

User Interface Modeling for Basic English Learning Applications using the Child-Centered Design Method

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Abstract-Interactive media convey information through videos or images that can move with computer control in their presentation. Interactive media have a positive effect on children's language development. A language is a tool that humans need to communicate with each other. With the development of technology, especially in communication, Indonesian people have begun to learn English which is used as a means of communication between nations around the world. According to the English Proficiency Index, Indonesia will be ranked 80th out of 112 countries in the world in 2021. This shows that Indonesia is included in the low ability group. One of the efforts to improve English language skills is to introduce basic material from an early age. Children aged 0-6 years quickly absorb and receive various information. This study aims to build a UI modeling of basic English learning applications according to the needs and criteria of kindergarten-age children, which was built using the Child-Centered Design method to analyze the tasks required by the user and evaluate the level of usability using the USE Questionnaire method with a Likert Scale of 1-5. The findings of this study provide user interface design recommendations for basic English learning applications and have a usability score of 88.75. These findings indicate that this application is easy to use and provides a positive experience in learning basic English for kindergarten-age children.

Keywords: Child-Centered Design; USE Questionnaire; English Learning Application; Likert Scale; User Interface

1. INTRODUCTION

Along with the development of technology, the delivery of information at this time can be done easily and quickly anytime and over time[1]. This is because the more advanced technology is, there will be various kinds of new innovations in the teaching process, such as innovations in the field of education. The teaching process usually combines verbal and audiovisual media to make learning and to teach more efficient, effective, and easy[2]. Therefore, one application of educational technology is interactive media. Interactive media usually refers to digital technology such as applications on Android smartphones (mobile applications) that are very easy to use anywhere. Using a smartphone can encourage children's concentration and motivation in learning[3]. Interactive media positively affects children's language development[4]. Language itself is a tool that humans need to communicate with each other. With the development of technology, especially in communication, the Indonesian people began to learn English, a global language[5]. English is used as a means of communication between nations around the world. However, according to the EPI (English Proficiency Index), Indonesia will be ranked 80th out of 112 countries in the world in 2021. This shows that English in Indonesia is included in the low proficiency group. Therefore, all Indonesians make efforts to master English.

One of the efforts to master English is to introduce it from an early age. According to Law Number 2 of 2003, children aged 0-6 years are in the golden age, namely the golden age of the child's brain, and this age is also the fastest growing process for children physically and mentally. At that age, children quickly absorb and receive various kinds of information[6]. English needs to be applied from an early age to make it easier for children to develop English when they reach their teens (entering elementary school, junior high school, or higher level). The English taught by the teacher will stick to the memory and be challenging to forget compared to children who are not taught English in Kindergarten[6].

The introduction of English to kindergarten-age children begins with the provision of introductory material in simple vocabulary and teaches it by reciting the language repeatedly. The teacher will explain vocabulary at school by listening, speaking, and reading[7]. Learning in kindergarten-age children will be easier using media to support teaching and learning activities. This is because children like something visual. The media used in general is drawing paper, but this media is not optimal because the image's visual form often does not follow the original condition[7]. The solution to overcome this is to use interactive media. Interactive media play an essential role in the process of providing stimulus to children because it can strengthen understanding and strengthen children's memories. Interactive media is also not dull because there are no elements of images, sounds, animations, and even videos that are displayed in it, so the atmosphere becomes more interactive[7]. Currently, there are interactive media in the form of applications of various types with the same purpose provided on the Android play store application. These recognition applications generally offer to learn while playing features.

Based on initial observations regarding English language learning in Kindergarten (TK) age children, which was carried out by observing English teachers at Pertiwi Bandar Jaya Kindergarten, Central Lampung, it was found that the process of introducing English still uses drawing paper media and is less than optimal, because it causes

students not to pay attention and get bored, which is caused by the lack of variety in using learning media which causes the teaching and learning process to be passive and the lack of interaction between teachers and students[8]. According to Budi Rahman (2014), the learning method using flashcards is not used because it is considered less effective for large groups and will focus on only a few students. In addition, observations were made with parents and children of Pertiwi Bandar Jaya Kindergarten students regarding introducing English outside of school. These observations found that the introduction process outside of school used several English learning applications. However, there were still some shortcomings in the usability aspect of English learning applications. The drawback lies in the low level of efficiency, learnability, and memorability because users, who are children, still find it difficult to remember and distinguish the function of the icons on each of the existing features. In addition, there are bugs (when the application is opened), so it takes a long time to open the application successfully. This is the primary problem parents face in introducing English to early childhood, and suitable learning methods are needed with the support of digital applications capable of usability and the ease of application features used.

