

# Android Application Dictionary of English Terms for Mathematics Learning

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## Android Application Dictionary of English Terms for Mathematics Learning

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### Abstract

Mathematical terms in English often confuse students with their meanings. In its application, the impact on students' difficulties in understanding the concepts being studied. Students also have a problem in making useful conclusions while the books in English-language textbooks. These things make most Mathematics education students low-motivation and challenging to understand the concepts and basic mathematics derived from English-language texts. The term dictionary can be an alternative solution that can be used to overcome the problems. In general, the term dictionary discusses terms that are not common in a field. This Android application also provides a specific explanation of the terms that are the main search words. Android applications that have been developed are named RIGA. RIGA has 100 words or phrases in English and explanations and 100 words or terms in Indonesian along with answers. This study uses qualitative and quantitative data types. Qualitative data were obtained using a questionnaire in the form of suggestions and criticisms given by the test subjects. Meanwhile, quantitative data were obtained from questionnaire distribution scores from the test subjects. The results show that the results of validation by media experts and field trials produce valid results. Thus, it can claim that RIGA can use for the teaching and learning process.

## INTRODUCTION

In this day and age, where information technology has become a critical requirement [1], it has become necessary for students and even the general public to master foreign languages, especially English. In general, English is an international language to communicate with each other. It is also because most of the books or research journals from around the world use English. So, to understand these things requires sufficient English skills and abilities. According to Damayanti and Maharani [2], mastery of foreign languages is essential and can be used as a source of competitiveness by learning cultural understanding and mutual communications.

Most of the books used as a source of knowledge in lectures in the Mathematics Department of IAIN Tulungagung use English books. It sometimes makes most students less motivated to study sourcebooks in English, even though they need the text to add insight and knowledge [3]. Based on research by Yaqin at the Sunan Kalijaga State Islamic University in Yogyakarta, there is a shallow interest in using English-language reference materials [4]. It is due to the low ability of students to use English. Besides, there is a lack of motivation from other parties to encourage students to use English-language references. Kartika was researching at Airlangga University. It can be concluded that students do not devote too much time to reading English literature [5]. Ningsih and Wijayanti found that students admit that they are afraid to

present in English because they fear mispronouncing it and do not understand mathematical terms in English [6]. Things like what has been described are miserable because young intellectual candidates must read more to gain broad knowledge.

In the world of mathematics, mathematical terms in English often confuse students with their meanings. Its application has an impact on student difficulties in understanding the concepts that are being studied. Students also find it challenging to make useful conclusions when the books are reviewed in English. These things make most Mathematics education students low in motivation, and it is not easy to understand the concepts and basics of mathematics which come from English-language textbooks.

The term dictionary can be an alternative solution that can be used to solve the above problems. In general, the term dictionary discusses terms that are not common in a field. The term dictionary also provides a specific explanation of the terms that are the main search words. Borowski and Borwein, in their book *The Harper Collins Dictionary of Mathematics*, created a term dictionary covering a wide variety of technical terms from pure and applied mathematics [7]. The book also contains examples and explanations. There are more than 3000 mathematical terms written by Nicholson in his book entitled *The Concise Oxford Dictionary of Mathematics*. These terms are believed to contain almost all existing mathematical words. However, the books above pay a reasonably expensive price [8]. Besides, some speak Indonesian, namely the *Mathematical Encyclopedia* written by Negoro and Harahap [9]. The book contains mathematical terms that are often used at the elementary to high school levels.

Apart from being in textbook form, one of the well-known websites Bruce Simmons developed [www.mathwords.com](http://www.mathwords.com), has set a mathematical term in English. It makes the development of the English dictionary for mathematics penetrate the digital era, especially the website. The website contains mathematical terms in English, starting from numbers, symbols, sets, geometry, and statistics. A website containing mathematical terms can help students understand mathematical terms in English [10].

The term dictionary development has been developed in mobile applications, especially for the Android operating system. The application "Mathematics Dictionary" developed by Paper Play Studio is a term dictionary application that contains a collection of Mathematical terms equipped with explanations. The application targets elementary, junior high, and high school students to make it easier to understand math terms. Another application that gets an increased rating is the "Mathematical Dictionary," developed by Luqman Dev. The application also contains mathematical terms similar to the first application. In general, applications developed are only mathematical terms in Indonesian with Indonesian explanations and are specifically for elementary to high school education. The application of a dictionary of English words for mathematics with Indonesian reasons for students in Higher Education is still rarely found in these applications.

