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Design Strategies for Digital Educational Games to Promote Active English Use Among High School Students in Bandung: A Case Study of Duolingo

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ABSTRACT

Technological advancements have made language learning more flexible and interactive through the use of digital platforms. Duolingo is an example of an app that has successfully integrated effective gamification and visual elements. However, Duolingo has limitations when it comes to developing active language skills. This is particularly unfortunate given that high school students in Bandung have a strong interest in international career opportunities. This study was conducted to formulate recommendations for the design of a digital English language learning game that encourages active English language use among high school students in Bandung. The study employed a mixed-methods approach involving observation, interviews, questionnaires, and a literature review. The findings resulted in recommendations regarding favorite features, the number of features associated with specific motivations, and visual guidelines tailored to the preferences of high school students in Bandung.

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INTRODUCTION

Many aspects of human life have changed due to the rapid development of information and communication technology. English, as an international language, is frequently used by people for a wide variety of purposes, such as social media, education, and the workplace. Because of this, learning English has become an essential need for people living in this era of globalization. With the advent of technology, the learning process is no longer limited to traditional methods, such as classroom instruction with printed textbooks. Learning can be conducted more flexibly through digital platforms like Duolingo.

In Indonesia, Bandung ranks among the top three cities with the highest Duolingo usage, according to an interview conducted by Tempo with Duolingo (2023). Compared to other language-learning apps like Busuu and Babbel, Duolingo is better known and more widely used in the Southeast Asian market. Duolingo is known as a language-learning app with a strong gamification approach, evident in its gamification systems, such as points, levels, streaks, and instant feedback, based on repetition and short daily exercises, as well as its playful visual elements, including the green owl mascot and characters that appear during learning sessions (Loewen et al., 2020). Several previous studies have shown the positive impact of the Duolingo app; among them, the study by Mahbub et al. (2020) indicates that Duolingo can increase motivation to learn English and support self-directed learning for students whose primary language is not English, while Putra's (2025) study also found that Duolingo can boost students' confidence by helping them become accustomed to speaking English.

However, Duolingo has limitations in developing active language skills such as speaking and writing. According to research conducted by Dhiyaushshafa & Otong Setiawan Djuharie (2025), Duolingo's speaking feature focuses only on proper pronunciation without the two-way interaction typical of face-to-face communication. According to Ghanbari & Rouhi (2021), apps like Duolingo are still not effective at building the ability to speak and write a language spontaneously because Duolingo does not provide exercises that simulate everyday conversations or the writing of more complex essays.

This is particularly unfortunate because Bandung exhibits a combination of high usage of digital language-learning apps and limited active proficiency among students. The city ranks among the top three cities in Indonesia with the highest number of Duolingo users (Ernis, 2023), which aligns with Indonesia's position as one of Duolingo's five markets with the fastest-growing daily active user base worldwide. Data from Duolingo also shows that learners from Indonesia have a high motivation to learn languages to support their education, 37% above the average (Sutrisno, 2026). However, this high usage of digital language-learning apps has not yet translated into corresponding proficiency in the language. According to the EF English Proficiency Index (2025), Indonesia ranks 80th out of 123 countries with a score of 471 (Low Proficiency category), while Bandung scored 505 (Moderate Proficiency), higher than the national average but still weak in speaking skills. A study conducted among high school students in Bandung also found that the program most desired by students in English courses is the "Conversation Class," underscoring a strong need for active skill practice (Pagita & Hariwan, 2015). Furthermore, another study conducted on high school students in West Java, including Bandung, showed that although integrative and instrumental motivation were relatively high, their investment in learning remained low, as evidenced by a lack of effort and enthusiasm in the classroom

(Muslim et al., 2020). Research conducted by the British Council in Bandung also reinforces these findings by revealing a significant gap between young people's aspirations to master English and the availability of accessible learning resources (Kurniawan, 2026). The high usage of Duolingo in Bandung, proficiency scores that remain limited to active language use, the gap between motivation and investment in learning, and policy incentives to compete in the global job market make Bandung an ideal case study for examining how the design of digital educational games can encourage active English language use among high school students.

This is deeply regrettable because English proficiency has become an essential skill in the global era, especially in Bandung, where students have a strong interest in working abroad. This interest is evident in government programs such as SMK Go Global, which is actively promoted in various high schools and vocational high schools across the city of Bandung (Humas Jabar, 2025). According to a report by EF Education First (2025), multinational companies in Southeast Asia rank English communication skills as one of the top three most sought-after skills in the future workforce. Limited language proficiency has the potential to hinder the global competitiveness of high school students in Bandung, given that Indonesia's English literacy rate remains below that of neighbouring countries such as Malaysia (ranked 25th) and the Philippines (ranked 20th). Based on data from the EF English Proficiency Index (EF Education First, 2025), Indonesia ranks 80th out of 116 countries, with English proficiency levels below the global average. Bandung has a score of 505, placing it in the "Moderate Proficiency" category. According to a British Council survey (2023), approximately 85% of young internet users in Indonesia consume English-language content daily. Despite this high exposure to English, active language skills, particularly speaking and writing, remain relatively low (Nadine et al., 2024).

