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E-Vokids (English Vocabulary for Kids): Aplikasi Berbasis Augmented Reality untuk Media Pembelajaran Bahasa Inggris

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Abstrak

Penelitian ini bertujuan untuk mengembangkan aplikasi pembelajaran kosakata bahasa Inggris menggunakan teknologi augmented reality untuk mengetahui hasil uji kelayakan aplikasi tersebut. Metodologi penelitian yang digunakan adalah Penelitian dan Pengembangan (R&D) dengan model pengembangan prototipe yang terdiri dari beberapa tahap: Analisis, Desain, Pemrograman, dan Pengujian. Hasil penelitian ini adalah aplikasi berbasis augmented reality, E-Vokids (English Vocabulary for Kids), sebagai aplikasi pembelajaran bahasa Inggris yang digunakan pada smartphone berbasis Android. Dengan hasil pengujian marker sebesar 100%, dapat disimpulkan bahwa marker yang digunakan sangat layak; hasil pengujian aplikasi, yang terdiri dari pengujian fungsionalitas, juga sangat layak. Uji kelayakan didasarkan pada tanggapan pengguna dari 30 siswa SMPS Makassar Raya, dengan hasil "sangat layak" dan rata-rata persentase kelayakan sebesar 85,35, aplikasi ini dikategorikan sebagai sangat layak. Berdasarkan hasil penelitian ini, E-Vokids layak digunakan sebagai aplikasi pembelajaran kosakata bahasa Inggris.

Abstract

This research aims to develop an English vocabulary learning application using augmented reality to find the application's feasibility test outcomes. The research methodology used is Research and Development (R&D) with a prototype development model consisting of several stages: Analysis, Design, Coding, and Testing. The results of this research are an augmented reality-based application, E-Vokids (English Vocabulary for Kids), as an English learning application used on Android-based smartphones. With a test percentage of 100% and marker testing, it is concluded that the markers used are very decent; the results of the application testing, which consists of functionality testing, are also very decent. The feasibility test is based on user responses from 30 students of SMPS Makassar Raya Obtained a "very decent" With an average feasibility percentage of 85.35, the application is categorized as very decent. Based on the results of this research, the E-Vokids are viable to be used as an English vocabulary learning application.

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PENDAHULUAN

One of the pillars supporting a country's growth is education. A nation's quality will increase in direct proportion to the calibre of its education sector. The student is supposed to maximize their potential with the help of a better education platform, which furtherly prepares them to become competent and with the support of society for their communities and country. It is essential to continue enhancing the education system. Modifications to the classroom learning process are one of them.

The interaction between teachers and students and learning resources that occurs in a learning environment is referred to as the learning process (Abroto et al., 2021). Interactions between teachers and students are also significant for the information that is given by the teacher to be correctly transferred to students and accepted, comprehended, and processed by them, the teacher and their students are essential.The impact of the media used to distribute instructional materials permeates all aspects of teaching and learning interactions in the classroom. Students are more interested in participating in class lessons when the media used to provide communicative content is engaging (Burhanuddin, 2017).

The employment of learning media in the teaching and learning process, according to Hamalik in Arsyad, may inspire and stimulate learning activities, create new needs and interests, and even have psychological repercussions on pupils. By modifying the learning material, learning media may be composed in various ways (Arsyad, 2017). Heinich, who Pribadi cited, declared that the type or classification of the media utilized for educational activities includes: (1) Print/Text Media, (2) Exhibition/Display Media, (3) Audio Media, (4) Motion Figures, (5) Multimedia, and (6) Web or Internet-based media (Pribadi, 2017). Technology-based learning media include products that are currently under development and that are frequently used. In the modern day, media that uses information and communication technology is a potential component in a learning process' success. Augmented reality technology-based media is one of the tech-based media that is frequently used in education. A technology known as Augmented Reality (AR) may add interactive virtual objects that are created in real-time to the actual environment and combine the real and virtual worlds in three dimensions (Khan et al., 2019); (Sirakaya, 2018).

Language learning is just one of the numerous academic disciplines that can benefit from using media based on augmented reality technology. Since language is a tool for communicating daily, it plays a crucial role in life. Language allows one to share with others and make their ideas understood. Every nation has a unique language. One of several international languages is English. English is the most widely spoken foreign language outside of the United States today, so learning English at the Junior High School level (SMP) is crucial for education.

