, followed by assessment tasks such as matching personal pronouns with verb forms and selecting the correct verb endings, with occasional pop-up messages explaining grammatical rules (see Figure 2).

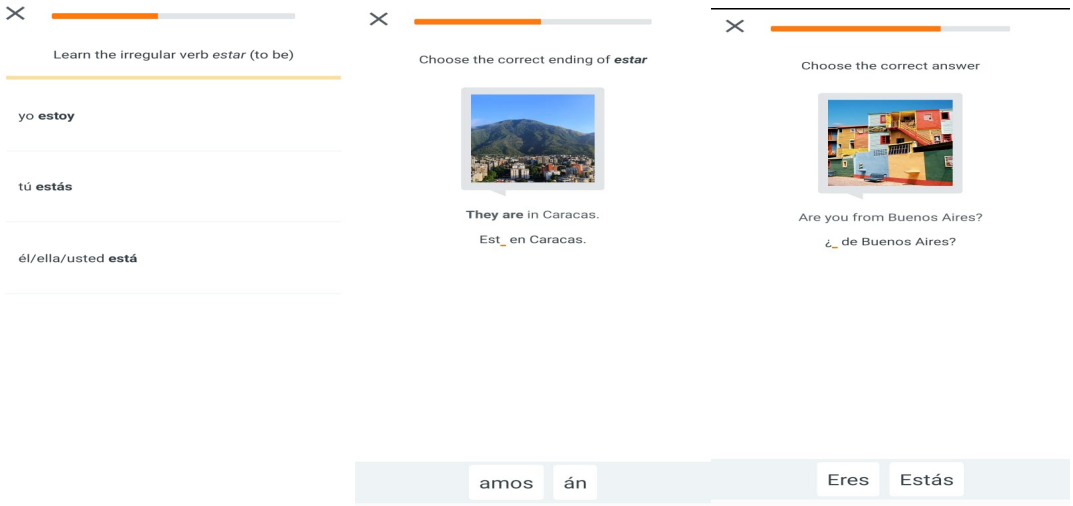

Figure 2. Babbel’s Screenshots: Grammar Learning and Grammar Testing

The following exercise tackles a more complex grammatical point, specifically, the distinction between the verbs “estar” and “ser” (to be), explained in English followed by practical exercises reinforcing the rules, such as selecting the correct verb form (see Figure 2). Pop-up messages are frequently employed to clarify grammatical rules throughout. The final activity prompts users to review vocabulary and grammar, requiring them to match English words with their Spanish equivalents and fill in missing pronouns or forms of “estar.”

Feedback is provided for correct answers, while incorrect responses are marked in red with the option to retry or view the correct answer. Similar to the conclusion of the first lesson in course 1, users receive a score and are prompted to review vocabulary using various ways. All in all, reflecting on the alignment between the app's description and actual performance, it is noted that although the free version may not fully match developer claims, upgrading to unlock extra features potentially brings it in line. However, we will save a thorough assessment to the Evaluation section for a more objective and detailed analysis.

4.2 Memrise

4.2.1 Memrise Description

Memrise, a British language platform, offers courses in 16 languages and utilizes spaced repetition of flashcards for accelerated learning. It also offers user-generated content across diverse subjects, primarily focusing on language instruction but extending to academic and nonacademic topics. With over 70 million users, the app provides free basic functionality, with more than 90% of its content accessible for free. Users can subscribe to the Pro version for €11.99 monthly, unlocking features such as tracking progress, chatbots, grammar bots, and unlimited access to courses. Memrise emphasizes its unique approach, using “killer learning science” to speed up learning and memory retention. It also offers various activities such as games and pronunciation practice, catering to different learning styles and preferences.

4.2.2 Memrise Content

Memrise offers a unique, gamified approach to language learning, focusing on vocabulary expansion through

flashcards and mnemonic techniques. Though not as smooth as Duolingo, it supports offline learning and covers many languages. Users embark on a journey, earning points for correct answers and memorizing words and phrases using mems. The app's "scientific" formula emphasizes spaced repetition, likening memory retention to tending a garden where each new memory is nurtured. Upon signing up, users gain access to community-created content. With audio, videos, and user-generated mems, Memrise offers an immersive learning experience where users "plant" and "grow" their vocabulary.

For this review, we selected Arabic as our L1, and French as our TL, and opted for the Intermediate course on Memrise. After registering, we began with the "Words and Phrases" course, featuring multiple lessons where only the first one is free. Upon starting, learners encounter flashcards displaying words or phrases in the TL alongside their meanings in the native language. The app emphasizes not just memorization but "planting" and "growing" vocabulary. During the "planting" stage, lessons include audio, videos, and Arabic translations, with users able to create and upload their mems or choose from a selection provided by the app (see Figure 3). According to Memrise's website, a "mem" is any tool that aids in linking a word to its meaning, ranging from photos to witty remarks.

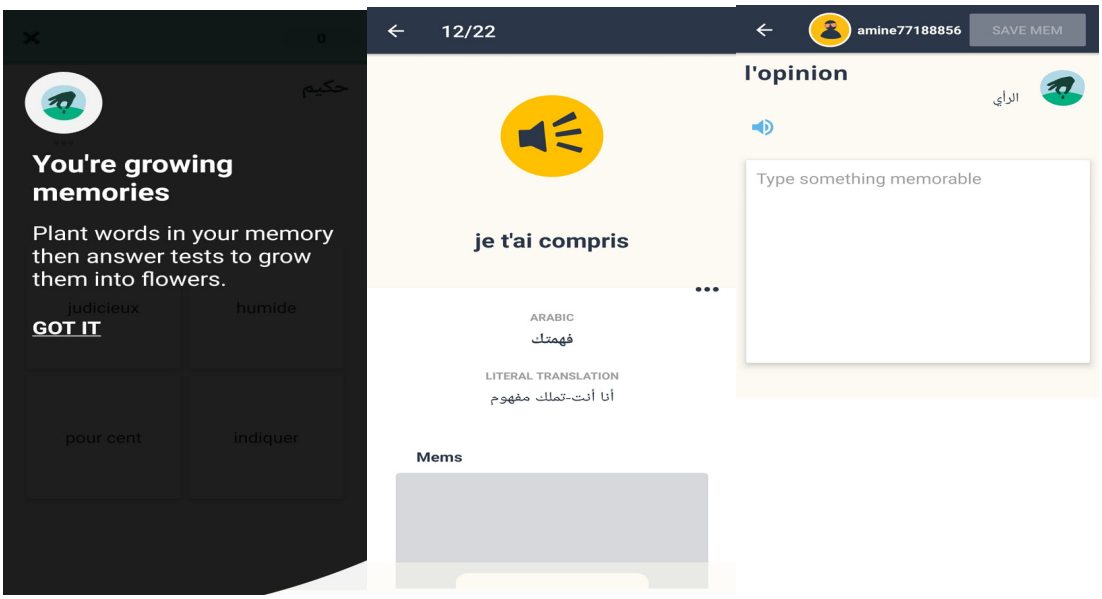

Figure 3. Memrise's Screenshots: Planting Stage; a Teaching Flashcard; Use of Mems

Users of Memrise have the option to mark words or phrases as difficult, which enables the app to detect areas of struggle. Conversely, they can also choose to ignore familiar terms to avoid unnecessary testing. The learning experience is gradual, in that it progresses from simple to complex, starting with individual words, advancing to phrases, and culminating in sentences; and it is varied because it uses various media forms such as text, images, audio, and videos.