Popular language-learning apps like Duolingo have great potential to address the English language paradox among high school students in Bandung; therefore, it is unfortunate that Duolingo has limitations in helping students develop their potential for active English use. When compared to other learning apps, Duolingo differs in terms of popularity, the strength of its gamification and visuals, and its support for active language skills compared to similar learning apps such as Busuu and Babbel, making Duolingo an appropriate case study for this research. The following table compares these three apps.

Table 1. Comparison Table of Duolingo, Babbel, and Busuu
(Source: Christine Larissa, 2026)

Aspect	Duolingo	Babbel	Busuu
Popularity	Popular worldwide. There has also been significant growth in Asia, including Indonesia	The United States is Babbel's strongest market, followed by Germany (Europe)	Europe is the strongest market. It also has a presence in the Asia-Pacific region, but it isn't as strong as Duolingo's
Gamification	Using many gamification elements	Has the fewest gamification elements among the three apps	Includes gamification elements, but not as many as Duolingo
Visual	Focus on the mascot, a simple, modern, and minimalist icon with bright colors	The UI is clean and professional, with minimal use of visual elements such as illustrations	The illustrations are in the form of photos, and the UI looks professional
Active use supports	There are levels for speaking and writing, but no two-way	There are structured dialogs and conversation exercises based on real-	There are speaking and writing exercises with feedback from

	interaction	life situations	native speakers

Duolingo could serve as a good case study because it incorporates strong gamification and visual elements, although it still needs improvement in the area of active speaking skills.

Several previous studies similar to this one include a study on the implementation of Duolingo to improve vocabulary skills among 10th grade high school students, conducted by Zunaya et al. and an analysis of gamification drivers that influence user motivation in language-learning apps, conducted by Permatasari & Oktavia. Most previous studies have discussed and analyzed Duolingo and other language-learning apps in terms of their effectiveness as language-learning tools and their impact on user motivation; however, few have addressed the use of these apps as a foundation for developing mechanics and visuals tailored to the preferences of the Indonesian public, specifically, high school students in Bandung.

This research is important because it has the potential to contribute to the development of user-centered digital learning designs. In practical terms, the results of this study can serve as a foundation for educational media designers and developers in creating game mechanics and visual interfaces for English language learning games that are more engaging and effective for Indonesia's younger generation. Theoretically, this study enriches the field of visual communication design by linking it to gamification theory, learning motivation theory, and visual aesthetics theory. This study also supports the Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, which emphasizes the importance of educational innovations that are inclusive and relevant to all segments of society.

RESEARCH METHODS

The approach used in this study is a mixed-methods approach with a Convergent Parallel design (Creswell & Plano Clark, 2018). This approach allows for the parallel collection of quantitative and qualitative data, followed by separate analyses of both datasets, which are then integrated during the interpretation phase to deepen our understanding of Duolingo's mechanics and visuals, as well as the preferences of high school students in Bandung. The researcher will observe Duolingo's mechanics and visuals, conduct interviews with high school students in Bandung regarding their experiences, distribute a questionnaire to high school students in Bandung about digital learning games or Duolingo, and gather supporting theories through a literature review. The approach used to collect data involves purposive sampling of high school students aged 16–18 who have previously used the app under study (Duolingo). Three categories can also be identified from the collected data based on the frequency of English use in daily life: high (frequent), moderate (occasional), and low (rare). The data analysis shows that the moderate category is the most common, followed by the low category, and then the high category.

Data analysis was conducted using content analysis. The theories used in the analysis of Duolingo's mechanics were the Octalysis gamification framework by Yu-Kai Chou (2019), as viewed through the lens of Communicative Language Teaching (CLT) (Richards, 2006) and Task-Based Language Teaching (TBLT) (Ellis, 2003). The theories used in the visual analysis of Duolingo are the Visual Engagement theory by Schneider et al. (2016) and the UI components from Tidwell (2011). Subsequently, the visual elements

will be reanalyzed using the Visual Engagement theory. Mechanical and visual elements will also be analyzed using Self-Determination Theory (Deci & Ryan, 2017). A literature review was also conducted to enrich the results of the observations and analyses. The results of the interviews and questionnaires were synthesized, and design recommendations were derived.

The data validity testing technique used in this study is data triangulation. This method is grounded in a multi-perspective phenomenological approach, ensuring that conclusions are not drawn from a single perspective alone (Soewardikoen, 2021). The triangulation method employed is methodological triangulation, in which the researcher compares the results obtained from observations, interviews, questionnaires, and the literature review.

Data Collection Instruments

The observation was conducted on the Duolingo app on a mobile device. The required instrument was a smartphone, and visual data was collected by taking screenshots. This study focuses on all features available for free in the app and on the website; therefore, features such as Video Calls or Subscriptions will not be included in the study. This decision was made because the majority of users access the app in its free version.

Semi-structured interviews were conducted with 15 participants from 6 different high schools in Bandung, aged 16-18, with 3 to 10 months of experience using Duolingo. The questions covered their experiences using English, factors that encourage or hinder their use of English, their favourite features and visuals in Duolingo, and suggestions for the app's future development.

The respondents for the questionnaire in this study consisted of 102 students currently enrolled in various high schools (SMA) in the Bandung area who had used Duolingo for at least one month. The respondents came from a total of 35 different schools. The questionnaire was divided into Likert-scale questions and open-ended questions regarding the app's mechanics and visuals.

