Impact of usability on continuance usage intention in language learning apps with gamification features

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Article Info

ABSTRACT

With the increasing popularity of language learning applications, gamification has become one of the approaches frequently integrated to enhance continuance usage intention (CUI). However, how the usability of these gamification features influences the intention to continue usage is not yet fully understood. Through the usability testing and system usability scale (SUS) method, this study evaluates the level of usability of gamification features in language learning applications with a novel research approach that also involves specific analysis regarding usability aspects according to Nielsen, including learnability, efficiency, memorability, errors, and satisfaction towards the CUI, categorized through the SUS statements grouping and then processed using the SPSS application. The study results indicate that the SUS scores show above-average scores for all three applications: Duolingo application at 77.08, Elsa Speak at 70, and Cake Learn at 70.58. Other findings suggest that usability aspects generally significantly influence CUI; however, only the satisfaction variable impacts CUI, which was observed only in Duolingo and Elsa Speak. These findings indicate that the overall usability of gamification features positively impacts CUI using language learning applications, thereby implying the need for continuous development.

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1. INTRODUCTION

Digital platforms for language learning have grown in popularity, mainly when gamification components are used to improve the learning process. Language learning apps have improved with gamification features to increase interest in their learning with the continuance intention [1]-[3]. Duolingo is one of the popular language learning applications, and it was launched in 2012. Duolingo is recognized for its ability to keep students motivated through engaging in challenges, thereby enhancing the efficiency of practicing a second language. This challenge is achieved by Duolingo through innovation in its gamification features, which has resulted in a user base surpassing 500 million by the year 2023.

In gamification, the game components comprise daily tasks, points for accomplishments, incentives, and innovative features that can be traded with the accumulated points. The attractiveness of these elements in this app-driven learning approach directly enhances users aspirations to refine their abilities [4]. The overarching objective of this gamification technique corresponds with the aim of keeping the application pertinent and continuously usable for users of language learning applications [5]. In today's dynamic digital landscape, where technology adoption can be as fleeting as its abandonment, continuance usage intention (CUI) becomes an indispensable metric. CUI holds particular significance in the context of information

technology, as it reflects an individual's determination to persist in using technology or application over time [6], [7].

A few research studies discuss the usage of gamification in language learning applications [8], [9]. In the grasshopper platform research to find the usability of the application, a system usability scale (SUS) investigation to find usefulness, satisfaction, and user experience while using it was limited [10]. Educational games require assessment to ascertain their efficacy in enhancing the learning process. However, the research was limited to analyzing the usability of gamification-based mobile platforms and its general impact on continuance intention. Numerous studies have also addressed the evaluation of gamification usability in general, particularly in the context of language learning applications, through various methods or approaches. Additionally, there are research studies discussing the role of gamification and its connection with continued usage intention. However, these studies do not explicitly delve into the detailed influence of usability elements on gamification features regarding continued usage intention [11]-[13].

The apps to be analyzed are Duolingo, Elsa Speaks, and Cake-Learn. Based on these findings, research will concentrate on analyzing the usability of gamification features in language learning applications. To get insight into the level of usability, we will use usability testing and the SUS. According to Jakob Nielsen, five fundamental elements constitute the measurement of usability: learnability, efficiency, memory, errors, and satisfaction [14]. These elements serve as valuable criteria for assessing the user experience and ensuring the optimal design of interactive interfaces. From here, the analysis will further and meticulously focus on how the five fundamental usability elements impact continued usage intention [15]. The purpose of this method is to identify problems that may arise in the interaction between the usability factors and application users, as well as provide recommendations for improvements that can enhance the CUI.