Following the learning stage, the app moves on to testing, where users are immediately assessed on their acquired knowledge. Tests may involve selecting the correct translation of a given word/phrase from multiple options or matching audio clips to their corresponding words/phrases (see Figure 4). Furthermore, the app users may be prompted to type what they hear—by putting into order the letters of the pronounced word—with hints available for assistance in challenging moments. This multifaceted approach ensures a comprehensive learning and assessment experience for Memrise users.

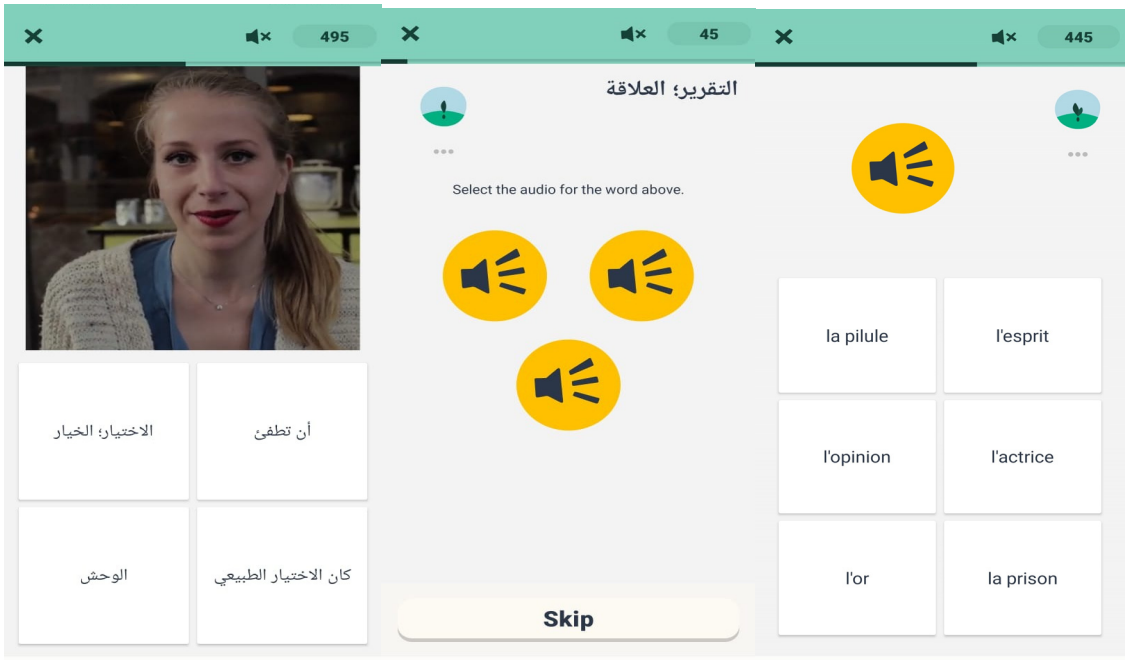

Figure 4. Memrise's Screenshots: the "Growing" Stage; Multiple Choice Exercises

The tests in Memrise can become increasingly challenging, requiring learners to arrange words in a sentence after hearing a native speaker or even sorting letters within a word. Correct answers prompt pronunciation by a native voice, whereas incorrect responses trigger sound and visual cues, guiding learners back to flashcards and mems for further practice until proficiency is achieved. Upon completion, learners receive scores and recommendations for review, with the opportunity to advance in rank based on progress.

Memrise settings allow customization of learning preferences, dictating the pace and content of sessions. Review options include classic review (retaking the same exercises of the presentation stage), speed review (reviewing under the pressure of time), difficult words, pronunciation, learning with locals, and listening skills, each designed to reinforce learning through various activities. Although the Pro version offers additional features, including access to all languages and courses, the app's content generally aligns with its marketing. We provide a more comprehensive assessment in Section 5 of this article.

4.3 Duolingo

4.3.1 Duolingo Description

Duolingo offers a language learning website, a mobile app, and a digital language proficiency assessment exam, aiming to provide free and enjoyable language education to anyone with internet access. Released on May 29, 2023, Duolingo ranks as the most downloaded language app globally and boasts a user base exceeding 300 million, owing to its interactive interface, frequent updates, and accessibility across multiple devices. The app offers 40 languages, expanding its range continuously through community contributions. Although it operates on a freemium model, offering free access alongside premium services, Duolingo emphasizes fun, free, and accessible language education, enabling learners to practice the language while progressing through bite-sized lessons and tracking progress. Praised by media outlets and users alike, it is heralded as a revolutionary approach to language learning.

4.3.2 Duolingo Content

Duolingo simplifies learning by organizing courses into various topics and grammatical subjects, allowing users to interpret text and audio while offering flexibility in answering activities, including typing, speaking, and selecting answers. Its user-friendly interface enables easy initiation, offering bite-sized lessons akin to playing a game. Employing text, pictures, and audio, Duolingo associates translations with visuals and reinforces learning through manual translation. Progression entails tackling increasingly challenging tasks, with the option to test out multiple sections at once through adaptive testing.

Upon selecting Arabic as TL and English as L1, we were prompted to choose a learning motivation and then a daily practice goal. After that, we took a placement test that adjusted difficulty based on our responses. The test involved

translating written sentences and identifying spoken ones in either “Ordinary” or “Turtle” mode. Upon completion, we earned “Gems”. Duolingo's structure comprises skills divided into levels and lessons, with learners progressing through each level to unlock subsequent skills. Regular notifications encourage learners to achieve their daily goals while revisiting previously learned skills is incentivized with experience points and “Hearts”, for practice (see Figure 5).