The data collection focused on learners' experiences with Duolingo's gamification mechanics and visual elements, as well as their preferences regarding app features that could encourage active English use. Information from the data regarding the level of daily English use (high, moderate, and low) was collected as part of the learners' background profiles to provide an overview of the diversity of user proficiency levels.

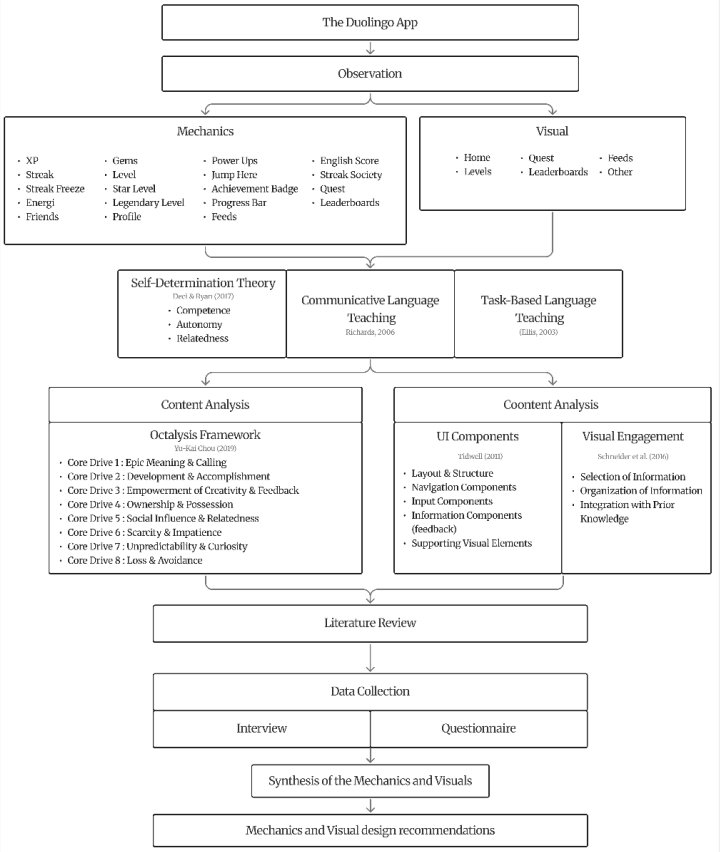


Figure 1. Research Process Flowchart
(Source: Christine Larissa, 2026)

FINDINGS AND DISCUSSION

The Relationship Between CLT and TBLT and SDT, Octalysis, and Visual Engagement in Language Learning Apps

Communicative Language Teaching (CLT) emphasizes that meaningful communication is the primary goal of language learning (Richards, 2006) and Task-Based Language Teaching (TBLT) asserts that tasks that fulfill communicative goals serve as motivators for active language use (Ellis, 2003). Learners need to engage in these communicative tasks, and to do so, they require motivation that arises from the fulfillment of three basic psychological needs outlined in Self-Determination Theory (Deci & Ryan, 2017). When using digital learning applications, these three basic psychological needs can be met with the help of Chou's Octalysis gamification framework. The visual elements of the application also influence the effectiveness of fulfilling these three psychological needs, as emphasized in Visual Engagement theory (Schneider et al., 2016).

Analysis of Duolingo's Octalysis Framework

The following is a summary table of all the features in the Duolingo app and their grouping based on the Octalysis Framework, from the data collected through observation:

Table 2. Duolingo's Octalysis Framework
(Source: Christine Larissa, 2026)

	CD 1	CD 2	CD 3	CD 4	CD 5	CD 6	CD 7	CD 8
XP		✓			✓			
Streak		✓						✓
Streak Freeze				✓				
Energy								✓
Gems				✓		✓		
Level		✓						
Star Level		✓					✓	
Legendary Level		✓				✓		✓
Power Ups				✓		✓		
Jump Here			✓					
Achievement Badge				✓	✓			
Progress Bar		✓						
English Score		✓						
Streak Society					✓			✓
Quest		✓					✓	
Leaderboards					✓			✓
Friends					✓			
Profile		✓	✓	✓				
Feeds					✓		✓	
TOTAL	0	**9**	2	5	6	3	3	5

Previous research conducted by Zen (2024) on the use of gamified environments among Indonesian adolescents showed that gamification elements can boost motivation and self-confidence and provide opportunities to practice speaking English. Digital platforms such as Duolingo, Roblox, and Minecraft provide a space for active language use that feels safer and more enjoyable than formal classroom settings. Gamification features like "Challenges" and "Streaks" help students stay consistent in their practice; however, they do not necessarily optimally foster spontaneous active language skills.

Based on data from all features on Duolingo and an interpretation of the Core Drives in the Octalysis gamification framework, the Core Drive most emphasized on Duolingo is Core Drive 2: Development and Accomplishment, with a score of 9 out of 19. Looking at the total number of all Core Drive types, the gamification approach used on Duolingo is predominantly Left-Brain Gamification, or Extrinsic Motivation. Most Duolingo features, such as XP, Quests, and Achievement Badges, involve points, goals, or missions to motivate players. Right-Brain Gamification, or extrinsic motivation, is primarily found in Core Drive 5, but remains less prevalent compared to intrinsic motivation.

