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DEVELOPING ANDROID-BASED BILINGUAL E-GLOSSARY FOR CIVIL ENGINEERING STUDENTS

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Abstract

Vocational college students should constantly improve their proficiency so that they can compete in the working industry. One of many ways to improve is by utilizing their proficiency based on the theories which had been learned with the assistance from the relevant expert advisor. This project is the implementation. The purposes of this research project are (1) to develop a bilingual glossary of English for Civil Engineering presented in the android app; (2) to give appropriate solutions to the problems. In this research, there were five stages to develop the product: analysis, design, development, expert validation, and evaluation.

The result of the research was a bilingual e-glossary application for Civil Engineering. The output of the research is beneficial for Civil Engineering Department students, people who study in the Civil Engineering field, and for D3 Program in Applied English at State Polytechnic of Malang.

Keywords: design and development research, bilingual e-glossary, Android application.

INTRODUCTION

Language is a significant source of communication. It is the way we share our ideas, feelings, views, and thoughts with others. There are thousands of languages within this world. Each country has its nationwide language. Some languages are spoken by millions of people, others by only a few thousand, Nishanthi (2018).

Nowadays, the importance of English cannot be ignored since it's the most common spoken language. With the assistance of emerging technology, English has been playing an important part in several sectors including medicine, engineering, and education, etc.

English courses in various fields of study in academic institutions have been investigated on their needs. Not only listening and speaking but reading and writing, as well as translation skills, are needed, Low (2018). Kaewpet (2009) researched with civil engineering students on their needs of communication skills in English and concluded that talking about daily tasks and duties, reading textbooks, reading

manuals, and writing periodic/progress reports were needed.

Linguistics needs and language skills were also examined with engineering students by Ulla & Winitkun (2017), and speaking skill was mentioned as the main skill to be developed and emphasized in English classes. One of the ways to improve English skills is by mastering the vocabulary.

Vocabulary is important for language learners. Limited knowledge of vocabulary can cause problems in language learning, especially in English for Specific Purposes (ESP). Student needs for vocabulary should be invested for learning achievement, Low (2018). There are many ways to enhance vocabulary mastery, one among which is using a glossary, Sari (2016).

In this era, with the development of high technology, such as the Internet, tablets, and smartphone, there are more innovative ways to learn English. For example, people can use technologies to send messages, present ideas, or share information anytime, anywhere.

Sari (2016) research shows that learning vocabulary can be done using paper-glossary and online-glossary. To support the improvement in vocabulary learning, glossaries are developed to suit the need in specific fields. In this research, the glossaries were developed for the Civil Engineering program in the Civil Engineering Department at State Polytechnic of Malang.

The Civil Engineering Department of State Polytechnic of Malang was chosen as this research setting because students at this department learned ESP. Mastering the basic knowledge of Civil engineering in English can be done by understanding the meaning and the use of specific terms as well as the vocabulary in the Civil engineering field.

In this research, the use of bilingual glossary was believed will be effective assistance to comprehend English materials in Civil engineering. To confirm the need for the glossary in the Civil engineering department, the distribution of questionnaires was done to know the need for Civil engineering glossary.

This study was aimed to develop a bilingual glossary of English for Civil Engineering presented in the android app. This study is expected to be beneficial theoretically and practically. Theoretically, there has been research on developing a glossary by some researchers but what makes it different is that my glossary is an android-based e-glossary for the Civil Engineering department and it is also bilingual. Practically, this Android-based Bilingual E-Glossary which focuses on Civil Engineering terms will be used for Civil Engineering students. The e-glossary will assist the students so that they can understand more Civil Engineering terms in English. For the other researchers, the study could be a reference for future research.

REVIEW OF RELATED LITERATURE

Some related literatures are reviewed here to guide the project.

Mobile App in Language Learning

Hao (2018) indicated the utilization of the app enhanced EFL (English Foreign Language) learning. Not only did the app provide a feasible path for the scholars moving from individual learning to cooperative learning, but it also bolstered their confidence in learning, ultimately promoting positive attitudes toward EFL learning. Finally, the planning of the app was confirmed as a good tool for mobile instruction, yet student perceptions of the interface design indicated a necessity for modification to be more adaptive.