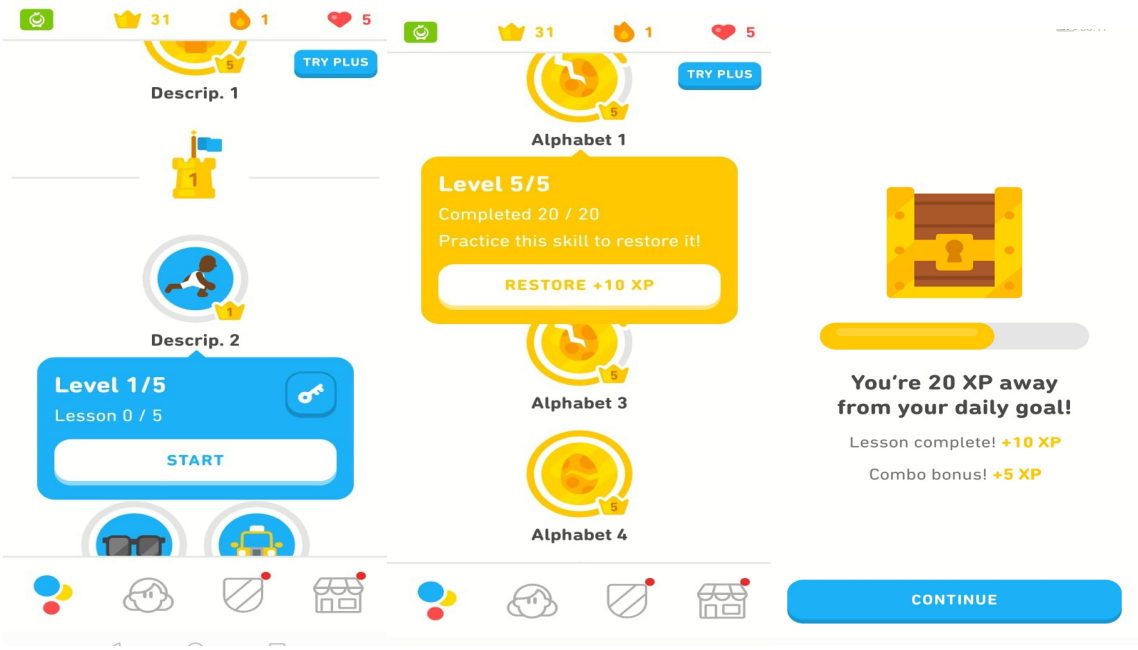

Figure 5. Duolingo’s Screenshots: Lessons & Levels; “Practice” Message; “Daily Goal” Message

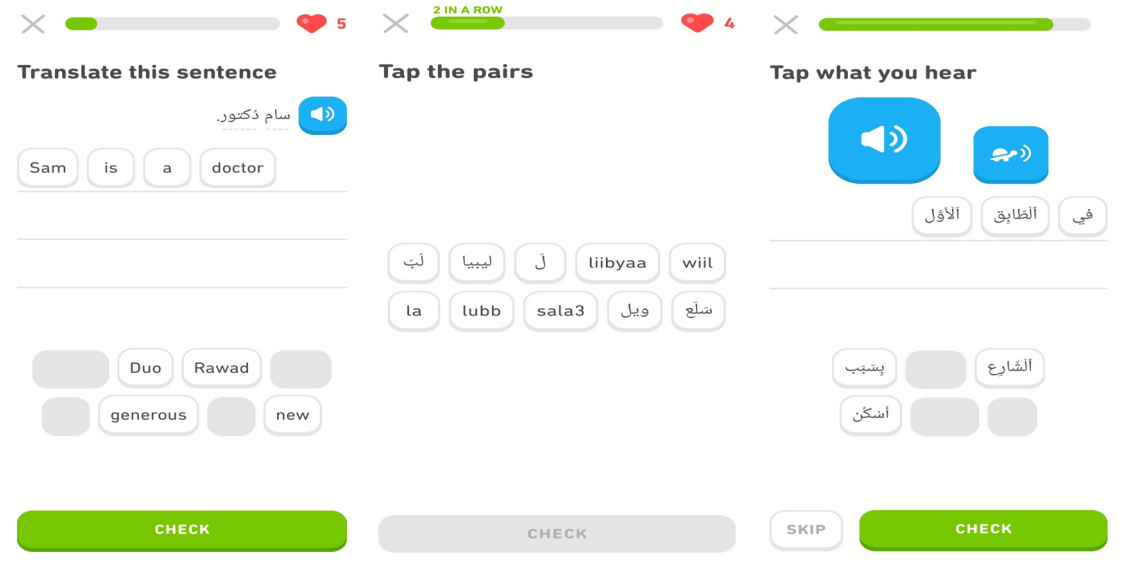

Figure 6. Duolingo’s Screenshots: Sample Exercises

In each lesson, learners encounter 10–15 exercises covering various categories, with a progress bar indicating advancement. Correct answers move the bar forward, while mistakes prompt feedback and repetition until completion. Duolingo allows users to revisit lessons at their convenience. Upgrading to Super Duolingo offers an ad-free experience, unlimited “Hearts,” offline lesson saving, and enhanced features, with a 7-day free trial available. The exercises include translation (from L1 to TL, and vice versa), word pairing (matching words from L1 and TL),

and listening tasks (typing/tapping words, phrases, and sentences correctly), providing learners with effective language skill practice (see Figure 6).

Duolingo provides diverse exercise types, including matching and speaking tasks, alongside its translation, pairing, and listening exercises. Upon reaching daily goals, learners receive rewarding sounds and visuals, encouraging continued engagement. The app sends push notifications to remind users to practice, often accompanied by motivational messages. Duolingo intelligently recognizes typos and offers personalized exercises through the "Dumbbell" feature, aiming to improve individual weaknesses. It is worth noting that although Duolingo provides a productive experience for its users, the app analysis does not fully support the promotional claims made about the app's superiority.

Finally, in this section, we examined three language learning apps: Babbel, Memrise, and Duolingo. We commenced with Babbel, a freemium app and one of Android's most downloaded applications. For the study, we opted for English as our L1 and Spanish as our TL, documenting our Spanish learning journey with the app. Next, we explored Memrise, another freemium app, recognized for its rapid growth. With Memrise, we selected Arabic as our L1 and French as our TL, using its flashcards for learning. Finally, we tested Duolingo, renowned as the most popular language app. For Duolingo, we chose English as our L1 and Arabic as our TL, engaging in game-based learning through its user-friendly interface. In summary, the analysis of the three apps yielded divergent results, highlighting the necessity for Section 5 to provide a more objective assessment.

5. Evaluation

In this section, we compare and contrast the features of the three apps: Babbel, Memrise, and Duolingo. We use the previously outlined app evaluation rubric, segmented into three categories: app design (AD), app content (AC), and app pedagogy (AP). We further subdivide each of the four criteria of evaluation within these categories into two descriptors to provide a clear and measurable assessment. Finally, we employ a numerical rating system ranging from 0 (low) to 2 (high) to enhance the validity and reliability of the evaluation rubric and the results obtained.