The data also shows that Duolingo uses White Hat and Black Hat gamification in a balanced manner. The dominant White Hat gamification used is Development & Accomplishment, while the dominant Black Hat gamification used is Loss & Avoidance. Although they occur in equal numbers, Duolingo's White Hat gamification is heavily focused on Core Drive 2 compared to Core Drive 1 and Core Drive 3.

Beerda (2020) analyzed the Duolingo app using the Octalysis framework and noted that Duolingo includes several elements that help motivate new users, namely short levels, a progress bar, and feedback on their learning progress. Core Drive 2, which is the dominant Core Drive on Duolingo, is a Core Drive based on extrinsic motivation. For Duolingo players who already possess intrinsic motivation, the extrinsic motivation provided by Duolingo replaces the intrinsic motivation they originally had. This is known as the Over-Justification Effect. Beerda's observations are also consistent with the findings of Rahayu

& Putra, n.d. (2024), who noted that Duolingo places excessive psychological pressure on players through the use of "Black Hat" gamification. Additionally, the app needs to enhance its creative and exploratory elements to support players' intrinsic motivation for language learning.

This analysis also shows that the Competence element in SDT has been successfully integrated through Core Drive 2, although the Autonomy element remains underdeveloped due to a low Core Drive 3 score. Core Drive 5 is present in Leaderboards, Friends, and other features to fulfill the Relatedness element, although most of these interactions are one-way since there are no direct forms of interaction, such as conversations. This implies that the game mechanics in Duolingo mostly emphasize achievement and punishment (Core Drives with extrinsic motivation) and have not yet integrated many elements of creativity and openness for learners to express themselves (Core Drives with intrinsic motivation), so the principles of CLT and TBLT have not yet been fully implemented. The motivation that develops tends to be more about maintaining engagement with the app than encouraging active use of English.

Visual Analysis of the Duolingo App

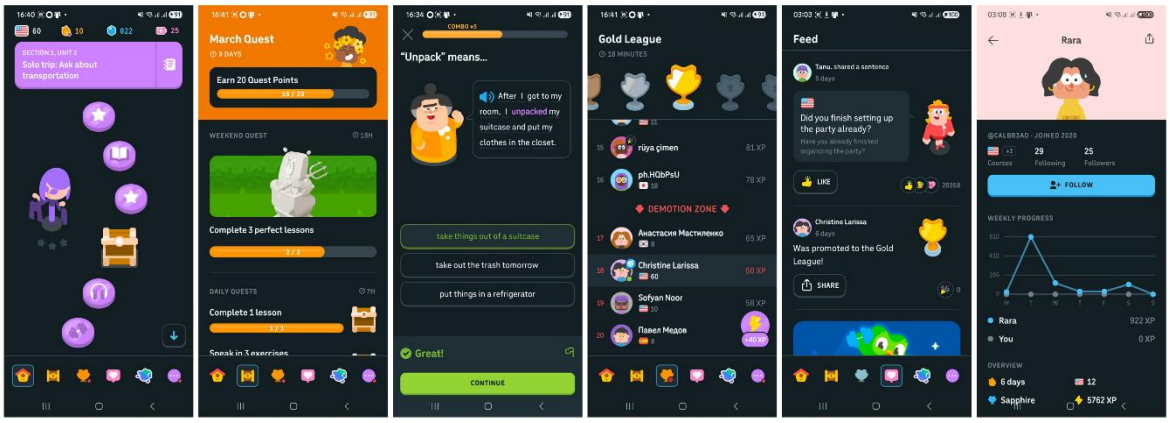


Figure 2. Duolingo's Interface
(Source: Christine Larissa, 2026)

Table 3. Duolingo's Visual Analysis Table
(Source: Christine Larissa, 2026)

Page	UI Components	Explanation
Home	Layout & Structure	The hierarchy on the Home screen uses color, shape, and size variations to identify the main elements.
	Navigation Components	There are navigation components for player status, page navigation, level display, and section navigation.
	Input Components	Players can choose a level type from all available level icons and select the specific level and rewards they want.
	Information Components	Duolingo displays players' level information via the level icon, and their learning progress via the English Score, Streak, Gems, and Energy menus.

	Supporting Visual Elements	The icons feature a minimalist style with familiar symbols. Colors are used to indicate section transitions. The typography is sans serif and predominantly rounded. Duolingo's mascot and illustrations have a simple, cartoonish style and provide visual elements for each section.
Levels	Layout & Structure	The hierarchy in the "Levels" view makes use of typography, such as large font sizes, bold text, and spacing between text. There are also illustrations that sometimes serve as the main focal point.
	Navigation Components	There is a navigation component in the form of a "Next" button for moving to the next question.
	Input Components	Players can tap buttons, type, or record their voices to enter answers to the questions.
	Information Components	Duolingo uses a progress bar to show how far player's gone in the level. It also provides feedback in the form of correct or incorrect notifications, player's current streak, and player's learning results.
	Supporting Visual Elements	The icons use a minimalist style with a single color. Each color serves a specific purpose: red for incorrect, green for correct, and yellow and blue for informational purposes. The typography is sans serif, and the illustrations are tailored to the context of the question; for example, a question about buses will feature an illustration of a bus.
Quest	Layout & Structure	The hierarchy in the Quest interface uses bright orange elements at the top of the page, large illustrations, and typography with varying levels of contrast.
	Navigation Components	The navigation elements consist solely of links to other pages at the bottom of the screen.
	Input Components	This page does not have any input fields for players.
	Information Components	There is a progress bar that shows players how far they have progressed in the mission.
	Supporting Visual Elements	The icon is more complex than the usual icon in other pages, yet it remains simple. The color orange is used to highlight the main points. The typography uses sans serif, and the design plays on the contrast between the text colors. The illustration on this page shows the progress of the mission.
Leader boards	Layout & Structure	The hierarchy on the leaderboards uses color (blue), illustration size, different profile shapes, and typographic contrast to distinguish the main elements.
	Navigation Components	There is a navigation bar on each player's profile and Lightning Round in the lower-right corner.
	Input Components	Players can indicate their status using the provided emojis.
	Information Components	The main Leaderboards screen displays information such as rankings and the leagues players are in. Players can also open their profiles to view their information.