2. METHOD

This research was conducted based on a research activity framework comprising the following stages: preparation, data collection, data processing, and outcome, as illustrated in Figure 1. We started by getting ready, setting clear goals based on what we needed to find out about gamification in language apps. Next, we collected data by observing users interact with the apps and by asking them to fill out surveys about how easy and enjoyable the apps were to use. This approach helped us understand both the actions users took and their opinions on the app features.
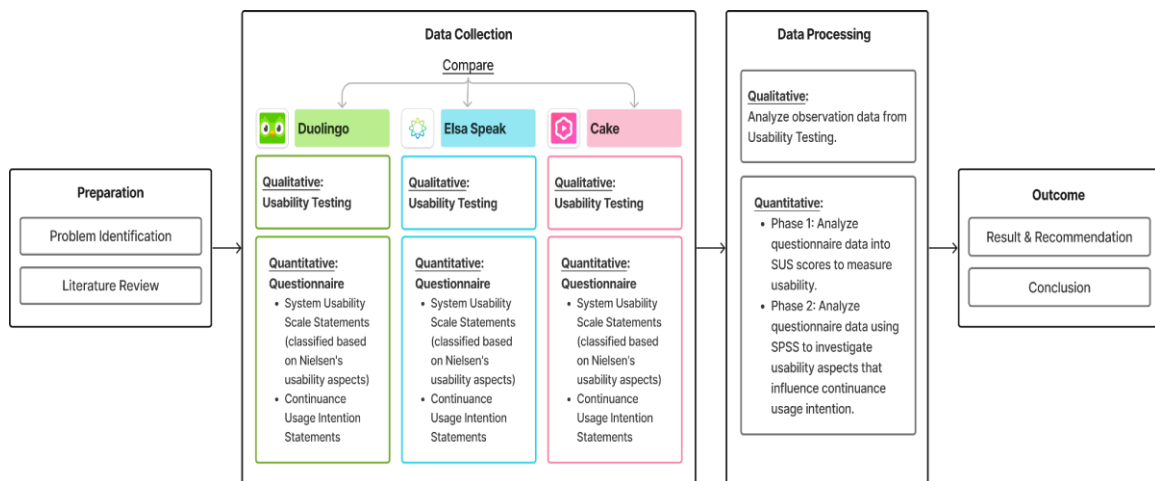

Figure 1. Research framework

2.1. Preparation

In this stage, the focus is on identifying and defining the key issues and challenges pertinent to the usability of gamification features in language learning applications and their subsequent influence on users' intentions for continued usage. This phase involves a thorough examination of existing literature, empirical evidence, and theoretical perspectives related to the usability of gamification features within educational applications, particularly those aimed at language learning. By critically analyzing prior research and identifying gaps or discrepancies in understanding, researchers aim to pinpoint specific problems or areas of

concern regarding the usability of gamified features in language learning applications and their potential impact on users' intentions to continue using such applications.

2.2. Data collection

In the data collection phase, we dived deeper, splitting into two distinct parts: observing actual app usage and gathering feedback via surveys. We chose three popular language learning apps for this purpose. The observations allowed us to see firsthand how users navigated and interacted with the gamification elements. At the same time, the surveys provided us with quantitative data about users' perceptions of their experiences. Together, these methods painted a full picture of both the user behavior and attitudes toward the gamification features of the language learning apps [16], [17].

2.2.1. Qualitative data

The activities in the qualitative research involved conducting interviews with 12 respondents after performing user testing on the three tested applications by executing 84 provided tasks. For observational purposes, respondents were given scenarios in the form of tasks to complete. The methodology involves testing several tasks that the authors will structure to examine user interactions with the gamification features on language learning applications and identify usability aspects of gamification features in Duolingo, Elsa, and Cake applications. These tasks were formulated based on the features of the mobile language learning application. The task scenario given to the respondents can be seen in Table 1.

Table 1. List of usability testing task scenarios

No	Task scenarios
1	Log into the registered account.
2	Find the practice unit that has been previously completed.
3	Complete a set of the practice unit.
4	Find the progress of the last practice unit worked on.
5	Select an additional practice unit beyond the main unit based on the story/topic.
6	Monitor the score progress on the leaderboard.
7	View the Achievements that have been attained.

2.2.2. Quantitative data

The quantitative research activity we conducted involved distributing questionnaires to application users within the age range of 17 to 25 years old. Approximately 30 respondents were collected from each application. The questionnaire statements used for this research combined statements from the SUS and the CUI variable.

In the first section of the questionnaire, a standard SUS statement consisting of 10 items is employed. These statements are categorized and grouped to assess Nielsen's usability dimensions, encompassing satisfaction, efficiency, learnability, errors, and memorability. These questions are categorized and grouped to assess Nielsen's usability dimensions, which include satisfaction, efficiency, learnability, errors, and memorability. It is noteworthy that, from the user's perspective, the SUS questionnaire is completed quickly and does not take much time [18], [19]. The list of questions is shown in Table 2. In the second section of the questionnaire, statements originally adapted from [20]. Were employed to assess CUI, as shown in Table 3.