The method used to build basic English learning applications is Child-Centered Design (CCD). Child-Centered Design is a User-Centered Design (UCD) approach that focuses on children[9]. In the UCD method, the system's end users are adults, while the CCD focuses on the end users of children[9]. The perspectives and rights of children are incorporated into each phase of the system-building process and become an essential element of the system in the end. This method involves parents' and teachers' roles as mediators and as part of the system modeling process.

According to a study by Ghifari [10] aims to develop UI designs for educational games for kids. The built features are found in the history and score/time menus. Adding these two menus makes it easier for users to repeat previous learning and provide a more interesting user experience[10]. In a study conducted by Nur Ariyani [11] aims to develop an educational game user experience on the Doni Adventure Game. The usability measurement in this study resulted in an average value of 90-95% and was declared acceptable as an educational game learning media[11]. In another research by Setyono Dwi Utomo et al [12] is proposed to create alternative interactive learning about animals using a smartphone application for school children. This application can describe animals' shapes, sounds, movements, and habitats more interestingly and improve children's understanding. The idea of making this application was proposed based on observations at Al-Persis 8 Islamic Kindergarten[12]. According to a study by Bhagas Raga Momintan et al [13] aims to build an application to recognize early childhood traffic signs. This application gets a significant percentage of the range value between the pre and post-test, 87.3% for the pre-test value and 90.3% for the post-test value[13]. In a previous study by Febri Arisandi Ramadhan et al [14] resulted a gender difference learning application for early childhood. Based on the test results, obtained a very good usability value, which is 87.8% [14]. This study uses the CCD method because the user of this application is a child. In previous studies [10][11][12][13][14], it has been proven to produce good usability results and can build applications in accordance with the child's preferences.

Therefore, this study aims to provide and model the User Interface of a basic English learning application using the Child-Centered Design (CCD) method, where this method makes the user, namely children, the center of the system development process based on user experience[9]. To measure the usability level of the application prototype for the introduction of basic English materials made using the USE Questionnaire method, which has aspects according to the background problems such as low-efficiency levels and issues with memorability and bugs (errors). Thus, this research produces a good UI model according to the needs and characteristics of kindergarten-age children.

2. RESEARCH METHODOLOGY

The method used to design a basic English learning application model is Child-Centered Design (CCD). The Child Centered Design (CCD) method is a development of the User-Centered Design (UCD) method. The difference between CCD and UCD methods lies in the application's end user. In the CCD method, the system's end users are focused on children, while the UCD end users are adults[9]. The results of the production model will be evaluated using the USE Questionnaire to ensure that the model is following the user's needs and characteristics. USE is an abbreviation that comes from Usefulness (usability), Statistics (satisfaction), and Ease of Use (ease of use). The Ease of Use factor consists of 2 factors: Ease of Learning and Ease of Use[15]. Below is an illustration that explains the flow or flowchart that will define the steps:

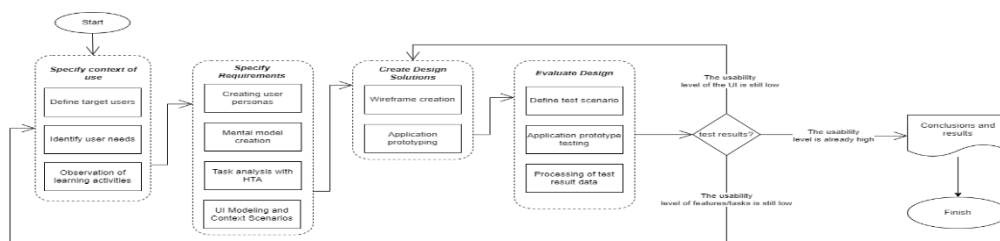
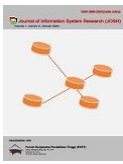