	Supporting Visual Elements	The icons on the league trophies have different colors depending on the league, and the emoticons are simple and minimalistic. Blue indicates general information, green indicates an improvement in performance, and red indicates a decline in performance. The typography is sans serif with varying levels of contrast. There aren't many illustrations besides the profile characters.
Feeds	Layout & Structure	The hierarchy in Feeds uses differences in contrast and typographic size, illustration size, the color blue, and different post formats to identify the main elements.
	Navigation Components	Players can view interactions on posts, view other users' profiles, and view announcements.
	Input Components	Players can interact with posts and add friends.
	Information Components	Information components consist of a series of posts displayed and data on each player's profile.
	Supporting Visual Elements	There are 2 styles of icons, very minimalist ones, such as the "Add Friend" button, and slightly more complex ones, such as the emoticons. Colors and sans-serif typography with varying levels of contrast highlight the main points on the page. Illustrations are mostly used as decorative elements.
Other	Layout & Structure	The hierarchy on the "Other" screen uses typography in different sizes, sections of varying sizes, the color blue as the primary accent, and longer button shapes to highlight the main elements.
	Navigation Components	Navigation features include a profile that can be opened, audio clips to hear the correct pronunciation, and a practice hub for players to practice.
	Input Components	This page does not have any input fields for players.
	Information Components	Information components came in the form of a player profile where players can view information about their learning progress.
	Supporting Visual Elements	The icons have a minimalist style. Color is used to convey information. The typography is sans serif, and there are few decorative elements. Duolingo's mascot and illustrations have a simple, cartoon-style design and are used to illustrate each practice option and as player avatars.

Analysis of Duolingo's Visual Engagement and Literature Review

Previous research conducted by Pratiwi & Trisanti (2025) on students in Indonesia showed that visual media such as videos tend to be preferred in English language learning because they are considered more engaging, aid in understanding the material, and boost learning motivation compared to text-only learning. The visual elements present influence students' understanding of the material and the learning process. This explains that visuals may be a factor in why Duolingo can enhance students' learning experience.

Based on all observations and analyses of Duolingo's information selection, Duolingo has a fairly clear hierarchy and appropriate main focus on each page. Each page has its own purpose and is laid out well enough that users can quickly sort through the information

provided. Duolingo also avoids excessive decorative elements; instead, it tends to feature simple, modern, and minimalist visuals. Almost all pages use more than one element to establish the desired hierarchy, such as bright colors to attract users' attention, large shapes to highlight important information, typography with varying contrast to distinguish between headings and explanatory text, and different section shapes to indicate the correct reading order. This aligns with Michelle's (2024) findings that Duolingo uses a well-organized grid layout and that all elements are well-balanced within each grid.

Duolingo successfully uses certain elements repeatedly to convey specific meanings, such as green objects signifying success, red objects indicating errors, and blue objects serving as neutral elements that provide information. This greatly helps players organize the information provided by the app because Duolingo is consistent in its use of these elements. Additionally, the use of similar illustrations and consistent icons across multiple pages makes it easier for players to process this information and reduces their cognitive load. The results of this observation align with the findings of Afifah et al. (2026), which indicate that Duolingo possesses a consistent "Ecology of Signs," and that the visual elements within the app are not merely decorative but serve as signs that shape the process of learning a foreign language. These findings also demonstrate the effective application of design principles and multimedia learning, consistent with the research conducted by Adriyanto et al. (2021), which found that design consistency plays a crucial role in optimizing digital learning.

Duolingo integrates with users' prior knowledge by incorporating common and familiar elements, such as a layout that generally resembles that of a game app. Duolingo also provides illustrations that align with the context of the questions presented to users, allowing them to connect the images to the context more easily. Most of the icons in Duolingo are commonly used and have easily understood connotations, such as the "Rewards" icon, which features a treasure chest. Afifah et al. (2026) state that the visual elements of Duolingo's gamification play a crucial role in shaping players' motivation and experience throughout the learning process on Duolingo.

