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# GLOSSARY ENGLISH MATHEMATICS: LEARNING MEDIA TO IMPROVE STUDENTS' DIGITAL AND VOCABULARY LITERACY

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***Abstract***

*English is a demand in the 5.0 era, especially in education. Students use many English journals and references. However, the students' interest in English still needs to be improved. Students need to understand books in English. An English math glossary can help them understand math terms in English. The English Mathematical Glossary contains explanations of mathematical terms—development of a Mathematical English Glossary using an Android application. Android applications have recently developed rapidly because of their nature that can be used anywhere and anytime. This research is development research using the SDLC (System Development Life Cycle) model. The Mathematical English Glossary's development has undergone five stages: planning, analyzing, designing, implementing, and testing. The product developed is an Android-based Mathematical English Glossary. The study results show that the Android-based Mathematical English Glossary is valid and practical in content, language, and presentation and effectively increases student digital literacy. After the vocabulary size test was carried out, it was found that the Android-based Mathematical English Glossary could improve the vocabulary skills of mathematics education students.*

**Keywords:** *English, Mathematics, Literacy*

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## INTRODUCTION

Education in the 5.0 revolution era made English a demand for everyone. The problem is that the position of English as a foreign language in Indonesia makes the learning process unoptimal (Purwaningrum & Utari, 2020). This is in line with research findings that students need help understanding concepts in English (Istiandaru et al., 2018) Some countries require teachers to understand English for mathematics because of the difficulty in implementing it (Heng & Tan, 2006). In develop countries, English for mathematics is needed because of students' ability in literacy and numeracy. In Indonesia is one of the countries where several universities already have subject English for mathematics. However, there are still many student errors found in writing English for

mathematics (Cesaria et al., 2022). Some types of errors are found such as incomplete material errors, technical errors, errors in understanding previous material and language misinterpretation. Therefore, prospective teachers must prepare to understand English subject matter to increase competence and make teaching easier.

Improving skills in English is urgently needed by today's students, especially Mathematics education students. Competence in mathematics requires using numbers and symbols as well as understanding and using mathematical vocabulary (e.g., adding, greater than, trapezoid) (Powell & Nelson, 2017). In solving math problems, students manipulate numbers and interpret symbols, so a good understanding of numbers and symbols is needed. Therefore it requires knowledge of Mathematics vocabulary in verbal and written form, called academic language (Dunston & Tyminski, 2013; Powell & Nelson, 2017). Academic language is the grammar and vocabulary students use in specific fields of knowledge (Miyake, 2005).

The wording is one of the components of academic language. Based on research, many teachers need to pay more attention to the language of mathematics in teaching, so it is not surprising that many students experience difficulties with the language of mathematics. Mathematics education students also experience this in understanding English Mathematics references.

In the world of education, mathematics students use many journals and references in English. However, Mathematics students' interest in English still needs to be improved. They also need help understanding English books. Student's difficulties in understanding the terms in Mathematics are caused by the terms used in Mathematics and English have different meanings; the terms used in Mathematics have particular definitions for Mathematics (Powell & Nelson, 2017). This affects students' understanding of the material being studied.

The success of learning depends on the use of learning resources and selected learning media (Sugiyono, 2011). The teaching materials must be developed by lecturers or teachers so that learning is more effective and efficient and stays consistent with the competencies to be achieved. Learning systems using teaching materials made by lecturers will make learning more efficient, practical, and relevant compared to conventional learning, which tends to be classical and face-to-face (Sungkono, 2009).

A math glossary can help students understand mathematical terms in English (Purwaningrum & Utari, 2020). A math

glossary is a collected list containing explanations of mathematical terms. Developing a mathematical glossary has begun to penetrate Android applications (Suzuki et al., 2019). Android applications have recently been overgrowing because of their open-source coding nature, which can be used anywhere and anytime, amidst students' high interest and needs regarding gadgets making mobile applications can be used as a learning tool (Ahmar & Rahman, 2017; Santosa et al., 2020). Android is software that is utilized on mobile devices (devices running processes) as an operating system, middleware, and core applications (Wardhani et al., 2016; Yunus & Fransisca, 2020).