5.1 App Design

Design is key in adopting apps (Deka et al., 2016). In AD, two key components are central: user interface (UI) and user experience (UX). The UI includes features like navigation, offline work, stability, and support, whereas UX pertains to aspects such as price, registration, advertising, and media. Through the study of various app evaluation rubrics and interactions with the selected apps, four common design features emerged: multimedia integration, offline functionality, in-app advertising, and app support, with the latter being a later addition to the list. These elements are prevalent themes in the reviewed literature (Martin-Monje et al., 2014; Schrock, 2013; Vincent, 2012; Walker, 2011) and significantly influence users' app preferences and experiences.

5.1.1 Multimedia

All three apps analyzed in this subsection employ multimedia elements, albeit to varying degrees, in their lessons and activities. The utilization of images, audio, and video is crucial because it enhances user engagement and caters to diverse learning styles (Beach & O'Brien, 2015; O'Brien & Voss, 2011), aligning with the multiple intelligence theory. Whereas Babbel and Duolingo primarily rely on images, audio, and text, Memrise stands out by incorporating video clips into its teaching approach, aligning with the need for apps to intentionally integrate multimedia elements (Mayer, 2014; Schwebs, 2014). Despite minor technical issues like the microphone problem in Duolingo, all apps maintain a user-friendly interface and effective use of multimedia, earning them a rating of 1 out of 2 points, with an extra point for Memrise for its exclusive and meaningful use of videos.

5.1.2 Offline Mode

The inquiry here pertains to whether the language learning app requires an internet connection to function optimally. While acknowledging that full offline functionality may not be feasible, partial offline access can significantly enhance UX, promoting flexibility (Kim et al., 2013; Miangah & Nezarat, 2012). All three apps examined in this study offer some offline capabilities, with Babbel and Memrise being particularly robust in this aspect, allowing users to download courses and access various features offline, including progress tracking. However, Duolingo falls short in comparison, offering only limited offline lessons and lacking certain features such as progress tracking and quizzes, which may push learners to raise the affective filter (Krashen, 1989). As a result, Babbel and Memrise receive a score of 2 out of 2 for their offline functionality while Duolingo receives 1 out of 2, based on our interaction with the apps.

5.1.3 In-App Advertising

In this subsection, we discuss two key inquiries: whether the app is paid or free, and if it includes distracting pop-up ads. These questions are pivotal because users prioritize pricing when selecting apps, expecting value commensurate with cost. App developers justify in-app ads as necessary for business sustainability (Sweeny & Moore, 2012), yet their timing and frequency can impact UX negatively (Chik, 2014). Babbel operates on a freemium model, offering one free lesson before requiring a monthly fee. Memrise offers limited free content, with full access through a paid subscription. Conversely, Duolingo is entirely free, with an optional ad-free premium version. Concerning pop-up ads, Duolingo is the most "ad-afflicted" of the three apps, Memrise includes fewer ads (but keeps encouraging upgrading to its Pro version), and Babbel remains ad-free. Considering both pricing and ad presence, all apps receive a score of 1 out of 2.

5.1.4 App Support

In this subsection, we address whether the three apps offer an active help section, crucial for ensuring positive UX and avoiding unwelcome high attrition rates (Berns et al., 2015; Niño, 2015). All three apps—Babbel, Memrise, and Duolingo—provide various support options, including online help centers, community forums, and email assistance. Babbel offers multiple avenues for support, while Memrise and Duolingo provide online resources and in-app support. Babbel appears to be the most responsive to user feedback, whilst Memrise and Duolingo also address user inquiries but may lack in providing personalized responses. In addition, all three apps regularly update based on user requests, earning them a full score of 2 out of 2 for app support.

Table 2. Evaluation of Language Learning Apps: App Design

Category	Criteria	Babbel	Memrise	Duolingo
5.1 App Design	5.1.1 Multimedia: the app (i) utilizes different forms of multimedia; (ii) in a didactic and meaningful way.	1	2	1
	5.1.2 Offline mode: the app (i) functions online and offline; and (ii) offers learning materials for download.	2	2	1
	5.1.3 In-app advertising: the app (i) is generous with free content; and (ii) does not contain recurring disturbing ads.	1	1	1
	5.1.4. App support: the app provides (i) various channels for support; as well as (ii) instant and personalized responses.	2	2	2

In this section, we evaluated four key AD features to assess the three language learning apps. These features include multimedia integration, offline mode access, in-app advertising, and app support. The results of the evaluation revealed that whereas some features are well-designed, others require improvement. Memrise stands out for its diverse multimedia integration and full offline access, along with strong app support. Conversely, Babbel and Duolingo have limited multimedia and offline access, with Duolingo plagued by recurring ads. Both Babbel and Memrise also offer limited free courses while Duolingo is highly generous with its free features. Overall, Memrise earns the highest score of 7 out of 8 for its well-designed features among the language learning apps assessed.

5.2 App Content

In the context of language learning apps, content revolves around the TL and the skills the app aims to impart to the learner. Through our review of relevant literature (Kim & Kwon, 2012; Liang, 2018; Rosell-Aguilar, 2017) and hands-on experience with the studied apps, we have identified four key content features for effective language learning: clear learning objectives outlining expected outcomes; comprehensive learning content covering relevant notions and skills; diverse learning activities including teaching, practice, and assessment materials; and explicit targeting of language skills and aspects. These elements serve as central pillars for designing robust and impactful language learning experiences within mobile apps.

5.2.1 Learning Objectives

In this subsection, we evaluate the clarity and measurability of learning objectives set by app designers for their courses or lessons within Babbel, Memrise, and Duolingo. Clear and measurable objectives are crucial for guiding learners and ensuring meaningful progress. Babbel's claim of users being able to speak a language after 3 weeks aligns with its well-defined learning objectives associated with each course, earning the app a score of 2 out of 2. Memrise, with its focus on joyful and scientific learning, effectively integrates measurable objectives into its

vocabulary-building approach and additional features like learning with locals, garnering another 2 out of 2. Duolingo, known for its claim of offering education equivalent to a university semester, provides clear objectives visible on each lesson's main page, contributing to its free and fun learning experience and winning the app a commendable score of 2 out of 2 as well. Overall, all three apps demonstrate strong alignment between their stated objectives and the learning experiences they offer, enabling the learners to safely embark on a stress-free learning journey (Krashen, 1989).

5.2.2 Learning Content

The second standard in the AC category centers on learning content, assessed through indicators of accuracy, variety, and structuredness. This standard aims to ensure that the app's content is error-free, diverse, and logically organized to facilitate learning and shun demotivation and disinterest (Krashen, 1989). The comparison among Babbel, Memrise, and Duolingo reveals that all three apps offer accurate content overall, although Duolingo occasionally mispronounces Arabic terms. In terms of richness, whereas Babbel has a relatively limited language selection, Memrise and Duolingo provide a wide variety of courses and lessons, enhancing content richness and diversity. However, when considering structuredness, Babbel excels with well-structured lessons building upon previous content, earning it 2 points. In contrast, Duolingo's lessons lack logical order, featuring nonsensical sentences, and Memrise's approach lacks a strong structured foundation, allowing learners to skip around the syllabus, resulting in both apps receiving 1 point out of 2 for this criterion of learning content.