Wang (2017) says that some researchers say mobile learning refers to be learning while on the move or using mobile devices to learn. That is, irrespective of where the scholars are, if they need mobile devices, they'll study ubiquitously. In summary, there are some advantages of using mobile devices in learning. 1) it's easier to share information: when people find any information, they'll share it on the web. 2) Learning without space constraints: learning is often done ubiquitously. for instance, students can study inside or outside the classroom. 3) Learning within the real context: students can observe or receive information and so interact with their peers on the web. 4) Recording students' learning portfolio: students' learning process is often recorded, and this may be provided as a reference for individual learning.

Vocabulary

Vocabulary learning is a crucial part of foreign language learning. They frequently emphasize the meanings of new words, whether in books or verbal communication. Vocabulary is considered as central in language teaching and is of paramount importance to a language learner. Vocabulary is a basic of one learns a foreign language, Susanto (2017).

Numerous researchers in education recognize that vocabulary is essential in foreign language learning. However, students often encounter difficulties when remembering vocabulary. Providing effective learning strategies is more important than giving an enormous amount of vocabulary to remember, Liu (2016).

Susanto (2017) aims to spotlight the importance of vocabulary learning as a vital part of foreign language learning. Even though it has been neglected for several decades, during the 80s it became a 'hot' topic for researchers. Lexical knowledge is central to communicative competence and the acquisition of a second/foreign language, and a lack of vocabulary knowledge is an obstacle to learning. An attempt has been done to review the trends within the area of teaching vocabulary through various techniques.

Glossary

Rabin (2008) says that glossary is a list of terms related to a specific subject, field, or area of usage, with accompanying definitions. Defining and explaining difficult, discipline-specific, or unusual words and expressions utilized in the text of scientific and clinical papers helps readers understanding and has the potential to result in more standardized and established terminology for dissemination and implementation within a specific field.

Glossary and dictionary are different. The difference between a glossary and a dictionary is that the definition provided by a glossary is in context, Dale Cohen (2017), glossary could be found on the last page of texts or books, Webb (2010).

Review of Previous Research Project

Wang (2017) conducted a study entitled "Designing Mobile Apps for English Vocabulary Learning". The research was done in Taiwan, resulted:1) Increase students' use of educational apps, 2) Cultivate students' self-learning habit, 3) Provide a ubiquitous learning environment, and 4) Develop students' confidence in language learning.

Putrawansyah (2018) who conducted research entitled "Design and Implementation of Android-Based Civil Engineering Dictionary Applications using Eclipse Juno". This study was conducted at Sekolah Tinggi Teknologi Pagar Alam, Padang, Indonesia. This study resulted in an Android-based Civil Engineering dictionary application with digitizing a conventional Civil Engineering dictionary into a digital dictionary.

RESEARCH METHODOLOGY

Research Design

This study employed the Design and Development Research adapted from Richey and Klein (2014). This research design was chosen because the design is suitable for this research which focuses on developing products and validating the product. According to Richey and Klein (2014), Design and Development Research is a structured study design to establish products and tools.

Figure 1 Research procedures from Design and Development Research as adapted from Richey and Klein (2014).

The development of the product was adapted from Richey and Klein (2014), the procedures were analysis, design, development, expert validation, and evaluation.

Analysis

In the analysis stage, the writer distributed the questionnaires. The purpose of the questionnaires was to figure out the problem that students faced in understanding the Civil engineering terms as well as texts in English. The questionnaire was also distributed to

discover the need for bilingual e- glossary for Civil engineering.

There were 14 questions asked to respondents. Those were questions about glossary in general, the need for bilingual glossary, and their preferred format of the glossary. *(Full questionnaire in appendix 1)*

Design

In this stage, the product was designed by an IT expert who was asked to develop bilingual e-glossary which contains terms, meaning, sentences example, and the translation in an Android-based application.

Development

In this stage, the terms, definitions, and the example sentences related to the Civil engineering terms were collected. The Civil engineering terms, the definition, and the example sentences related to the Civil engineering for the bilingual e-glossary application were collected from books and e-books by using Antconc. All the data that has been collected were added into an Excel document. After that, the data were uploaded into the website of the bilingual e-glossary application.