Figure 1. UI Modeling Flowchart



Data collection is carried out by making observations with the target user. Observations were made on parents, children, and kindergarten English teachers. Observations on parents are carried out to obtain information on what content can be provided so that learning applications are safe and optimal in terms of age and accordance with the child's environment at home. In contrast, observations on teachers are carried out to obtain information on features and learning content so that the application is suitable for learning at school and can help children to improve their abilities. Then observe the children, as the main target of the application to be made, to find out what problems children face when using English learning applications. From these problems, the user's needs for the application and the needs that the application must have to meet user needs can be identified. User task descriptions are adjusted to the results of observations of children's daily learning activities. In addition, job descriptions are also made based on an analysis of similar English learning applications by developing features on the application that are expected to help in the learning process. This observation resulted in three types of users: High, Medium, and Low. This user grouping is divided based on the user's ability to interact with technology and user behavior in learning English directly or using learning applications. Table 1 is the user persona in this study.

Table 1. List of User Needs by Persona

Persona	Goals	Requirements
Child	Train cognitive abilities.	Giving challenges and scores on the app.
	Get to know objects around you in English appropriate for their age.	Provide the appropriate category and often found in the vicinity.
	Understanding words in English.	Provides audio features to learn the pronunciation of words in English.
	Saying words in English.	Provides an audio recording feature to test the pronunciation of words in English and improve it.
	Choose the word in English that matches the picture.	Provide challenges in the form of pictures and choice of words according to the image.
	Choose the word in English that matches the audio.	Provides challenges in pronunciation of audio and word choice according to the audio.
	Get entertainment on the sidelines of learning.	Provides story and music play features.
	Understand the use of English learning applications.	Provides a tutorial at the beginning of using the application.
Interact with English learning apps.	Provide gender-adjusted characters.	

The next stage is to design the appearance of the mobile application. The design is made with a high-fidelity Mockup type which will later be used to build a prototype of an English recognition application. This stage begins with making an overview of the overall task to be carried out in detail. The target respondents of this study were kindergarten-age children who were asked to declare an application for learning English with adult assistance. The usability level measurement on the application prototype uses the USE Questionnaire method. There are 15 questions according to the USE Questionnaire method in the survey. These questions represent four factors consisting of 5 questions related to Usefulness factors, three questions related to Satisfaction factors, five questions related to Ease of Use factors, and two questions related to Ease of Learning factors. This study uses ten samples of respondents because to achieve an acceptable threshold of 85 percent of usability problems, a minimum of 5 respondents is required[16]. The questions asked are in accordance with Table 1.

Table 1. USE Questionnaire

A list of Questions	
Ease of Use	
1	The Study Bus app is easy to use.
2	The Study Bus app is easy to understand.
3	The Study Bus app can quickly and easily avoid errors in its use.
4	Users do not see any inconsistencies while using the Study Bus app.
5	The Study Bus app menu display is easy to recognize.
Ease of Learn	
6	The Study Bus app can be quickly learned how to use.
7	The Study Bus app is easy to remember how to use.
Satisfaction	
8	The Study Bus app is convenient to use.
9	The Study Bus app is fun to use.
10	The Study Bus app works as desired.
Usefulness	
11	The Study Bus app is helpful for users.

A list of Questions

- 12 Study Bus app according to need.
- 13 The Study Bus app helps you to be more effective.
- 14 The Study Bus app helps you be more productive.
- 15 The Study Bus app saves time when you use it.

The survey assessment uses a Likert scale with answer choices and a score of 1 to 5, with a maximum result of 5 (100%) and a minimum score of 1 (20% of the maximum score). After the respondent answers that, the results of the answer need to be carried out before the usability measurement process. The test was conducted to determine the correlation of the questions answered by the respondents, which resulted in valid and invalid questions. The invalid question, deletion to generate more optimal usability value. The results from the valid ones are then calculated by calculating the size and compared with standard values such as Table 2[17].