Purwaningsih was making a flash-based animation game, "Jarimatika". The game can be run on two media, namely PC and smartphone, based on Android [11]. Another study by Aprilia about developing the 2-dimensional game "The Bugs Hunter" for personal computers and Android [12]. This environmental-themed game is aimed at the community to be more concerned about the environment. Research on dictionaries of English terms for mathematics is still rare. Research has been done in most research on the development of learning media for a particular mathematics material.

Applications based on the Android operating system are open source, or the application can be used or even modified with specific permissions by the public. As a result of the allowed modifications, it causes the development of Android applications. It is currently believed that the number of Android applications circulating on the Google Play Store has reached millions of applications. It is in line with the number of mobile phone users with Android systems and programmers who have sprung up due to the rapid development of information technology.

Currently, mobile phone users based on the Android operating system are increasing (source [www.et.co.id](http://www.et.co.id)). The Android operating system was the most widely used smartphone operating system in Indonesia in 2014. By the end of that year, Android had a market share of nearly 60%. Meanwhile, at the end of 2015, Android increased the number of users to 74%. In mid-2016, Android was still above 77%, but it was always challenging to get to 80%. At the end of 2016, 80% of smartphone users in Indonesia were using Android. In 2017, Android users in Indonesia reached 87%. And the facts that exist in the field, most Android-based cellphone users are young people of productive age, ranging from middle-level students to university students.

Based on the explanation accompanied by the facts above, with the increasing number of mobile-based application developers with various purposes and difficulty understanding English terms for mathematics, it is necessary to develop a mobile-based application. The goal is to build a math-themed application by applying currently developed technology, namely smartphones, with an Android-based operating system. The target of this application is Mathematics education IAIN Tulungagung students.

It is essential, considering that technological developments that positively influence and have a negative result can quickly impact students. So, applying a dictionary of English terms for mathematics can provide information and direct learning about the explanation of these terms, which can be used practically anywhere and anytime.

Applications made by researchers have the advantage of displaying information on a mobile basis. Among them are having a bilingual database of mathematical terms, showing meanings and definitions/meanings, and displaying mathematical images and formulas. So far, there is no mobile application capable of saying these things. Most of them only show their importance.

In the next section, we will discuss the methods used to create applications. Furthermore, there is a discussion related to researchers' trials both to the media expert and the test subjects, namely students.

## METHOD

The English term dictionary (RIGA) application for mathematics was developed by the development model proposed by Sugiyono [13] and the waterfall software development model (waterfall) [14][15][16]. This model is based on the fact that the model has covered all matters relating to development to produce an Android-based English Glossary for Mathematics application product [17]. The steps are (1) Potential and Problems; (2) Needs Data Collection; (3) Product Design; (4) Implementation and Unit Testing; (5) Product Validation; (6) Product Revisions; (7) Product Trial (8) Product Revision 2; and (9) Product Distribution. The development model in this study can be seen in Figure 1.

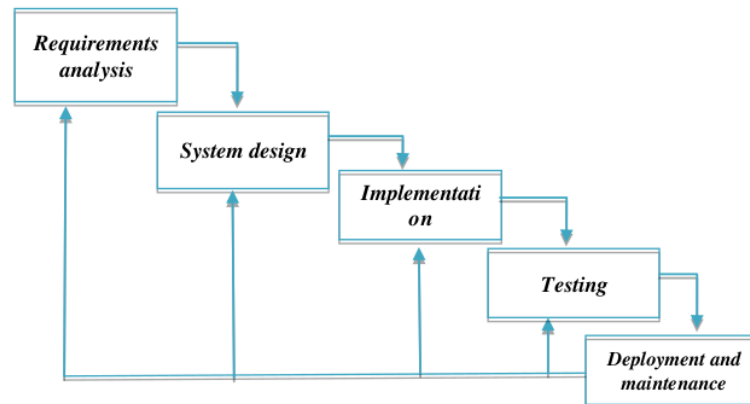


Figure 1. The Development Model of a Dictionary of English Terms for Mathematics

This research requires sources of information related to library sources to develop a dictionary of English terms for mathematics. The library sources used come from reliable and correct references. So it is hoped that it can strengthen the discussion that will be proven in later reports. This study uses ancient studies and field studies for the data collection process.