Summary of Interview Findings and Questionnaire Data

Table 4. Summary of the Questionnaire and Interviews
(Mechanics)
(Source: Christine Larissa, 2026)

Rankings	Core Drives (Chou, 2019)	Mean	Positive percentage	Features that were mentioned from Questionnaires and Interviews
1.	Core Drive 3 : Empowerment of Creativity & Feedback	4.43	94.90%	Feedback while working on problems; Ability to choose desired topics; Role-playing and scenarios as a level
2.	Core Drive 2 : Development & Accomplishment	4.39	91.08%	Streak; Challenges or missions; Levels with increasing difficulty; Goal Tracker; EXP; Achievement Badges
3.	Core Drive 7 : Unpredictability	4.32	85.99%	Random or secret rewards; Lore or stories about the characters

	& Curiosity			
4.	Core Drive 1 : Epic Meaning & Calling	4.15	75.80%	The lore or backstory of each character; the roles students play in the game; choices that shape the story
5.	Core Drive 6 : Scarcity & Impatience	4.08	71.34%	Limited-time event; Time-limited rewards; it's even harder to get Power-Ups
6.	Core Drive 5 : Social Influence & Relatedness	4.03	70.70%	Interact with Native Speakers; Conversation features; Duel features with friends; EXP and Badges displayed on your profile
7.	Core Drive 4 : Ownership & Possession	3.94	61.78%	Achievement Badges; Interactive profile avatars; Rewards for avatars/profiles
8.	Core Drive 8 : Loss & Avoidance	3.73	68.79%	Streak; Penalties for incorrect answers; resources that can be lost; a drop in ranking if you don't play regularly

Based on the data collected, the top ranking was achieved by Core Drive 3: Empowerment of Creativity & Feedback, which was nearly tied with Core Drive 2: Development & Accomplishment. Core Drive 2 is a Core Drive that garners high interest among students; however, if it is implemented excessively without being balanced by other Core Drives, such as Core Drive 3, which also has many supporters, it will negatively impact students' intrinsic motivation. Core Drive 3 is an intrinsically based Core Drive, so it would be beneficial to implement it further. Core Drive 1, which was not present in the Duolingo observations, ranked fourth in terms of popularity. It would be beneficial to add features related to Core Drive 1.

Although there are differences between the questionnaire and interview data, features related to Core Drive 5 have a significant impact on students' initial motivation to use English. Student motivation associated with this Core Drive is high, but few students reported that features related to this Core Drive were their favourites compared to other features. Based on observations, this Core Drive has already been implemented on Duolingo through features such as Leaderboards, Friends, Feeds, and others. However, this implementation does not yet meet the needs for active social interaction as mentioned by the interview participants, since there is no synchronous interaction among learners. A suggestion to include direct interaction with native speakers could be added to the app.

Table 5. Summary of the Questionnaire and Interviews
(Visual)
(Source: Christine Larissa, 2026)

UI Components (Tidwell, 2011)	**Mean**	**Positive percentage**	**Features that were mentioned from Questionnaires and Interviews**
Layout & Structure	4.67	96.82%	The UI layout is intuitive, with simple, non-distracting visuals; the UI has good contrast, clean UI, organized screen layout.

Input Components	4.83	98.09%	Input components such as a microphone are easy to understand; animations of people speaking can improve comprehension.
Information Components (Feedback)	4.61	93.63%	Visual feedback for correct and incorrect answers; engaging UI reward elements; the need for a progress bar; removal of negative animation feedback.
Navigation Components	4.18	78.98%	Navigation icons with unclear meaning requires an additional text.
Supporting Visual Elements	4.19	75.16%	Adorable visuals; appealing characters/mascots; features engaging animations.

Based on a summary of the questionnaire data, the Duolingo UI component that is most helpful for active language conversation is the input component, followed by layout and structure. The input component here refers to the fact that the microphone button and the blank fields in Duolingo's exercises are intuitive and easy for learners to understand. Most respondents cited elements related to the information component (Feedback) while working on exercises, as well as the engaging mascot or characters. The information component received the widest variety of responses. Based on the respondents' answers, Duolingo's layout and structure are already very good, no responses mentioned these aspects negatively, while the navigation component drew criticism regarding its unclear icons.

Based on the results of the interviews and questionnaires conducted, many students mentioned that they prefer a user interface (UI) and illustrations that are simple, clean, and minimalist. Many students also expressed a preference for layouts that look neat and contain few distracting elements, which aligns with the findings of Wibowo & Zainudin (2024) that Generation Z (high school students) prefer white space in a design and minimalist elements.

Discussion of the Results of Data Collection and Observations Using SDT, CLT, and TBLT

Previous research conducted by Espiritu & Buaraphan (2024) on the development of game-based speaking applications emphasizes that the gamification elements in the application need to be integrated with the principles of task-based language teaching so that learners are not only motivated by the incentives provided by gamification elements (points, achievements, and others), but are also encouraged to use the language in real communicative situations. Thus, the fulfilment of basic psychological needs is a key requirement for students to be motivated to actively use the language.

Duolingo's game mechanics and visual aesthetics can influence active English language proficiency if they meet the three basic psychological needs outlined in SDT. These three needs influence learners' motivation to engage in tasks or active communication practices that align with the principles of CLT and TBLT. The following is an explanation of these three basic psychological needs:

1. Competence
   Competence is a key element throughout Duolingo's mechanics. Core Drive 2: Development and Accomplishment and Core Drive 8: Loss & Avoidance, which manifested through level progression based on difficulty, XP, Streaks, and Achievement badges, are some of the features that fulfill this element, as they

make players feel capable and confident when practicing speaking. The questionnaire data also shows that Core Drive 2 ranks second in terms of player interest. Visually, this element is fulfilled through visual feedback (informational components) such as progress bars, streak indicators, and animations. The minimalist UI also helps by not placing an additional burden on players, allowing them to focus on solving the exercises. However, many interviews revealed that students felt the levels were too easy and not challenging enough, causing them to become bored and reluctant to continue. This indicates that while the Competence element is indeed fulfilled, it is not sufficiently deep to keep students practicing. This can also discourage students from speaking spontaneously, which is the goal of the communicative approach.