Table 2. Eligibility Standard

Value range (%)	Description
value < 21	Very Inappropriate
21 - 40	Not Eligible
41 - 60	Enough
61 - 80	Worth
81 - 100	Very Eligible

3. RESULT AND DISCUSSION

3.1 Task and User Needs

Data collection is done by observing the target user to get the context specifications needed to support the application so that it can be used optimally and in accordance with the target user. Observations were made on parents, children, and kindergarten English teachers. After that, user needs are identified, and the application must have requirements to meet user needs. In addition, job descriptions are also made based on an analysis of similar English learning applications by developing features that are expected to help in the learning process. This observation gets three levels of users. This user grouping is divided based on the user's ability to interact with technology and user behavior in learning English directly or using learning applications. In the system, there are two features, namely the main features that will be fully used by the main user (children) and complementary features, where these features will be used by others other than the main user (parents/guardians).

3.2 Design Solutions

At this stage, it produces a prototype application design according to user needs in learning English. This stage begins with a detailed description of the tasks to be carried out. Then define the visual components to be used when creating the wireframe. The wireframe is an overview of the display structure and layout of the app's features in the form of a low-fidelity mockup. Furthermore, the results obtained will be used as a reference in making a more detailed user interface design (high-fidelity mockup).

The mockup offers a thorough representation before prototyping. Here is a mockup of the basic English learning application built. Figure 2 shows the initial view of the application, which shows a gif bus which is the icon of the application, the name of the application, and the 'Play' button to start the application. The application menu, including "Read", "Talk", and "Quiz", is displayed on the home page after the user presses the play button. In addition, this page also provides information about the time of use of the application and the name and profile photo of the user.



Figure 2. Home Page Application

When the user selects the “Read” menu, the user will enter the learning category page. There are several categories to choose from, such as Animal, Alphabet, Numbers, Color, Shapes, Family, Body Parts, Vegetables, Fruits, and Room. The following display is a display of the Animal category options. In addition, the vocabulary review features a feature to listen to vocabulary pronunciation and sounds from animals, as presented in Figure 3.

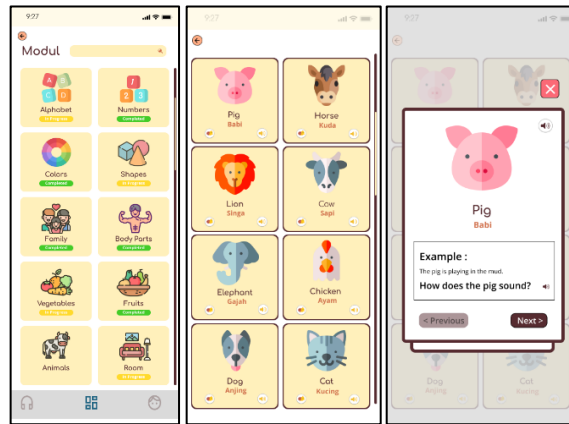


Figure 3. Read Menu Display

The learning category page is found in every menu option on the home page and as well as the "Speak" menu. The following display is a display of the Animal category selection. This learning has several levels until the user completes the lesson. After that, feedback will be given as a word pronunciation correction if the user says a word that does not match the pronunciation, as presented in Figure 4.

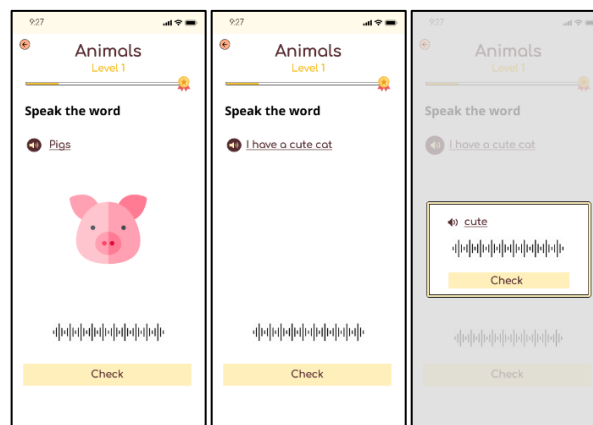


Figure 4. Speak Menu Display

Figure 5 shows the "Quiz" menu used by the user to conduct a learning test. There are 2 test options: guess the word "What is it?" and search for images that match "Where is it?". In addition, there is feedback in the form of scores to determine the right choice. The application also displays audio according to the command when the user accesses the audio tool.