Android is an operating system for mobile phones, smartphones, and tablets (Yunus & Fransisca, 2020) Learning media development based on Android is expected to make it easier for students to master teaching materials to achieve learning objectives easily (Deswita & Niati, 2018, 2020) Students do not have to access learning on campus, but students can also access the media wherever and whenever they are through the Android media devices that students already have (Deswita & Niati, 2020; Septia & Wahyu, 2023). This is the reason for developing an Android-based Mathematical Glossary application for mathematics students.

## METHOD

This type of research is research development (Research & Development). The product developed is an android-based mathematics English glossary. This study's Android-based learning media development model uses the SDLC development model. SDLC model design steps are planning, analysis, implementation, testing, and maintenance as in figure 1. The instruments used in this study were validation sheets, questionnaires, interview guides, and vocabulary size tests.


**Figure 1**. SDLC Cycle

The digital literacy ability questionnaire items are compiled based on three digital literacy components (Harmawati et al., 2024; Purnamasari et al., 2021). Questionnaire scoring scores using a Likert scale. The grid of the digital literacy ability questionnaire can be seen in Table 1.

**Table 1.** Digital Literacy Ability Questionnaire Grid

| Component | Indicator | Statement Item |
|---|---|---|
| Technical Skills | Ability to use multiple digital media | 1,2,3 |
| Critical Skills | a. Digital media can help understand the material being studied. | 4,5,6,7,8 |

| | | |
|---|---|---|
| | b. Students prefer the use of digital media.<br>c. The use of digital media can increase interest in learning. | |
| Communicative skills | a. The use of digital media can help students complete assignment<br>b. Digital media is used for discussion | 9,10 |

The analysis is carried out on each component of digital literacy by calculating the average, which will be converted into percentage form. The assessment category for each digital literacy component was determined using five criteria: very poor, not good, good enough, reasonable, and very good.

To know vocabulary literacy, the vocabulary test for students is done. Vocabulary is an essential part of language, and it makes sense to be able to measure learners' knowledge of it. The Vocabulary Levels Test is designed to estimate vocabulary size for students learning English (Siregar, 2020). The rationale for the test stems from research showing that vocabulary size is directly related to the ability to use English in various ways.

## RESULT AND DISCUSSION

Developing an android-based mathematical English glossary has gone through five stages: planning, analyzing, designing, implementing, and testing. The development of an android-based mathematical English glossary using the SDLC model has the following results. At the planning stage, the process is identifying student characteristics, identifying Textbooks / References, identifying Literature, and planning system requirements (Ikbal Hossain, 2023). The process carried out at the analysis stage is to analyze textbooks and mathematics reference books in English. Each section of the text and references containing mathematical material is used as a reference for compiling a glossary of English mathematics (Lemke, 2018). At the stage of analyzing the Literature, the Literature related to the development of android-based learning media were studied, namely research method books related to development research.

The third stage, namely the design stage, aims to design Android-based learning media(Adrianto et al., 2017; Ikbal Hossain, 2023). The following is an android-based mathematical English glossary designed. The material to be developed is briefly arranged, as shown in Figure 2.

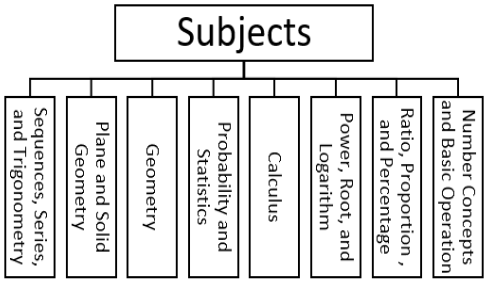


**Figure 2**. Composition of the Material

The implementation stage is the stage of implementing the system design that has been made at the design stage into a product. At this stage, the action taken was compiling a glossary of English mathematics; validation tests were carried out by filling out validation sheets by the validator until valid results were obtained. The results of the overall data analysis show that the percentage of English mathematics glossary is categorized as very valid with a value of 84.39%. Researchers have made revisions based on notes from the validator to produce a valid mathematical English glossary.