5.2.3 Learning Activities

In this evaluation, we pose two crucial questions: whether the app includes the main types of activities—presentation, practice, and testing (PPT)—and if the exercises are adequately challenging, varied, and dosed to maintain learner engagement and effectively measure learning outcomes. The significance lies in ensuring that learning follows a structured sequence and that exercises remain stimulating to prevent learner boredom and frustration. While analyzing Babbel, Memrise, and Duolingo, it becomes apparent that Duolingo deviates from the PPT sequence, focusing solely on quizzes, potentially leaving learners frustrated due to a lack of explanations. Conversely, Babbel and Memrise follow a quiz/review format, providing material followed by immediate testing, placing learners at risk of language abnormalities. Regarding exercise diversity and interest, Babbel offers a variety of exercises including speech recognition and translation, while Memrise features typing, translation, sentence reordering, and jumbled word exercises. Duolingo provides a range of exercises as well (Liang, 2018), but its pronunciation exercises are lacking, spelling tasks are tedious, and reliance on the learner's native language is excessive, earning it 1 point compared to 2 points for the other two apps.

5.2.4 Targeted Skills

Research on the language skills targeted by language learning apps is often neglected (Ganapathy et al., 2016; Steel, 2012). Although individuals usually develop listening, speaking, reading, and writing skills when learning a language, it is uncommon for a single app to cover all these skills (Hsu, 2013; Nami, 2020). Hence, the evaluation centers on how effectively and contextually the apps teach their prioritized skills. Despite differing categorizations—Babbel as a four-skill app, Memrise as a vocabulary app, and Duolingo as a grammar app—the analysis reveals more similarities than differences among them. All three apps cover basic listening, speaking, reading, and writing, alongside vocabulary, pronunciation, and basic grammar, albeit with variations in emphasis. Notable distinctions include Babbel's focus on conversational learning, Memrise's emphasis on memory-based learning, and Duolingo's reliance on translation-based learning. Moreover, whereas Babbel and Duolingo offer explicit grammar instruction, Memrise teaches implicit grammar, expecting learners to deduce rules independently. Each app also approaches vocabulary acquisition differently, with Babbel and Memrise targeting vocabulary explicitly, whereas Duolingo introduces a wide range of words, sometimes without adequate context or practicality. Regarding pronunciation, Babbel and Duolingo users are likely to develop this skill faster due to extensive listening exercises, whereas Memrise users benefit from interactive dialogues for speaking practice. Given their focus on micro rather than macro language skills, all three apps receive a half score in this evaluation criterion.

In this section, the evaluation of the three studied apps revealed a mix of strengths and weaknesses across these features akin to the app design analysis. Notably, the apps excel in clear and realistic learning goals, well-structured content in Babbel, and logically sequenced and diversified learning activities in both Babbel and Memrise. Conversely, areas needing improvement include Duolingo's flawed Arabic pronunciation, as well as the unstructured content in Memrise and Duolingo. Additional concerns include the lack of depth in targeted language skills across all three apps, along with issues such as the repetitive nature and lack of depth in some of Duolingo's exercises. With a score of 7 out of 8, Babbel emerges as the most well-developed language learning app in terms of content, in our

assessment.

Table 3. Evaluation of Language Learning Apps: App Content

Category	Criteria	Babbel	Memrise	Duolingo
5.2 App Content	5.2.1 Learning objectives: these (i) are clear and aligned with the course items; (ii) are achievable and measurable.	2	2	2
	5.2.2 Learning content: the learning content (i) is rich and accurate; (ii) is logically built and structured.	2	1	1
	5.2.3 Learning activities: these (i) align with the Present-Practice-Test (PPT) model; (ii) are varied and interesting.	2	2	1
	5.2.4 Targeted skills: the app (i) effectively teaches their targeted skills; (ii) meaningfully integrates the other skills.	1	1	1

5.3 App Pedagogy

Pedagogy means the art, science, and craft of teaching (Shah and Campus, 2021). Pedagogy is distinct from content because it pertains to the methodology of teaching. An effective pedagogy empowers learners to be active, autonomous, and responsible for their learning, stressing learner-centered, customized, game-based, error-based, and interactive approaches. These principles are crucial for any language learning app aiming to deliver satisfactory learning outcomes and thrive in the competitive app market. Drawing from the literature review and app interactions, we identified key pedagogical features essential for educational efficacy and user engagement. These include customization, gamification, scaffolding, and interaction, adapted from Liang's study (2018) for evaluating the three apps in this research.

5.3.1 Customization

For language learning apps designed for self-study, integrating customization or personalized features is crucial to cater to learners with varying abilities and provide them with comprehensible input tailored to their individual needs and interests (Krashen, 1989; Kukulska-Hulme & Traxler, 2007). We evaluate this standard of customization based on two indicators: (i) inclusion of placement tests; and (ii) ease of access to different difficulty levels. Babbel employs self-assessment or a brief placement quiz for learners to gauge their proficiency level, whereas Duolingo utilizes adaptive testing but with limitations in test duration and question depth. Conversely, Memrise lacks placement tests, hindering users' ability to assess their proficiency level. In terms of offering difficulty levels, Memrise stands out with customizable learning paths, adaptive testing, and mem customization features, albeit some are restricted to premium users. Babbel provides personalized review sessions but primarily on desktop, whereas Duolingo offers a single level of difficulty that progresses gradually, supplemented by personalized weak word practice and adaptable question sets. Duolingo's robust customization options and learner-centric design earn it a full score of 2, while Babbel and Memrise receive 1 point each for their partial customization features.

5.3.2 Gamification

Gamification, leveraging game elements in nongame contexts to enhance engagement and motivation, is a prominent strategy in educational AD (Domínguez et al., 2013; Hamari et al., 2014). In this evaluation, we focus on whether the three apps integrate gamified features into their platforms and if these features effectively motivate users or prove distracting and frustrating. Babbel emerges as the least gamified, lacking many typical game-like elements. In contrast, Memrise adopts a memory game format, engaging users in a space-themed journey where they earn points for correct answers, maintain daily streaks, and compete with fellow learners through rankings and achievements. Duolingo similarly gamifies learning with an immersive interface reminiscent of a mobile game, offering rewards like gems and experience points, albeit with a controversial health bar system penalizing mistakes. Whereas both Memrise and Duolingo effectively engage users with their gamified modes, Babbel falls short in this aspect, warranting a 2/2 score for Memrise and Duolingo, while Babbel receives a lower score due to its limited gamification features.