Table 2. List of questions on usability Nielsen's category

No	Code	Task scenarios	Nielsen's category
1	S1	I think that I would like to use this app frequently	Satisfaction
2	EF1	I found the app unnecessarily complex	Efficiency
3	L1	I thought the app was easy to use	Learnability
4	ER1	I think that I would never need the support of a technical person to be able to use this app	Error
5	EF2	I found the various functions in this app were well-integrated	Efficiency
6	ER2	I thought there was too much inconsistency.	Error
7	M1	I would imagine that most people would learn to use this app very quickly	Memorability
8	L2	I found the app very cumbersome to use	Learnability
9	S2	I felt very confident using the app	Satisfaction
10	M2	I needed to learn a lot of things before I could get going with this app	Memorability

Table 3. List of questions on CUI variables

No	Code	Task scenarios	Category
1	CUI1	I think that I would like to use this app frequently	Continuance usage intention
2	CUI2	I found the app unnecessarily complex	

2.3. Data processing

Qualitative data is then processed and derived from observations made during usability testing. The quantitative data, on the other hand, is processed in two phases. The first phase measures the app's usability by converting questionnaire results into SUS scores. The second phase investigates the five Nielsen usability aspects that influence CUI, analyzing data using the SPSS software. The ten SUS statements are processed alongside the CUI statements to determine the influence of usability aspects on CUI. This combined analysis is aimed at determining the impact of usability aspects on CUI. The combination of the SUS questionnaire statements, as stated in Table 2, and the CUI variable statements in Table 3 are structured as a model, which is depicted in Figure 2.
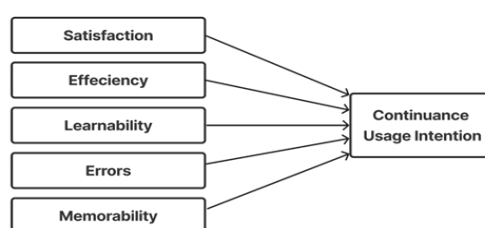

Figure 2. Research model structure

The proposed structure was built mainly to analyze usability factors in feature gamification towards CUI using language learning mobile applications. The conceptual framework incorporates five constructs as independent variables: satisfaction, efficiency, learnability, errors, and memorability. On the other hand, the CUI is considered the dependent variable within the framework.

2.4. Outcome

The final stage comprises the result and discussion as well as the conclusion. Results and discussion entail presenting and interpreting the findings derived from data analysis. The discussion will be informed based on the results to optimize the usability of gamification features in language learning applications. Additionally, the conclusion provides a summary of the study's key findings, implications, and avenues for future research, thereby contributing to the advancement of knowledge in the field of gamification in language learning applications.

3.   RESULTS AND DISCUSSION

This section presented data obtained from data collection, described how the data processing was conducted, and elaborated on the data analysis process that produced the final results.

3.1. Result

The primary objective is to articulate the relationship between gamification features in language learning applications and user continuance intention in a usability perspective. By analyzing the usability dimensions—learnability, efficiency, memorability, errors, and satisfaction—we aim to elucidate how these factors contribute to a user's decision to engage with these applications persistently. The findings are intended to provide insights for application developers and educators, informing the design of more effective, user-centric language learning tools that align with the evolving needs and preferences of learners. Here is full detail the result based on research activity.

3.1.1. Usability testing (observation)

This research focuses on the elements within each application that possess distinctive characteristics as well as mechanisms to enhance user engagement motivation in learning, including point-based systems, leaderboards, competitions, and rewards. The outcomes of this testing aim to identify the challenges perceived by participants in executing the assigned tasks. The testing was conducted on 12 participants aged

between 17 and 25 years, all of whom had prior experience with the application. Out of the 84 tasks assigned, 12 participants completed them, achieving a 100% success rate.

3.1.2. Usability evaluation (system usability scale score)

In evaluating the SUS score, one must first ascertain the system's assessment based on the acceptability ranges, which are categorized into three groups: not acceptable, marginal, and acceptable. Subsequently, one must refer to the grade scale, which includes the grades A, B, C, D, E, and F. Additionally, the adjective rating encompasses descriptors such as worst imaginable, poor, ok, good, excellent, and best imaginable [21]. The SUS scores for the three language learning applications can be seen in Table 4. The data indicates that the average SUS score for each application has surpassed the standard SUS score, where the typical average SUS score is 68.