At the testing stage of a valid mathematical English glossary, then trials for mathematics education students. Students were selected based on academic abilities in mathematics: two people with high skills, two with moderate abilities, and two with low abilities limited trial to see the practicality of the developed Mathematical English Glossary. The results of the practicality questionnaire by students found that the practical percentage of the mathematical English glossary was 85%. Based on the criteria put the results of a practicality questionnaire by students in the English mathematics glossary are categorized as very practical (Istiandaru et al., 2018). Based on the results of interviews with students about the practicality of the mathematical English glossary, the following description is obtained:

a. English Mathematical Glossary is easy to use because there are clear instructions.
b. students can use the English mathematics glossary independently.
c. The language used in the English mathematics glossary is easy to understand.
d. English mathematics glossary motivates students to learn because it makes it easier to understand the material.
e. Learning media has certain advantages to support the learning process, and deficiencies and obstacles must be corrected.
f. Learning media can be used in the learning process of mathematics or other material.

The effectiveness test results were carried out to see digital literacy skills and student vocabulary literacy. The results showed that students' digital literacy technical skills increased after using the Android-based English Mathematical Glossary—personal ability technical skills in using and operating the media effectively (Haidari et al., 2022). The ability to access digital media for someone depends on the type of digital media, needs, and special

functions of digital media (Audrin & Audrin, 2022). The level of critical understanding in digital literacy is the level of knowledge students possess in assessing the accuracy and correctness of information. Thinking at a high level requires a high level of experience (Bahri et al., 2022; Kusumo et al., 2022). Students are asked to evaluate data that is appropriate rather than by the reading comprehension that has been read. Furthermore, critical understanding is also related to students' ability to identify errors in language elements (words, phrases, clauses, sentences) and spelling. Communicative ability is understanding ideas and symbols and conveying the results to others (Apriyanto, 2022). Based on the research results, a glossary of English mathematics can increase student motivation.

The Vocabulary Level Test provides an estimate of a student's comprehensible vocabulary size. Although language uses many words, not every word has a function. One measure of word usefulness is its frequency: how often a word occurs in the regular use of language. The calculation of the vocabulary test is in Table 2.

**Table 2.** Vocabulary Size and Text Coverage

| Vocabulary Size | Text Coverage |
|---|---|
| 1.000 | 72,0% |
| 2.000 | 79,7% |
| 3.000 | 84,0% |
| 4.000 | 86,8% |
| 5.000 | 88,7% |
| 6.000 | 89,9% |
| 15.000 | 97,8% |

(Leech et al., 2014)

Based on Table 2, it can be assumed with a vocabulary size of 2,000 words; a student will know 80% of the words in a text, which means that 1 out of every five words (approximately two words in each line) is unknown to students. Based on the results of the vocabulary test on 30 students, it was found that more than 80% of students could understand more than 2000 words, meaning that students could understand more or less 80% of the reading (total words from the assignment were more or less 15,000). Based on the results of data analysis, the average student is at the level of 3000 and 2000 words. The highest word size was 4560 words, and the lowest was 1850. It was also found that not all words were recognized or fully memorized by students when they answered the test. Based on the minimum words from English for mathematics from each student, therefore a glossary of English Mathematics is needed to improve students' literacy ability (Adoniou & Yi, 2014; Istiandaru et al., 2018).

## CONCLUSION

For students in higher education, learning vocabulary is done while receiving material from lecturers or reading scientific articles. One of the reasons for the low level of student's English proficiency is that the amount of vocabulary they understand

related to material still needs to be more significant. One way to overcome this problem is to develop an android-based mathematical English glossary. Development of an android-based mathematical English glossary using the SDLC model. The development results show that the resulting Android-based Mathematical English Glossary is valid, practical, and effective in increasing student vocabulary as measured by the vocabulary size test. Using a mathematical English glossary to increase students' digital literacy in technical skills, critical understanding, and communication skills in the medium category is a significant step toward improving their digital literacy. Based on the study's results, there is a significant increase in students' digital literacy. The impact of using the English mathematics glossary in the learning process is that as multi-source learning, it is more flexible because it can be carried out anywhere and anytime, not just limited to the classroom. An English mathematics glossary also increases student vocabulary, which is over 2000 words, which means students can understand 80% of the reading material.

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