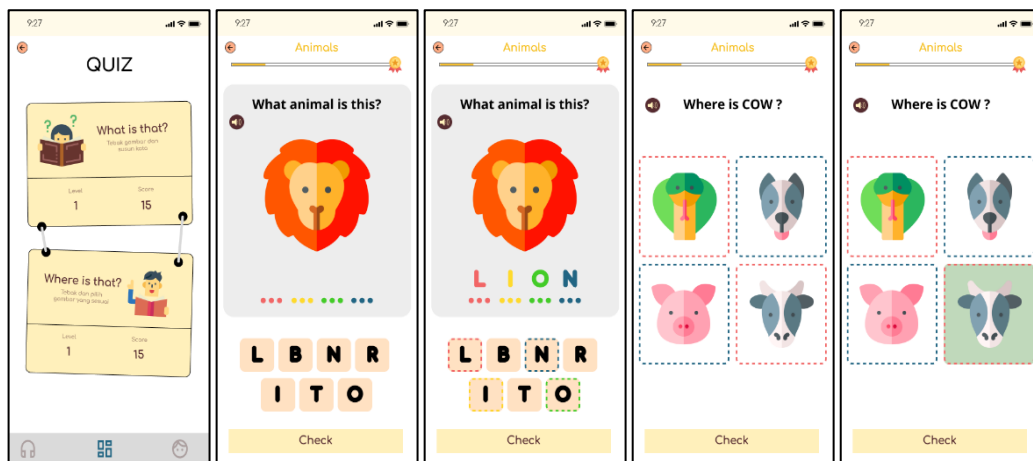


Figure 5. Quiz Menu Display

Figure 6 is a page that displays stories and music as a means of entertainment on the sidelines of learning. On this page, users are presented with a choice of various stories and music titles. In addition, the story's presentation in the form of an animated video is equipped with interesting text for children.

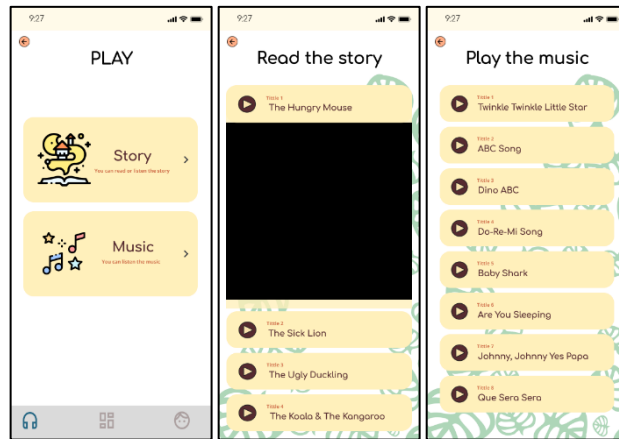


Figure 6. Play Page Application

Figure 7 is the "Profile" page, where users can change their personal information, access learning history, and find out the scores that have been collected. In the change profile photo section, there is an option to add a photo that allows the user to use a personal picture. There is also a Logout menu to exit the account and stop using the application.

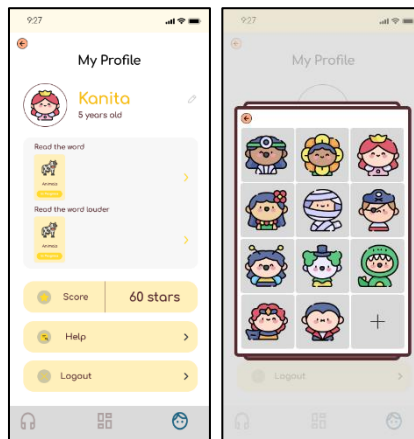


Figure 7. Profile Page Application

3.3 USE Questionnaire Evaluation

After the prototype of the basic English learning application is made, an evaluation is carried out at this stage. The number of respondents required is 10 participants. The testing process is carried out for approximately 20 minutes for each participant to follow the given task scenario. This test uses the direct usability testing method. The test begins by explaining in advance the intent and purpose of the examination conducted to the respondent. At the time of testing, the child is accompanied by a guardian to direct the task scenario. The test was carried out twice, with and without a guardian. Assessment by respondents was transferred to the questionnaire method to facilitate accumulation. In addition, the authors also conducted follow-up interviews to find out the problems faced by children when carrying out task scenarios. The user interface design was tested using a Likert Scale of 1-5, where five indicated strongly agree, and one indicated strongly disagree. The results of the calculation of the correlation value in the questions asked are shown in Table 3.