According to the observations done at SMPS Makassar Raya, many students struggle with learning English. They have inadequate English language skills,

including a limited vocabulary and an inability to grasp introductions and self-introductions. Their delay in starting English language instruction began when they entered junior high school and was the issue's root. Three factors should be considered when learning a language: hearing, speaking, reading, and writing. (Mulyati, 2015). Most SMPS Makassar Raya students can only write out of these three, while hearing and reading are still decent enough. Furthermore, this institution does not currently use interactive learning materials to teach English. The research team chose to create an Augmented Reality-based English learning media in response to the abovementioned issues. This android-compatible media is called E-Vokids (English Vocabulary for Kids).

METODE

The development of the English Vocabulary for Kids (E-Vokids) app, which utilizes Augmented Reality (AR), marks a significant step in the field of educational tools. This app is designed to make learning English vocabulary an interactive and engaging experience for children. The app's effectiveness as a learning tool was evaluated, and the findings provide valuable insights into its potential to enhance language learning through innovative technology. This study uses the Research and Development (R&D) method with the Development waterfall Style approach, which consists of four stages, namely: analysis, design, coding, and testing stages (Rosa & Shalahuddin, 2015).

The software development process begins with the analysis stage, where requirements are meticulously gathered to align with specific application needs, taking into account user demands. This phase is crucial for researchers to identify the necessary tools and materials required for the application's creation. Following this, the design stage translates the application requirements into a visual representation, which includes flowchart and user interface designs, preparing for the subsequent implementation phase. The coding stage then takes these designs and transforms them into executable application software, adhering to the specifications laid out during the design phase. Finally, the testing phase is conducted to verify the functionality and correctness of the developed application, ensuring that it operates as intended. Each stage builds upon the previous one, ensuring a structured and efficient development process.

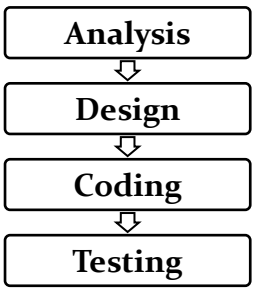

Fig.1 Development waterfall Style

The research objectives encompassed the development of the E-Vokids app, leveraging augmented reality to facilitate English learning for children. Additionally, the study sought to evaluate the outcomes of the app's feasibility study, focusing on its effectiveness as an AR-based educational medium. This research was conducted at two institutions, Golden Gate School and Makassar Raya School, involving a sample of 30 students. Data was collected through a combination of observation, questionnaires, and documentation. The end product of this endeavor is an Android-based application that employs AR technology to create an immersive English learning environment. The development of an application product is followed by a series of tests to ensure its functionality and user satisfaction. This study employs a structured testing approach that includes functionality testing, marker testing, and usability testing to evaluate the application's performance and user interaction.

Functionality Testing

Functionality testing is a critical phase in the evaluation process, aimed at assessing the features identified during the requirement analysis. This study utilizes the Guttman scale to calculate the functionality score for each instrument on the answer sheet for each question item. The Guttman scale provides a clear binary response system, categorizing answers into yes-no, true-false, or positive-negative, which are recorded as a checklist with a high score of 1 and a low score of 0, as per Sugiyono (2014). The eligibility percentage is then calculated using the formula:

$$Eligibility\ percentage = \frac{observed\ score}{sexpected\ score} x\ 100\%$$

The data obtained is categorized using the eligibility categories outlined by Arikunto & Jabar (2009), as shown in Table 1.

Table 1 Qualitative Conversion of Eligibility Percentage

Numbers	Classification
< 21%	Not Worthy
21-40%	Inadequate
41-60%	Decent Enough
61-80%	Worthy
81-100%	Very Decent

Marker Testing

Marker testing evaluates the camera's ability to detect markers under various conditions, focusing on three primary indicators: camera distance, marker tilt angle, and background contrast. Camera distance testing determines the maximum distance at which the camera can accurately detect the marker. The marker tilt angle test assesses the camera's tolerance to different angles when identifying features.

The marker background contrast test measures the camera's sensitivity to color variations on the marker's background, as described by Yesmaya (2018).

Usability Testing

Usability testing is based on direct user feedback and employs the USE Questionnaire, which includes dimensions such as usefulness, ease of use, ease of learning, and satisfaction, as per Lund (2001). User responses are analyzed using a five-point Likert scale, allowing for a nuanced understanding of user perceptions, following the methodology by Riduwan (2013). The Likert scale conversion is detailed in Table 2.

Table 2 Likert Scale Conversion

Alternative Answer	Score
Strongly Disagree (SD)	1
Disagree D)	2
Neutral (N)	3
Agree (A)	4
Strongly Agree (SA)	5

Statistical Descriptive Analysis

The feasibility analysis of the application involves a statistical descriptive analysis technique, which is crucial for explaining data and drawing conclusions from the user feedback. The percentage results of user responses are compared with the Likert scale, a widely-used tool for measuring attitudes, opinions, and perceptions about an event, as detailed by Guruitno et al. (2011). The grouping of percentage levels according to the Likert scale is presented in Table 3. This structured approach to testing ensures that the application product is thoroughly evaluated, providing a comprehensive understanding of its performance and user acceptance.