The purpose of this step is to study and conduct an in-depth study of the latest theories in developing a dictionary of English terms for Mathematics. Researchers come from articles, textbooks, both electronic and non-electronic, and other relevant sources.

This second step aims to obtain information from students about the obstacles they face during the learning process using English textbooks. Apart from that, the researcher also made observations to determine what expectations the students expected to increase their interest in learning English textbooks. Researchers know and try to provide solutions to the problems and expectations that arise by developing mobile-based applications where students are expected to use these applications anywhere and anytime with or without an internet connection. Besides, researchers also conducted direct interviews with related lecturers to know firsthand the lecturers' obstacles in lectures using English textbooks.

The Dictionary of English Terms for Mathematics consists of 3 core parts: initial view, search view, and display results. Figure 2 shows the flowchart of the term dictionary.



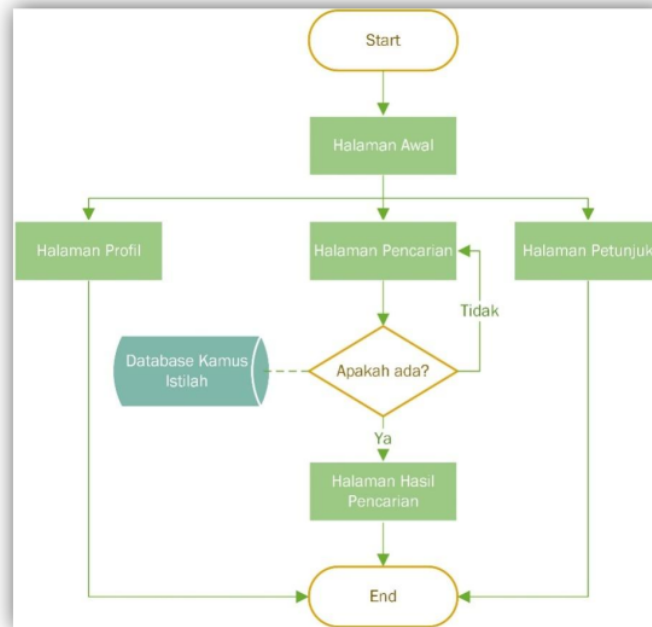


Figure 2. Flowchart of the Terms Dictionary

The RIGA application was tested through two trial subjects, namely testing by an expert and testing by users. Expert trials are carried out by practitioners in charge of Android application development. Meanwhile, the user trial aims to see the feasibility of the RIGA application that has been developed. The test subjects in this study were lecturers or practitioners and target users. The practitioner in question is one of the media development experts from the State University of Malang. The subject of the user trial was the Mathematics education student of IAIN Tulungagung.

This study uses qualitative and quantitative data types. Qualitative data were obtained using a questionnaire in the form of suggestions and criticisms given by the test subjects. Meanwhile, quantitative data were obtained from questionnaire distribution scores from the test subjects.

A closed questionnaire was used in this study as a data collection instrument. The value obtained refers to the Likert value scale in the form of positive questions so that the scoring is 5, 4, 3, 2, and 1 [17]. The data analysis technique used to process data from expert testing and field trials is the percentage analysis technique [19][20][21].

## RESULTS AND DISCUSSION

The English term dictionary application for mathematics, RIGA, is a mobile application with at least 100 English words or terms along with their meanings, definitions in English and Indonesian, pictures, and formulas. RIGA also has at least 100 Indonesian words or phrases and descriptions in English and Indonesian, images, and procedures. The RIGA application can be used both offline and online. Users can experience the whole experience if the user has an internet connection.

The RIGA application has two necessary uses as a dictionary: translating a word or term from English to Indonesian and vice versa. Second, RIGA also has examples of formulas and drawings and their application. The main page of RIGA is a word search page. Before performing a word search, users can choose from English to Indonesian or Indonesian to English. There is also a display of the overall term dictionary data on the main page and will change data when the user selects the language option. When the user has selected the search for a word or term, and the user presses the search button, the user can also see images, formulas, and even examples of use, if any, provided the user has an internet connection.