5.3.3 Scaffolding

Instructional scaffolding includes various forms of assistance, which are gradually withdrawn as learners gain autonomy. In the analysis of the three language learning apps regarding scaffolding, we aim to ascertain if learners can track progress, if activities scaffold difficulty, and if instant feedback—the guarantor of productivity (Forsythe,

2013; Smith & Higgins, 2006)—is provided. Babbel allows learners to monitor their course progression on the home screen, whereas Memrise visualizes progress through plant growth symbols, and Duolingo offers a progress bar indicating level and points. Regarding activity difficulty progression, all three apps exhibit scaffolding to varying degrees: Babbel explains grammar rules and starts with basic conversational phrases, Memrise utilizes a spaced repetition algorithm and mems for vocabulary retention, and Duolingo gradually introduces complex sentences sequentially. Although all apps provide feedback primarily through visual cues and sound effects, only Babbel offers explanations for incorrect choices, albeit inconsistently. Besides, Duolingo allows users to revisit the weakest words for revision, whereas both Babbel and Memrise provide various review options for progression. Therefore, due to the absence of detailed feedback like Babbel's, Memrise and Duolingo receive half the points.

5.3.4 Interaction

In this subsection, we tackle the interaction of app users not only with the app developers and the TL but also with the target culture and other users of the same app. Drawing on the principles of communicative language teaching (CLT) and the works of some scholars, which emphasize interaction as the key to language acquisition (Howatt, 1984; Hymes, 1972; Long, 1996), we assess whether the three language learning apps integrate these sociocultural features. Babbel and Memrise demonstrate adherence to CLT principles by immersing users in real-life conversations and favoring everyday conversational skills, respectively, whereas Duolingo falls short in providing relevant cultural context and occasionally presents sentences that are not practical in natural speech. Regarding the social aspect, Memrise stands out with its communal exchange of information and leaderboard to foster competition among learners, whereas Babbel lacks social interaction features. Although Duolingo promotes a sense of community through leaderboards and language clubs, the overall social interaction in all three apps remains primarily individualistic rather than collaborative, resulting in a score of 1 out of 2 for each of the three apps for their failure to integrate collaboration as a crucial element of interaction.

Table 4. Evaluation of Language Learning Apps: App Pedagogy

Category	Criteria	Babbel	Memrise	Duolingo
5.3 App pedagogy	5.3.1 Customization: the app offers (i) placement tests; and (ii) ease of access to different difficulty levels.	1	1	2
	5.3.2 Gamification: (i) the app utilizes gamified features; (ii) these have a pedagogical added value for the app users.	1	2	2
	5.3.3 Scaffolding: app users (i) can monitor their learning; (ii) are scaffolded and offered instant and detailed feedback.	2	1	1
	5.3.4 Interaction: the app (i) targets culture; and (ii) facilitates collaboration between the app users.	1	1	1

In the AP section, we discussed four key pedagogical features present in the three selected apps, serving as evaluation criteria: customization, gamification, scaffolding, and interaction. The evaluation highlighted both effective features and areas needing enhancement. Notable strengths include Duolingo's comprehensive customization options, engaging gamification in Duolingo and Memrise, and Babbel's scaffolding approach providing detailed feedback and support. However, areas for enhancement include limited customization in Babbel and Memrise, minimal gamification in Babbel, inadequate feedback mechanisms in Memrise and Duolingo, lack of cultural context in Duolingo, and limited social interaction in Babbel and Memrise. With a score of 6 out of 8 points, Duolingo emerges as the most pedagogically productive app among the three.

6. Conclusion

Analysis results from the three language learning apps—Babbel, Memrise, and Duolingo—highlight both similarities and distinctions among them. Although all three apps offer multiple languages to study, cater to learners of varying proficiency levels, and provide concise language instruction, they diverge in their primary emphasis—Babbel focuses on all language skills, Memrise emphasizes vocabulary, and Duolingo centers on grammar, albeit with some overlap among them. We also discovered that there is inconsistency between an app's content and its description by the owner and that the free versions of these apps may not provide a comprehensive basis for objective evaluation of their performance and value.

Similarly, evaluation results indicate that Memrise exhibits strong design, Babbel excels in content, and Duolingo

stands out for its pedagogical effectiveness. Further, although the three language learning apps display several performant features such as offline functionality, support, learning objectives, activities, and gamification, there are areas requiring improvement, including multimedia integration, scaffolding, and interaction, as well as aspects that necessitate reconsideration such as in-app advertising and targeted language skills. These findings underscore the complexity of evaluating language learning apps and the need for a nuanced understanding of their various features and functionalities.

Despite this study revealing interesting findings, it faces several limitations that need to be addressed. First, the rapid evolution of AC, observed during a revisit 2 months post-data collection, poses a challenge to evaluation accuracy. Second, the focus exclusively on free and freemium apps overlooks the potential features of paid counterparts. Third, the study's narrow selection of three apps limits generalizability. Fourth, the absence of participant input hampers replicability and overlooks user perspectives. Finally, reliance on a single researcher's rubric introduces potential bias, suggesting the need for multi-examiner triangulation. These constraints highlight the intricacies of app evaluation and highlight the necessity of addressing methodological limitations in future studies.

This study offers valuable insights for both app designers and educators interested in language learning app development. First, teacher training courses and programs might consider emphasizing the educational benefits of language learning apps to pre-service teachers. Moreover, the developed rubric can aid learners in selecting high-quality language learning apps, serving as a reliable reference for app users seeking suitable language learning tools. In addition, we identified avenues for future research, suggesting the need for diachronic studies to address app updates, exploration of paid app effectiveness, broader sample sizes for improved representativeness, and inclusion of user perspectives to enhance objectivity. These recommendations offer valuable directions for advancing the field of MALL and ensuring the validity of app evaluation frameworks.

References

Al-Hashash, S. (2007). Bridging the gap between ESL and EFL: Using computer assisted language learning as a medium. *Indian Journal of Applied Linguistics*, *33*(1), 5-39.