The evaluation scores indicate that users generally view the three assessed applications positively, considering them satisfactory but with room for enhancement, as detailed in Table 4. Despite being rated as "Good" in adjective ratings and "Acceptable" in acceptability ranges, the grade C assessment suggests potential areas for improvement. This implies that while the apps are deemed adequate, there are specific aspects that could be refined to meet higher standards of performance and user satisfaction. Overall, the evaluations highlight a positive reception with opportunities for further development.

Table 4. Overall SUS scores

Differences	Duolingo	ELSA Speak	Cake-Learn
SUS score	77.08	70	70.58
Acceptability ranges	Acceptable	Acceptable	Acceptable
Grade scale	Grade C	Grade C	Grade C
Adjective ratings	Good	Good	Good

3.1.3. Usability factors that impact on continuance usage intention

The data processing technique utilized in this study involves the application of SPSS version 26 to analyze the collected data from respondents. The research assessment encompasses various aspects such as model validity, reliability, and correlation values, investigating the simultaneous and partial effects of Nielsen's usability categories on the CUI of language learning applications. The processing of data obtained from study participants is a crucial step in evaluating the aforementioned factors. This analysis facilitates an in-depth exploration of these elements, assisting in the thorough evaluation of how users interact with language learning apps in Nielsen's usability categories.

3.1.4. Validity and reliability test

In this research, Cronbach's alpha coefficient is utilized to evaluate the reliability of a questionnaire. A questionnaire is deemed reliable if the Cronbach's alpha value exceeds 0.60. Conversely, if the Cronbach's alpha value is equal to or less than 0.60, the questionnaire is considered not reliable [22]. The reliability of the questions posed to the study participants in this research can be assessed by referring to the reliability statistics table, which is provided in Table 5.

Table 5. Reliability test

Applications	Cronbach Alpha's	N of Items	Result
Duolingo	0.846	12	Reliable
ELSA Speak	0.920	12	Reliable
Cake-Learn	0.904	12	Reliable

Accordingly, no exclusion of research items occurred, as each variable demonstrated alpha values surpassing the 0.6 threshold. The result showed that all instruments in the questionnaire were reliable [23]. Validity test is a measure that shows an instrument's validity level. The validity test is considered successful when the observed correlation value (r_count) exceeds the critical table value (r_table) [24]. Table 6 outlines the outcomes of the validity assessment conducted for the three analyzed language learning applications. The results from the validity test table reveal that all variables employed in this study possess acceptable validity.

3.1.5. Regression summary model

The R-square adjusted serves as a metric for evaluating the explanatory power of the model. This statistical measure shows an increase in its value when the inclusion of a new variable results in an

enhancement of the regression model's fit to the dataset [25]. Table 7 shows the insights into the correlation between the models of three different language learning applications (Duolingo, ELSA Speak, and Cake-Learn) and a dataset of interest, as determined by the R-square adjusted values.

Table 6. Validity test

Variables	Duolingo	Elsa Speak	Cake-Learn
S1	0.846	0.765	0.645
S2	0.460	0.634	0.831
EF1	0.521	0.806	0.828
EF2	0.575	0.675	0.724
L1	0.680	0.921	0.609
L2	0.714	0.856	0.729
ER1	0.517	0.615	0.769
ER2	0.689	0.692	0.701
M1	0.595	0.795	0.673
M2	0.668	0.477	0.624
CUI1	0.608	0.862	0.758
CUI2	0.586	0.774	0.543

Table 7. R-square adjusted statistics

Applications	R-Square's	Value (%)	Result
Duolingo	0.402	40.2	Moderate correlations
ELSA Speak	0.676	67.6	High correlation
Cake-Learn	0.277	27.7	Low correlation

3.1.6. F-Test
The F-Test (Simultaneous) is conducted to ascertain whether there exists a collective impact, when considered together, of the independent variable (X) on the dependent variable (Y) [26]. In this study, the dependent variable is CUI and the independent variable is usability. The following Table 8 shows the result of a significant F-Test.

3.1.7. T-Test
The T-Test is used to determine if the indicator is accepted or rejected. If the T-Test value is used, the t-value must be over than 2.048, and the requirement then the variable is considered significant and directly affects positively, and the indicator is accepted. The following Table 9 shows the T-Test values. Based on Table 9, in Duolingo user's apps there are 1 acceptable and 4 rejected indicators. In ELSA Speak user's apps there are 1 acceptable and 4 rejected indicators. Cake-Learn user's apps all reject indicators. The results of this research show that 2 of the 3 applications examined found that satisfaction indicators have a positive and significant effect on CUI.