RIGA is also equipped with a feature to save words or terms that are liked by users. Users do not need to search the explored words at favorites menu. There are two favorite menus for English to Indonesian and Indonesian to English. In the menu, users can also delete data if the data is no longer needed. A screenshot of the RIGA application can be seen in Figure 3 and Figure 4.

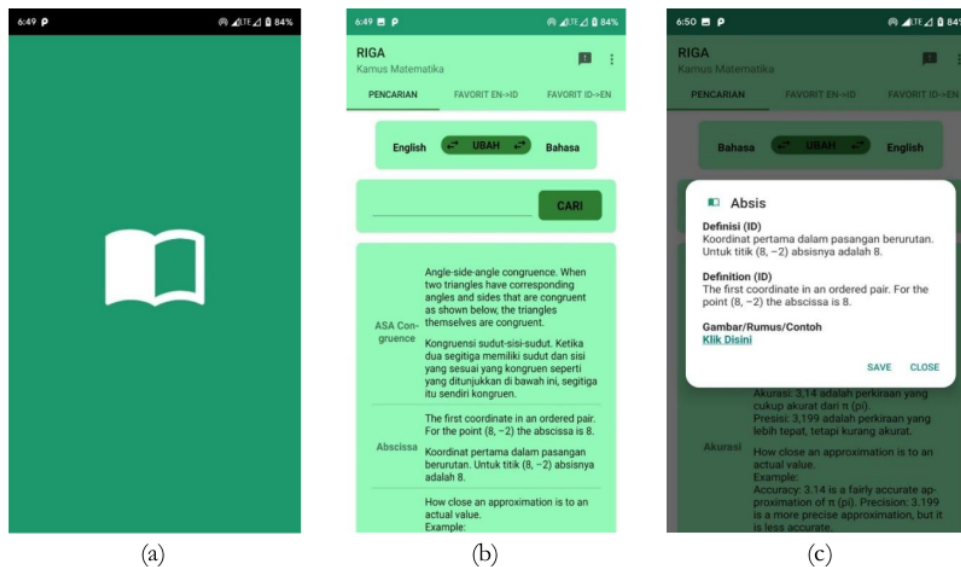


Figure 3. Screenshot of RIGA Application (a) Splash Screen; (b) Main page; (c) Search Results.

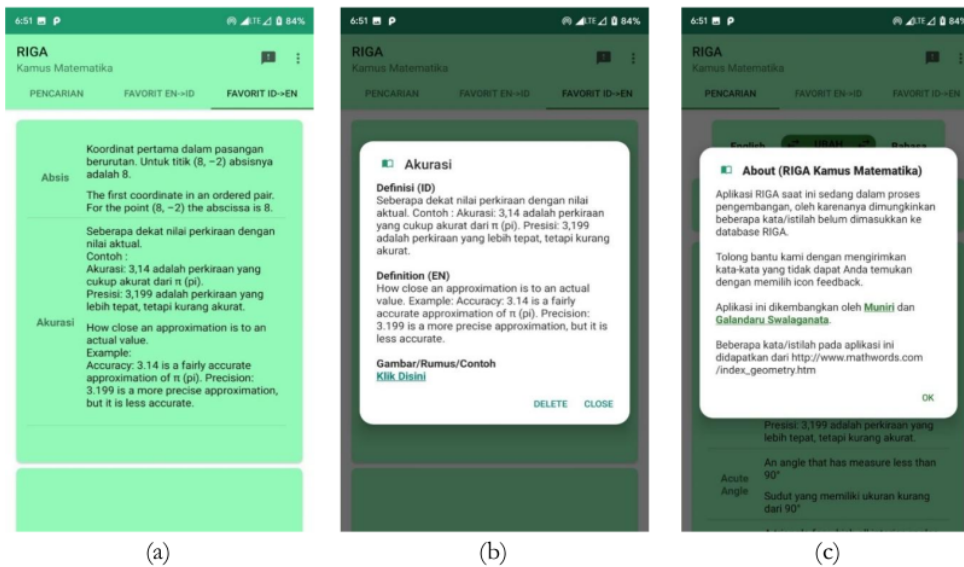


Figure 4. Screenshot of RIGA Application (a) Favorites; (b) Delete Favorites; (c) About.