Table 3 Qualitative Conversion of Eligibility Percentage

Eligibility Percentage	Criteria
81%-100%	Very Decent
61%-80%	Worthy
41%-60%	Quite Decent
21%-40%	Inadequate
<20%	Not Worthy

HASIL DAN PEMBAHASAN

The research has culminated in the development of an Android-based mobile application named E-Vokids (English Vocabulary for Kids), which integrates augmented reality technology to facilitate English language learning. This application is designed to be user-friendly and is equipped with a marker recognition

feature that triggers the display of English vocabulary in three dimensions when scanned. The development of E-Vokids was accomplished using Unity 3D as the primary engine, supplemented by additional software such as Vuforia SDK, Visual Studio, Blender, Sketch-Up, and Corel Draw to enhance the application's augmented reality capabilities.

Application Features and Interface

E-Vokids is designed to operate seamlessly on Android smartphones, offering a range of features to enhance the learning experience. The main feature, "Scan Here!", leverages augmented reality to present 3-dimensional objects, audio, and text based on the markers scanned by the user. Complementing this is the "Materials" feature, which provides supplementary learning materials. The "Quiz" feature offers interactive questions to assess students' grasp of the vocabulary after engaging with the other features. Lastly, the "Guide" feature serves as a user manual to ensure proper and effective use of the application. Figures 2 through 6 illustrate the main screen, the augmented reality feature, the materials menu, the quiz menu, the guide menu, and the application marker, respectively.

Fig.2 Main Screen

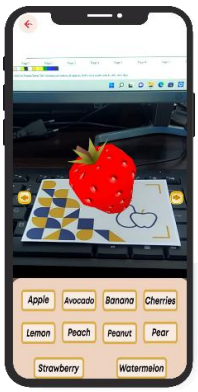

Fig.3 Main AR Feature/Scan Here!

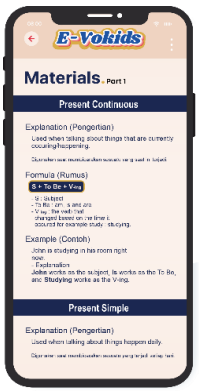

Fig.4 Materials Menu Screen

Fig.5 Quiz Menu Screen

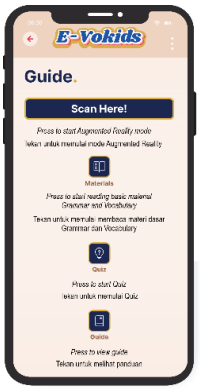

Fig.6 Guide Menu Screen

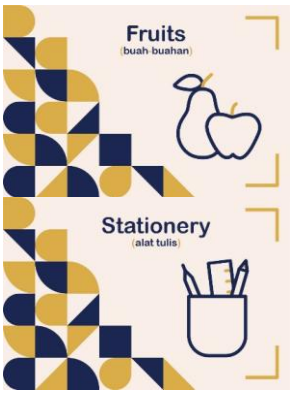

Fig.7 Application Marker

Testing Protocol

1. Functionality Test

The Functionality Test, specifically the Camera Distance Test, is a critical component in evaluating the performance of the E-Vokids application. This test is designed to measure the camera's capability to detect markers at various distances, which is essential for the augmented reality features of the application to function correctly. The test results are systematically documented in a table format, as depicted in Figure 1. The table illustrates the detection status of five different markers at incremental distances ranging from 5 cm to 200 cm. The detection status is categorized as either "Detected" or "Not Detected," with an accompanying description that provides insights into the visibility and stability of the 3D objects associated with each marker.

Upon examining the test results presented in Figure 1, it is evident that the application's camera can reliably detect markers at distances up to 150 cm, where the 3D objects associated with the markers are fully visible. However, at 180 cm, the detection becomes inconsistent, with the 3D objects sometimes disappearing, indicating a decrease in the camera's ability to accurately recognize the markers. This could be attributed to the reduced size of the marker in the camera's field of view, which may affect the recognition algorithm's accuracy. At 200 cm, the markers are no longer detected, and consequently, the 3D objects fail to appear, signifying the outer limit of the camera's effective detection range for the markers. These findings are crucial for understanding the operational parameters of the E-Vokids application, particularly in settings where the distance between the camera and the markers may vary.