Table 8. Result of significant F-Test

Indicator	Applications	F-Statistic value	F-Table value	Result
Usability → CUI	Duolingo	4.894	2.6	Significant
	ELSA Speak	13.099	2.6	Significant
	Cake-Learn	3.225	2.6	Significant

Table 9. Result of significant T-Test

Applications	Indicator	T-Statistic value	T-Table value	Result
Duolingo	Satisfaction → CUI	3.395	2.048	Significant
	Efficiency → CUI	-2.683	2.048	Not significant
	Learnability → CUI	-2.696	2.048	Not significant
	Errors → CUI	0.628	2.048	Not significant
	Memorability → CUI	-1.313	2.048	Not significant
ELSA-Speak	Satisfaction → CUI	2.942	2.048	Significant
	Efficiency → CUI	1.971	2.048	Not significant
	Learnability → CUI	0.054	2.048	Not significant
	Errors → CUI	-0.179	2.048	Not significant
	Memorability → CUI	0.452	2.048	Not significant
Cake Learn	Satisfaction → CUI	0.997	2.048	Not significant
	Efficiency → CUI	0.476	2.048	Not significant
	Learnability → CUI	0.338	2.048	Not significant
	Errors → CUI	0.883	2.048	Not significant
	Memorability → CUI	-1.124	2.048	Not significant

3.2. Discussion

Based on the usability analysis conducted, it was found that there is a simultaneous influence of usability on CUI. Another finding in this research revealed that only the satisfaction aspect, out of the five usability aspects, has a significant influence on CUI in the context of language learning applications. This indicates that usability is a critical factor that can impact user satisfaction and the long-term success of an application.

In this research, one of the most significant usability concerns found relates to the overall application navigation. Ensuring users can smoothly navigate and transition within a language learning application is vital. Hence, the application's navigation framework must be intuitive and seamlessly operated by users. Based on the issues identified, the following are recommended improvements for enhancing navigation usability:

- Enhance navigation items by adding clear and descriptive labels

Users should quickly understand what action will occur and what they will receive if they click on a navigation item. For example, based on observations of 12 users, it was found that without clear labels on each icon in Duolingo's bottom navigation bar, users have to try and click on and enter each menu individually to find a particular menu. This impacts the task completion time during usability testing sessions. Figure 3 displays a design recommendation that shows a bottom navigation bar with menu icons equipped with clearer and more descriptive labels. This is intended to make it easier for users to decide which icon to click on to display the desired menu.
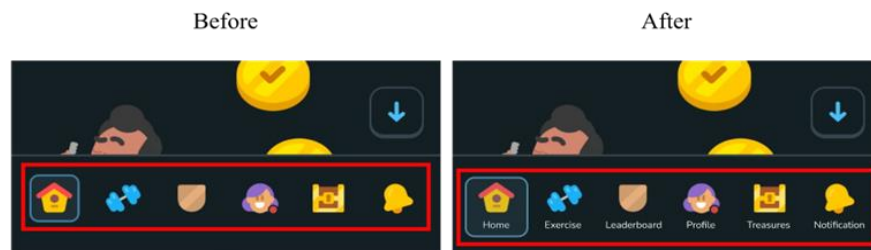
Figure 3. Navigation label–Duolingo

Non-descriptive navigation labels were also found in the Cake app. Based on the observations during the usability testing, participants struggled to find a specific menu due to non-descriptive navigation labels, as detailed in Figure 4. Even though the "Plus Only" menu icon had a label, most users felt it didn't adequately describe the content based on topics, leading to confusion during task 5.
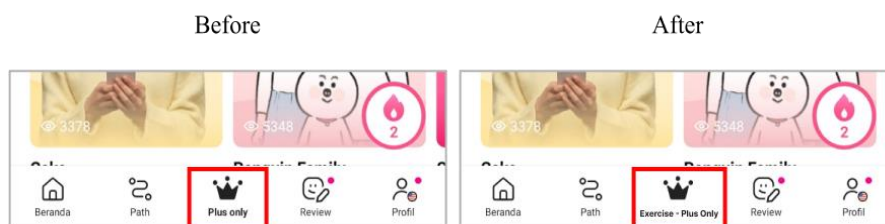