2. Relatedness
   Relatedness is one of the elements frequently mentioned in interviews with students regarding their motivation to actively use English. The Core Drive that aligns with this motivation is Core Drive 5: Social Influence & Relatedness. Features on Duolingo that tap into this Core Drive include Leaderboards, Feeds, and Friends. Visually, the mascots and characters that frequently appear on Duolingo are also related to this element. These mascots and characters, designed to look friendly and each with their own distinct personalities, create a sense of connection with the characters. This is evident from interview responses and questionnaire results, which indicate that users hope for more lore or stories about each character on Duolingo. Although there are social features that support relatedness, the lack of features that facilitate direct interaction, such as conversations among students, results in a lack of motivation to use language for meaningful communication.

3. Autonomy
   Autonomy is an element that is still not well integrated into Duolingo. This element is closely related to Core Drive 3: Empowerment of Creativity & Feedback, which is still not very prevalent in Duolingo. The lack of Autonomy and Core Drive 3 is also one of the factors causing many students to get bored with Duolingo easily, especially at certain levels. This is particularly unfortunate given that Core Drive 3 ranked number one in a survey of high school students in Bandung regarding the Core Drives they find most appealing. Visually, there aren't many elements in Duolingo that incorporate this aspect. A lack of autonomy means that students do not yet have the motivation to actively produce language.

Based on the discussion above, it was found that Duolingo's mechanics and visuals successfully meet the needs of Competence and, to some extent, Relatedness, although they have not yet been able to meet the need for Autonomy. This is unfortunate given that the principles of CLT and TBLT require learners to use language independently and meaningfully, which can be achieved through Core Drive 3, and through direct interaction with other learners, which serves as an additional motivator from Core Drive 5. The motivation that arises from the app tends to sustain engagement within the learning app rather than encouraging active language use outside of the learning environment.

Implications of Recommendations for the Mechanics of Digital Educational Games

Based on Core Drive preferences and the results of the analysis using SDT, CLT, and TBLT theories, the most popular sequence of Core Drives is:

1. Core Drive 3: Empowerment of Creativity & Feedback
2. Core Drive 2: Development & Accomplishment
3. Core Drive 7: Unpredictability & Curiosity
4. Core Drive 1: Epic Meaning & Calling
5. Core Drive 6: Scarcity & Impatience
6. Core Drive 5: Social Influence & Relatedness
7. Core Drive 4: Ownership & Possession
8. Core Drive 8: Avoidance & Loss

To generate app recommendations based on the sequence of data above, it is also necessary to consider White Hat and Black Hat features, as well as features focused on the Left Brain and Right Brain. These two types of features must be balanced as much as possible while maintaining the Core Drive preference order listed above. This balance between intrinsic and extrinsic factors will also fulfill the three basic needs of SDT, which motivate learners to engage in meaningful communication and perform communicative tasks in accordance with the principles of CLT and TBLT. Therefore, the most ideal ratio of features is:

6 : 5 : 5 : 4 : 4 : 3 : 3 : 2 (CD3 : CD2 : CD7 : CD1 : CD6 : CD5 : CD4 : CD8)

The breakdown was as follows: 15 purely White Hat features (46.8%), 11 purely Black Hat features (34.3%), 12 Left Brain features (37.5%), and 14 Right Brain features (43.75%).

Here are some of the most highly recommended features identified through interviews and open-ended questions in the questionnaire (in no particular order):

1. Interaction with others (Core Drive 5)
   Interaction with others can take the form of chatting with them directly, calling them, or sending them voice notes. This feature can also be integrated to allow students to interact with native speakers.
2. Streak (Core Drive 2, Core Drive 8)
   Streak is a feature designed to motivate students to continue their studies by requiring them to complete daily activities within the app. The “Streak” feature should be accompanied by intrinsic incentives or allow for some flexibility so as not to place too much of a burden on students.
3. Progressive Levels (Core Drive 2)
   Progressive levels are levels that offer varying and gradually increasing levels of difficulty. Levels shouldn’t be repetitive; they should include varying levels of complexity, especially for students who have been playing for a long time, so they don’t get bored.
4. Story Lore and Role-Play (Core Drive 1, Core Drive 3)
   Story lore, such as the roles students play within a game, can motivate students to continue learning because they are curious about how the story unfolds. Role-play that is appropriate for a given situation can also help students integrate the vocabulary they have learned into situations that feel real.
5. Immediate Feedback (Core Drive 3)
   Immediate feedback after students enter their responses, whether in text or audio form, is highly recommended. Feedback should also be specific, especially when it involves more challenging communicative tasks such as live conversations or essay writing. Feedback can take the form of corrections, right/wrong indicators, or animations and illustrations.