Table 4 Camera distance test result

Camera Distance	Marker 1	Marker 2	Marker 3	Marker 4	Marker 5	Description
5 cm	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	The 3D object does not appear on marker
10 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
20 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
50 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
80 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
100 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
120 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
150 cm	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety

180 cm	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	The 3D objects are visible but sometimes disappear
200 cm	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	The 3D objects no longer appear, markers are not detected

2. Marker Test

The marker test evaluated three aspects: camera distance, marker tilt angle, and background contrast. The camera distance test determined the range at which the camera could detect the markers, with the results indicating that the camera could reliably detect markers from 8.5 cm to 180 cm away. The marker tilt angle test assessed the camera's tolerance to different angles, with the camera successfully detecting markers at angles up to 60°. However, at a 90° angle, the markers were not detected. The background contrast test revealed that the application could accurately detect markers against various background colors, including white, brown, black, and orange.

The tables presented, table 5 and table 6, offer a detailed examination of the E-Vokids application's marker detection capabilities under varying conditions. Conversely, table 5 investigates the impact of the tilt angle between the camera and the markers. The data reveals that the application maintains effective marker detection up to a 60° angle, with 3D objects being fully visible. However, at a 90° angle, detection fails, indicating a limitation in the system's ability to recognize markers when the camera is perpendicular to them. This finding is significant for users, as it highlights the importance of maintaining an optimal angle for effective interaction with the application.

Table 5 Test results of marker tilt angle

Angle	Marker 1	Marker 2	Marker 3	Marker 4	Marker 5	Description
0°	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
30°	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
45°	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
60°	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
90°	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	The 3D object does not appear

table 6 demonstrates the system's performance with respect to different background colors. The results indicate a consistent detection of markers against a spectrum of colors including white, brown, black, and orange. This uniform detection across the color palette suggests that the application's augmented reality feature is robust against variations in background color, ensuring that the 3D objects

associated with the markers are reliably rendered in their entirety. This consistency is crucial for the application's usability in diverse environments where the background may not be controlled. Collectively, these tables provide valuable insights into the operational parameters that influence the E-Vokids application's augmented reality features, guiding users on how to position markers for optimal detection and visualization of educational content.

Table 6 background contrast test results

Background Color	Marker 1	Marker 2	Marker 3	Marker 4	Marker 5	Description
White	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
Brown	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
Black	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety
Orange	Detected	Detected	Detected	Detected	Detected	The 3D objects visible in their entirety

3. Usability Test

The usability of the E-Vokids application was evaluated through a questionnaire given to 30 students from Golden Gate School and Makassar Raya School, yielding an average score of feasibility level of 85.35%. This data positions the application firmly in the "Very Decent" category, indicating a high degree of usability. As detailed in Table 7, an overwhelming majority of respondents, precisely 83.3%, rated the application as "Very Decent," demonstrating its success in fulfilling user expectations and delivering a positive user experience. The remaining responses were distributed among "Worthy" (6.6%) and "Decent Enough" (10%), with no negative feedback recorded. These findings not only validate the application's usability but also provide a solid foundation for future enhancements, aiming to uphold and possibly elevate the current level of user satisfaction.

Table 7 Usability Test Results

Category	Number of Respondents	Percentage
Very Decent	25	83,3%
Worthy	2	6,6%
Decent Enough	3	10%
Inadequate	0	0
Not Worthy	0	0

SIMPULAN

This research produces a product in the form of an application called E-Vokids, which is designed as an English learning medium. This application is based on Augmented Reality that can be run on android smartphone devices. The applications are designed using additional components such as Support Software and markers. The design result of the E-Vokids Application consists of several essential menus/features including the "Scan Here!" to start the Augmented Reality mode to scan the desired object, and the "Materials" menu to access the materials in the E-Vokids application. The "Quiz" menu to access the questions related to the materials in the E-Vokids application, and finally the "Guide" menu guides users to use all the features in the E-Vokids application.

Because the outcomes of the tests indicate that the E-Vokids program fulfils the testing criteria, it is believed to be feasible. The results show that it is very decent in terms of functionality, with a test success rate of 100%, marker testing, which illustrates that the markers used are compatible with the application, thereby making it easier for the application to recognize markers that have been provided and usability testing. The average eligibility rate for the group of users with 30 responses was 85.35%, with 23 respondents falling into the "Very Decent" category, 5 in the "Decent" category, and 2 in the "Quite Decent" category.

UCAPAN TERIMA KASIH

Ucapan terima kasih disampaikan bagi pihak yang telah memberikan bantuan dana dan/atau penulisan artikel ilmiah akademik ini.

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