Bárcena, E., Read, T., Underwood, J., Obari, H., Cojocnean, D., Koyama, T., ... & Kukulska-Hulme, A. (2015). *State of the art of language learning design using mobile technology: sample apps and some critical reflection* (pp. 36-43). Research-publishing. net. https://doi.org/10.14705/rpnet.2015.000307

Beach, R., & O'Brien, D. (2015). Fostering students' science inquiry through app affordances of multimodality, collaboration, interactivity, and connectivity. *Reading & Writing Quarterly*, *31*(2), 119-134. https://doi.org/10.1080/10573569.2014.962200

Berns, A., Palomo-Duarte, M., Dodero, J. M., Ruiz-Ladrón, J. M., & Calderón Márquez, A. (2015, August). Mobile apps to support and assess foreign language learning. In *Critical CALL–Proceedings of the 2015 EUROCALL Conference, Padova, Italy* (pp. 51-56). Dublin: Research-publishing. net. Retrieved from https://www.semanticscholar.org/paper/Mobile-Apps-to-Support-and-Assess-Foreign-Language-Berns-Palomo-duarte/8920a4fb9fc56df63e74 d8966be52f1a1a404d70

Bower, M., Howe, C., McCredie, N., Robinson, A., & Grover, D. (2014). Augmented Reality in education–Cases, places and potentials. *Educational Media International*, *51*(1), 1-15. https://doi.org/10.1080/09523987.2014.889400

Burston, J. (2014). The reality of MALL: Still on the fringes. *Calico Journal*, *31*(1), 103-125. https://doi.org/10.11139/cj.31.1.103-125

Byun, H., Lee, J., & Cerreto, F. A. (2014). Relative effects of three questioning strategies in ill-structured, small group problem solving. *Instructional Science*, *42*(2), 229-250. Retrieved from https://www.learntechlib.org/p/167970/

Chen, Xiaojun (2016). Evaluating Language Learning Mobile Apps for Second-language Learners. *Journal of Educational Technology Development and Exchange (JETDE): 9*(2), Article 3. https://doi.org/10.18785/jetde.0902.03

Chik, A. (2014). English language teaching apps: Positioning parents and young learners. *Changing English, 21*(3), 252-260. https://doi.org/10.1080/1358684X.2014.929285

Creswell, J. W. (2007). Qualitative inquiry research design: Choosing among five approaches (2nd ed.). London: Sage. Retrieved from https://archive.org/details/qualitativeinqui0000cres_d2m7 /page/n475/mode/2up

Deb, D., Fuad, M. M., & Kanan, M. (2017, March). Creating engaging exercises with mobile response system (MRS). In *Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education* (pp. 147-152). ACM. https://doi.org/10.1145/3017680.3017793

Deka, B., Huang, Z., & Kumar, R. (2016, October). ERICA: Interaction mining mobile apps. In *Proceedings of the 29th annual symposium on user interface software and technology* (pp. 767-776). https://doi.org/10.1145/2984511.2984581

Domínguez, A., Saenz-De-Navarrete, J., De-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, *63*, 380-392. Retrieved from https://www.learntechlib.org/p/132289/

Ebbinghaus, H. (2013). Memory: A contribution to experimental psychology. *Annals of Neurosciences*, *20*(4), 155-156. https://doi.org/10.5214/ans.0972.7531.200408.

Forsythe, E. (2013). Autonomous language learning with technology. *JALT CALL Journal, 9*(3), 329-337. Retrieved from https://archive.org/details/ERIC_EJ1107992

Ganapathy, M., Shuib, M., & Azizan, S. N. (2016). Malaysian ESL students' perceptions on the usability of a mobile application of grammar test: A case study of ESL undergraduates in Universiti Sains Malaysia. *3L: The Southeast Asian Journal of English Language Studies, 22*(1), 127-140. https://doi.org/10.17576/3L-2016-2201-10

Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does Gamification Work? A Literature Review of Empirical Studies on Gamification. *HICSS*, *14*, 3025-3034. https://doi.org/10.1109/HICSS.2014.377

Hannon, K. (2017). Utilization of an Educational Web-Based Mobile App for Acquisition and Transfer of Critical Anatomical Knowledge, Thereby Increasing Classroom and Laboratory Preparedness in Veterinary Students. *Online Learning*, *21*(1), 201-208. https://doi.org/10.24059/olj.v21i1.882

Heil, C. R., Wu, J. S., Lee, J. J., & Schmidt, T. (2016). A review of mobile language learning applications: Trends, challenges, and opportunities. *The EuroCALL Review*, *24*(2), 32-50.

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting education in "educational" apps: Lessons from the science of learning. *Psychological Science in the Public Interest*, *16*(1), 3-34. https://doi.org/10.1177/1529100615569721

Howatt, (1984). A history of English language teaching. Oxford: Oxford University Press. Retrieved from https://www.kingsavenue.org/download/a-history-of-english-language-teaching/

Hsu, L. (2013). English as a foreign language learners' perception of mobile assisted language learning: A cross-national study. *Computer Assisted Language Learning, 26*(3), 197-213. https://doi.org/10.1080/09588221.2011.649485

Hymes, D. (1972). On communicative competence. *sociolinguistics*, *269293*, 269-293. Retrieved from https://pdf4pro.com/view/hymes-d-h-1972-on-communicative-competence-in-j-b-5fc1f3 .html

Illeris, K. (ed.) (2009). *Contemporary Theories of Learning: Learning Theorists -- In Their Own Words*. Routledge. Retrieved from https://archive.org/details/contemporarytheo0000unse_ a4v1/

Kim, H., & Kwon, Y.,. (2012). Exploring smartphone applications for effective mobile-assisted language learning. *Multimedia-Assisted Language Learning, 15*(1), 31-57. https://doi.org/10.15702/mall.2012.15.1.31

Kim, D., Rueckert, D., Kim, D.-J., & Seo, D. (2013). Students' perceptions and experiences of mobile learning. *Language Learning & Technology, 17*(3), 52-73. Retrieved from http://llt.msu.edu/issues/october2013/kimetal.pdf

Krashen, S. (1989). We acquire vocabulary and spelling by reading: Additional evidence for the input hypothesis. *The Modern Language Journal*, *73*(4), 440. https://doi.org/10.1111/j.1540-4781.1989.tb05325.x

Krippendorff, K. (2004). Reliability in content analysis: Some common misconceptions and recommendations. *Human communication research*, *30*(3), 411-433. https://doi.org/10.1093/hcr/30.3.411

Kudo, C., Kohara, N., Urata, M., Endo, M., Yasuda, T., Hamatani, T., & Mouri, K. (2015, October). Developing an astronomy education system in a science museum using push notifications. In *2015 IEEE 4th Global Conference on Consumer Electronics (GCCE)* (pp. 614-618). IEEE. https://doi.org/10.1109/GCCE.2015.7398531

Kukulska-Hulme, A., & Traxler, J. (2007). Designing for mobile and wireless learning. In *Rethinking pedagogy for a digital age* (pp. 200-212). Routledge. Retrieved from https://archive.org/details/rethinkingpedago0000unse_h8h3/page/n7/mode/2up?view=theater

Larkin, K. (2013). Mathematics Education: Is There an App for That? *Mathematics Education Research Group of Australasia*. Retrieved from https://research-repository.griffith.edu.au/handle/10072/59614

Liang, L. (2018). Exploring Language Learning with Mobile Technology: A Qualitative Content Analysis of Vocabulary Learning Apps for ESL Learners in Canada. Retrieved from https://ir.lib.uwo.ca/etd/5763