Implications of Visual Recommendations for Digital Educational Games

The design should be easy to navigate and should not distract students. It should utilize color, spacing, typography, size, and shape to convey what elements are important on the page. Based on the data collected, there are also recommendations regarding the use of text for bottom navigation to clarify the meaning of each icon. The design elements should use icons that are simple and easy to understand. For the text, it is recommended to use a font with minimal decorative elements, such as a sans-serif font.

UI components must be consistent to make it easier for students to organize information. If certain colors represent specific meanings (such as green for success and red for failure), the app must consistently integrate them on every page. Animations should focus on positive outcomes, such as when a player answers correctly or wins a competition. A progress bar can also be added to motivate students to complete their lessons.

Based on interviews and questionnaires, what students are most interested in are the mascots and characters that accompany them throughout the learning process. Duolingo integrates prior knowledge by using easily understandable icons, such as a microphone icon for the spoken input component and a speaker icon for listening to audio from questions. Integration is also achieved by providing images that match the context of the question to help students understand the question more easily. Duolingo has successfully implemented past knowledge integration.

The following is a summary of the criteria for mascots/characters derived from all respondents' answers in the interviews and open-ended questions in the questionnaire:

1. The mascot looks funny, cute, and expressive.
2. The mascot and characters are frequently featured during the learning process. For example, in questions, feedback, and on the main page.
3. There are a variety of characters in addition to the mascot.
4. The characters or mascot have a story or lore.
5. Animations for the mascot and characters make them more immersive.
6. Align the style of the mascot and characters with the UI, simple and minimalistic.

Visual Prototype

Based on the visual recommendations outlined above, here are examples of visual prototypes created using all of those criteria.

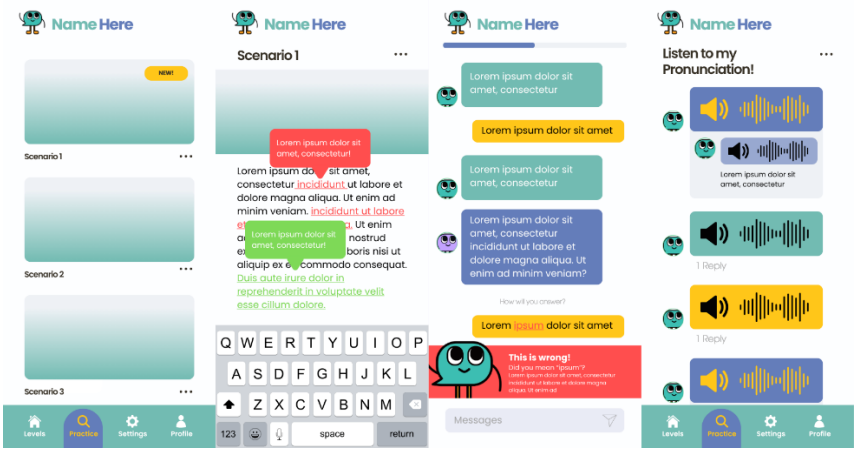


Figure 3. Visual Prototype
(Source: Christine Larissa, 2026)

This prototype incorporates the recommendations into several of its design elements, including:

1. Layout: A clean, simple layout that avoids overcrowding a single page, with careful consideration given to white space on the page. This helps reduce the cognitive load on students when navigating the app.
2. Color: There are three primary colors (turquoise, blue, and yellow) that provide clear contrast against the white background, along with two accent colors (red and green) to indicate success and failure. This provides consistency across all pages for students and allows them to easily identify the main focus of each page.
3. Typography: The font used is Poppins, a sans-serif typeface. Sans-serif text is easy for students to read in various sizes. This is particularly important because students will be reading a lot of text while using the app.
4. Icons: The app uses familiar icons so students can easily understand their meaning. This also helps reduce students' cognitive load.
5. Mascot: The mascot has an expressive face and appears in most questions. It also follows the overall UI style, featuring the same colors (turquoise, yellow) and a simple design.

CONCLUSION

The findings of this study indicate that Duolingo does not utilize all Core Drives in a balanced manner and focuses on extrinsic motivation or left-brain gamification. Nevertheless, the app successfully integrates all three principles of Visual Engagement through a non-confusing hierarchical layout, consistent visual icons across all pages without excessive decorative elements, a high degree of familiarity, and visuals that enrich the context. From the perspective of Self-Determination Theory, the mechanics and visuals in Duolingo successfully fulfill the element of Competence, although they are not yet fully effective in fulfilling Relatedness and Autonomy. Designs that are overly focused on achievement and repetition, such as Duolingo's, have the drawback of not allowing space for independent, creative, and communicative language use. Therefore, the design recommendations formulated in this study emphasize the importance of balancing achievement elements with features that strengthen autonomy and relatedness, as well as feedback that encourages creativity among learners. Scientifically, this study provides an analysis of gamification with a focus on active language use through the integration of Octalysis, SDT, Visual Engagement, and the principles of CLT and TBLT. Practically, the resulting design recommendations can serve as a reference for developers of Indonesian language learning applications. This study has several limitations, including a sample focused solely on Bandung, which may not represent the preferences of high school students throughout Indonesia, and a still-limited sample size. Suggestions for future research include expanding the sample and the regions studied, as well as testing the new application prototype that has been developed.

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