Figure 4. Navigation label-Cake

- Refine the information structure by defining a clear hierarchy

Users should be able to understand the relationship between various parts within the application, so they can easily determine where they are within the app and how they can move to other sections. For instance, based on the usability testing results of 12 users, it was found that the Cake app had a shorter average completion time for tasks compared to Duolingo and Elsa Speak. Figure 5 displays the leaderboard menu page, which can be accessed directly via an icon on the app's bottom navigation bar. Within this page, there is also a section to showcase achievements or milestones reached during learning. Thus, accessing achievements no longer requires a separate action through the profile menu. This is intended to simplify the hierarchy of the information structure.
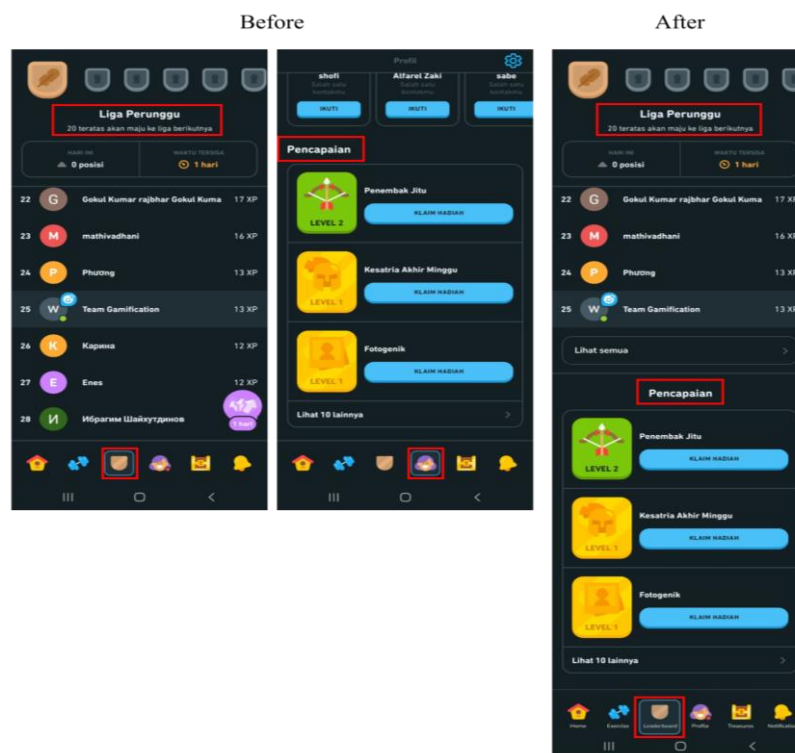
Figure 5. Information structure

This study provided valuable insights into how usability and gamification features in language learning applications can influence users to keep using these apps. However, it's important to note the study's limitations. We mainly relied on what participants told us about their experiences, which could lead to biases or inaccuracies in the data. The number of people we surveyed and observed was also quite limited, making it hard to say if our findings would hold true for all users everywhere. Additionally, we focused on what users thought and intended to do based on the apps' usability, without looking at other factors that might play a role in whether they continued to use the apps. In the future, studies could improve upon this by tracking actual user behavior over time, including more participants from different backgrounds, and examining more reasons that could affect a user's decision to stick with a language learning app.

4. CONCLUSION

The study achieved a 100% success rate during usability testing with 12 participants, supported by SUS questionnaire data from 30 responders yielding scores above the typical average. All three applications met the "Acceptable" criteria, categorized as "Good" under grade C. Simultaneously, Usability significantly influenced CUI across Duolingo, ELSA Speak, and Cake-Learn applications. However, when analyzed separately in Nielsen's usability categories, only the satisfaction variable exhibited significant positive effects on Duolingo and ELSA Speak applications. These findings emphasize the importance of continuous improvement in usability aspects to enhance user satisfaction and promote long-term application usage. Recommendations include improving navigation labels and refining information structure to optimize user interaction. Overall, the study contributes valuable insights into the impact of Usability on user engagement in language learning applications, underscoring the need for ongoing development to meet user expectations and ensure continued usage. Additionally, future studies could prioritize performing a thorough analysis of all gamification features present within applications for deeper understanding of the specific gamification features that contribute significantly to promoting long-term app usage.

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