Table 3. Validity Test Result

List Use r	Ease of use					Ease of learning				Satisfacti on		Usefulness					rValu ed	Descripti on
	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q9	Q0	Q 1	Q 2	Q 3	Q 4	Q 5			
R1	4	4	4	4	4	5	5	5	5	4	4	4	4	4	4	0,931	Valid	
R2	5	5	5	5	5	4	4	5	5	5	4	4	4	4	4	0,808	Valid	
R3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0,816	Valid	

List Use r	Ease of use					Ease of learning			Satisfacti on		Usefulness					rValu ed	Descripti on
	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q9	Q0	Q 1	Q 2	Q 3	Q 4	Q 5		
R4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0,808	Valid
R5	4	5	4	5	4	5	4	4	5	4	5	5	4	4	5	0,931	Valid
R6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0,739	Valid
R7	5	5	5	5	5	5	4	5	4	5	4	5	5	5	4	0,782	Valid
R8	3	3	4	3	3	4	3	3	3	4	3	4	4	4	3	0,872	Valid
R9	5	4	5	4	5	5	5	5	5	5	5	5	5	5	5	0,791	Valid
R1 0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0,816	Valid

After calculating the validity, the reliability is calculated to get Cronbach's Alpha value. The reliability statistics values in Table 4 show Cronbach's Alpha value of 0.965. When compared with the value on Cronbach's Alpha Reliability Level, the range of values is in the Very High category [17]. Therefore, it can be concluded that the questionnaire used is reliable as a usability measurement tool.

Table 4. Reliability Statics

<i>Cronbach's Alpha</i>	N of question	Description
0,965	15	Reliabel

3.4 Usability Evaluation

At this point, the results of the respondents are used for usability testing by calculating the maximum score of the scale and the observation score of each question dimension [17]. The number of respondents involved was ten people, the assessment score for each question was 5 points on the Likert Scale, and the number of valid questions was 15. The usability test value is shown in Table 4.

Table 5. Usability Calculation Result

No	Usability Dimension	N of question	Score _{max}	Score _{observe}	%
1	<i>Ease of use</i>	5	250	221	88.40
2	<i>Ease of learning</i>	3	150	134	89.33
3	<i>Satisfaction</i>	2	100	90	90.00
4	<i>Usefulness</i>	5	250	219	87.60
Average					88.37

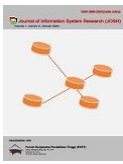
The usability data processing above produces an average result of 88.37%. Based on the average marks obtained, the prototype design recommendations can be placed in the Very Eligible category according to the Eligibility table in Table 2. These results indicate that using the CCD method to build a user interface for basic English learning applications can improve efficiency and user satisfaction in children's English learning.

4. CONCLUSION

This research produces a User Interface Model for basic English learning applications using the Child-Centered Design method. The built application provides simple, creative and attractive learning features to help children learn basic English. In addition, the application also offers a collection of stories and music features as a means of entertainment. Furthermore, to increase user convenience in learning English, the authors develop similar application features expected to assist in learning, such as audio play, voice recording, interactive video and reading correction. The UI model of the android-based application was then tested for usability using the USE Questionnaire method with a Likert Scale rating of 1-5. The USE Questionnaire method has several aspects of use, namely Ease of use (Ease of use), Ease of learning (Ease of learning), satisfaction (satisfaction), and usefulness (usability). To test the usability, ten questions were asked, consisting of 2 questions related to Ease of learning, three questions related to satisfaction, and five questions each related to Ease of use and Usefulness. This usability test resulted in an average score of 88.37%. The score comes from the scores of each group of questions, namely the Ease of use aspect receives a score of 88.40%, the Ease of learning part gets a score of 89.33%, the Satisfaction aspect receives a score of 90.00%, and the Usefulness aspect gets a score of 87.60%. Therefore, the user interface modeling of basic English learning applications using the Child-Centered Design method that has been built is categorized as very feasible and can increase user efficiency and satisfaction in learning basic English.

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