The first data and analysis were obtained from the validation of the media expert, who was a Mathematics education lecturer at IAIN Tulungagung. Based on the data obtained from media experts' validation results, the following is an analysis of the data from each aspect assessed by the media expert.

#### 1) Application aspect

Indicators for application aspects include whether the application is easy to install on the cellphone. The application does not stop quickly, is easy to use, the buttons work as expected; there are no pauses when opening the application or the transition from one command to another. Media experts give a score of 5, 5, 4, 5, 4, 4 in sequence with a percentage of 90% categorized as valid.

#### 2) Graphic aspect

Visual aspect indicators include letters, layout design, layout settings, color display, image display, notes, and background, do not overlap, and attractive application icons. Media experts give a score of 5, 5, 4, 4, 3, 4, 4 in sequence with a percentage of 82.85%, which is categorized as valid.

#### 3) Content and material

Content and material feasibility aspect indicators include terms used, meanings/definitions, the assistance provided, illustrations, punctuation marks, symbols, and the language used. Media experts give a score of 5, 4, 4, 5, 3 in sequence with a percentage of 84% categorized as valid.

The second data and analysis were obtained from a trial on 5 Mathematics Education students who received 246 out of 275. The percentage obtained was 89.45%. Thus, the RIGA application is categorized as valid.

The third data and analysis were obtained from trials with five education practitioners, the lecturers. The following is an analysis of data from each of the aspects assessed by field practitioners.



1) Application aspect

Indicators for application aspects include whether the application is easy to install on the cellphone. The application does not stop quickly and is easy to use. The buttons work as expected; there are no pauses when opening the application or the transition from one command to another. Field trial subjects gave a total score of 23, 23, 22, 23, 22, 21 in sequence with a percentage of 89.3% categorized as valid.

2) Graphic aspect

Visual aspect indicators include letters, layout design, layout settings, color display, image display, notes, and background do not overlap, and attractive application icons. Field trial subjects gave a total score of 20, 20, 24, 21, 22, 22, 20 in sequence with a percentage of 86.5% categorized as valid.

3) Content and material

Content and material feasibility aspect indicators include terms used, meanings/definitions, the assistance provided, illustrations, punctuation marks, symbols, and the language used. Field trial subjects gave a total score of 23, 21, 22, 23, 23 in sequence with a percentage of 89.6% categorized as valid.

Based on the validation results from media experts and student and lecturer field trials, the final data obtained sequentially were 85.56%, 89.45%, and 88.21%. The average product obtained from the validation results is 87.74% and is categorized as valid.

Research is conducted to determine an effective medium for understanding a lecture material or using a questionnaire after students try the RIGA application [22]–[26]. A total of 10 statements were compiled as an effectiveness questionnaire based on research by Ambaryani [22], Rolisca [23], and Hestari [27]. Based on the effectiveness questionnaire that has been filled in by the test subjects, namely students, the score was 46 out of the maximum value of 50. So, the percentage value is about 92%. That means there are about 8% of the reasons why the RIGA application is ineffective. Some of the causes are the unavailability of good internet access in the student area and student devices whose screen size is less than 5 inches. The display on student cellphones is not optimal.

## CONCLUSIONS AND SUGGESTIONS

The RIGA application has two primary uses as a dictionary: translating a word or term from English to Indonesian and vice versa. Second, RIGA also has examples of formulas and drawings and their application. Media experts have validated RIGA, field practitioners, in this case, are lecturers, and the test subjects are students. The validation results by media experts resulted in a rate of 85.56% and were declared valid. The validation of field practitioners or lecturers produced a rate of 88.21% and were declared valid. The trial validation results for students resulted in a rate of 89.45% and were declared valid. Besides, it was obtained a 92% rate for RIGA's effectiveness in helping students understand lecture material. Thus, the mobile-based RIGA application is declared valid and suitable for use, especially for Mathematics education students of IAIN Tulungagung.

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