Long, M. H. (1996). The role of the linguistic environment in second language acquisition. In W. C. Ritchie, & T. K. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 413-468). New York: Academic Press. Retrieved from https://typeset.io/papers/the-role-of-the-linguistic-environment-in-second-language-1a4q7kstqh?ysclid=lskwaebaon849221228

Martín-Monje, E., Arús, J., Rodríguez-Arancón, P., & Calle-Martínez, C. (2014). REALL: Rubric for the evaluation of apps in language learning. Retrieved from http://hdl.handle.net/20.500.12020/389

Mayer, R. E. (2014). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.). *The Cambridge Handbook of Multimedia Learning* (Second ed.) (pp. 43-71). New York, NY: Cambridge University Press. https://doi.org/10.1017/CBO9781139547369.005

Miangah, T. M., & Nezarat, A. (2012). Mobile-assisted language learning. *International Journal of Distributed and Parallel Systems (IJDPS), 3*(1), 309-319. https://doi.org/10.5121/ijdps.2012.3126

Nami, F. (2020). Educational smartphone apps for language learning in higher education: Students' choices and perceptions. *Australasian Journal of Educational Technology, 36*(4), 82-95. https://doi.org/10.14742/ajet.5350. Doi:10.14742/ajet.5350

Niño, A. (2015). Language Learners Perceptions and Experiences on the Use of Mobile Applications for Independent Language Learning in Higher Education. *IAFOR Journal of Education*. https://doi.org/10.22492/ije.3.se.05

Nisbet, D., & Austin, D. (2013). Enhancing ESL vocabulary development through the use of mobile technology. *Journal of Adult Education*, *42*(1), 1-7.

Nushi, M., & Jenabzadeh, H. (2016). Busuu: The Mobile App. *The TESL Reporter*, *49*(2), 30-38.

O'Brien, D., & Voss, S. (2011). Reading multimodally: What is afforded? *Journal of Adolescent & Adult Literacy*, *55*(1), 75-78. https://doi.org/10.1598/JAAL.55.1.9

Pachler, N, (2009) Research Methods in Mobile and Informal Learning: Some Issues. Retrieved from https://www.researchgate.net/publication/233981163_Research_methods_and_informal_learning_ some_issues

Pechenkina, E., Laurence, D., Oates, G., Eldridge, D., & Hunter, D. (2017). Using a gamified mobile app to increase student engagement, retention and academic achievement. *International Journal of Educational Technology in Higher Education*, *14*(1), 31. https://doi.org/10.1186/s41239-017-0069-7

Quick, N. (2014). Using iPads to improve academic gains for students with disabilities. Retrieved from https://repository.rit.edu/eatc/Papers/Papers/6/

Rodríguez-Arancón, P., Arús, J., & Calle, C. (2013). The use of current mobile learning applications in EFL. *Procedia-Social and Behavioral Sciences, 103*, 1189-1196. https://doi.org/10.1016/j.sbspro.2013.10.446

Rosell-Aguilar, F. (2017). State of the app: A taxonomy and framework for evaluating language learning mobile applications. *CALICO Journal*, *34*(2). https://doi.org/ 10.1558/cj.27623

Rosell-Aguilar, F. (2007). Top of the pods—In search of a podcasting "podagogy" for language learning. *Computer Assisted Language Learning*, *20*(5), 471-492. https://doi.org/10.1080/09588220701746047

Rouse, M. (2020, August 7). Mobile application (mobile app). Techopedia. Retrieved from https://www.techopedia.com/definition/2953/mobile-application-mobile-app

Salmon, G., Pechenkina, E., Chase, A. M., & Ross, B. (2016). Designing Massive Open Online Courses to take account of participant motivations and expectations. *British Journal of Educational Technology*, *48*(6), 1284-1294. Retrieved from https://www.learntechlib.org/p/ 181101/

Schrock, K. (2013). Critical evaluation of mobile apps. Retrieved from http://www.schrockguide.net/ ipads-in-the-

classroom.html

Schwebs, T. (2014). Affordances of an app: A reading of the fantastic flying books of Mr. Morris Lessmore. *Barnelitterært forskningstidsskrift, 5*(1), 24169. https://doi.org/10.3402/blft.v5.24169

Shah, M., Sid Nair, C., & Bennett, L. (2013). Factors influencing student choice to study at private higher education institutions. *Quality Assurance in Education*, *21*(4), 402-416. https://doi.org/10.1108/QAE-04-2012-0019

Shah, R. K., & Campus, S. (2021). Conceptualizing and defining pedagogy. *IOSR journal of research & method in education*, *11*(1), 6-29. https://doi.org/10.9790/7388-1101020629

Smith, H., & Higgins, S. (2006). Opening classroom interaction: The importance of feedback. *Cambridge journal of education*, *36*(4), 485-502. https://doi.org/10.1080/03057640601048357

Steel, C. (2012). Fitting learning into life: Language students' perspectives on benefits of using mobile apps. Retrieved from https://www.researchgate.net/publication/288308534_Fitting_learning_into_life_Language_students'_perspectives_on_benefits_of_using_mobile_apps

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, *94*, 252-275. D https://doi.org/10.1016/j.compedu.2015.11.008

Supyan, H. (2017, March 4). Mobile Apps, Mobile Learning Apps, Mobile-Assisted Learning Apps, Mobile-Assisted Language Learning Apps. Retrieved January 22, 2023 from https://supyanhussin.wordpress.com/2017/03/04/mobile-apps-mobile-learning-apps-mobile-assisted-learning-apps-mobile-assisted-language learning-apps/

Sweeney, P., & Moore, C. (2012). Mobile apps for learning vocabulary: Categories, evaluation and design criteria for teachers and developers. *International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT)*, *2*(4), 1-16.

Vincent, T. (2012). Ways to evaluate educational apps. Retrieved from http://learninginhand.com/blog/ways-to-evaluate-educational-apps.html

Walker, H. (2011). Evaluating the effectiveness of apps for mobile devices. *Journal of Special Education Technology, 26*(4), 59-63.

Wanner, T., & Palmer, E. (2015). Personalizing learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course. *Computers & Education*, *88*, 354-369. https://doi.org/10.1016/j.compedu.2015.07.008

Wu, P. H., & Marek, M. (2016). Incorporating LINE smartphone affordances: Cross-cultural collaboration, willingness to communicate, and language learning. *International Journal of Computer-Assisted Language Learning and Teaching (IJCALLT)*, *6*(2), 56-73. https://doi.org/10.4018/IJCALLT.2016040104

Zichermann, G., & Cunningham, C. (2011). *Gamification by design: Implementing game mechanics in web and mobile apps*. O'Reilly Media, Inc. Retrieved from https://books.google.ru/books?id=zZcpuMRpAB8C&redir_esc=y

Zou, B., & Li, J. (2015). *Exploring Mobile Apps for English Language Teaching and Learning*. Research-publishing.net. https://doi.org/10.14705/rpnet.2015.000394

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