Expert validation

In the expert validation stage, the writer assigned the bilingual e-glossary Android application of Civil engineering contents to the expert to be validated. The expert must meet the criteria that have been discussed like, mastering civil engineering or teaching civil engineering, has work experience for more than 5 years, and mastering ESP for civil engineering. The validation is needed to know whether the bilingual e-glossary application of Civil engineering met the criteria or not.

Evaluation

In this stage, the bilingual e-glossary application was user-tested by the students of the Civil engineering Department of State Polytechnic of Malang. In this stage, the users gave reviews of the bilingual e-glossary application of Civil engineering, and then the product was revised based on the reviews. A questionnaire was distributed to know how the glossary application works and to receive feedback from the users. *(Full questionnaire in appendix 2)*

Research Setting

Organization and location

The setting of this study was in the Civil Engineering Department of State Polytechnic of Malang. State Polytechnic of Malang is a vocational higher education located at Jl. Soekarno Hatta No. 9 Malang, East Java. This location was chosen because they learn English for Specific Purposes (ESP), and some of them used English as their daily conversation in international classes.

Respondent

The respondents of this study were the students of regular and international classes of Civil Engineering. The respondent was chosen by some aspects, they learn English for specific purposes (ESP), they used English as their daily conversation in the international classes, and this research respondent was selected from 19 – 21 years old or for sort, college students.

Data Collection

Two sets of questionnaires were used in the research study. The first questionnaire was distributed to students to check on their needs of e-glossary for Civil engineering at the beginning of the research followed by the field test questionnaire at the end of the research.

All of the data for the glossary were gathered and collected from books and e-books by Antconc. Those books were Construction Business Development Meeting New Challenges, Seeking Opportunity By Christopher N Preece, Krisen Moodley, and Paul Smith, The Engineers Manual of Construction Site Planning By Juri Sutt, Olev Muursepp and Irene Lill, and Fundamentals of Construction Estimating Third Edition by David J. Pratt, etc.

Development Procedure

The first procedure in developing the study was analysis. In the analysis procedure, the questionnaires were distributed. The questionnaires were conducted to both students from the international and regular classes of the Civil engineering Department to know the problem and the need for the

bilingual e-glossary for Civil engineering applications.

Next, design the product. In this step, the specification of the product was decided. The Civil engineering terms were decided to be collected from Civil engineering related books and e-books. The books were Construction Business Development Meeting New Challenges, Seeking Opportunity By Christopher N Preece, Krisen Moodley, and Paul Smith, The Engineers Manual of Construction Site Planning By Juri Sutt, Olev Muursepp and Irene Lill, and Fundamentals of Construction Estimating Third Edition by David J. Pratt, etc.

At the development process, the Civil engineering terms, the definition, and the example sentences related to the Civil engineering terms were collected. The Civil engineering terms, the definition and the example sentences related to the Civil engineering terms for the bilingual e-glossary application for Civil engineering which were already collected were added into an Excel document. The Excel document which contains the Civil engineering terms, the definition, and the example sentences related to the Civil engineering terms was added into the website of the bilingual e-glossary application.

Next, in the expert validation. The bilingual e-glossary application of Civil engineering contents was validated by the experts to know whether the materials inside the e-glossary application meet the criteria or not. The validation was done by the lecturer of the Civil Engineering department who was Dr. Nur Salam, Drs., M.Pd. Some a screenshot of the discussion on Appendix 1.

In last step, evaluation, the users reviewed the bilingual e-glossary application and assess whether it met the criteria or not.

Product Specification

The result of this study was a bilingual e-glossary application which contains 250 Civil Engineering terms. The example of the usage of the term in sentences was in English and Indonesian. The pictures which were related to the terms inputted in the bilingual e-glossary application. Android Lollipop (5.0) until the latest Android is the Android operating systems that support the installation of the bilingual e-glossary for Civil Engineering application.

DEVELOPMENT RESULT AND DISCUSSION

This part describes the result of the product development process and discussion.

Result of Product Development Process

There were five stages implemented to develop the bilingual e-glossary application of Civil engineering in the current study. Those stages included analysis, design, development, implementation, and evaluation. All five stages are presented thoroughly below.

Analysis

In this stage, the writer distributed the questionnaires which were aimed to know and confirm the need to develop an android-based bilingual glossary application for Civil engineering. Due to the coronavirus pandemic, the writer could not explain the project to the respondents which caused there were only a few respondents that willingly to fill the questionnaire. It would be easier to collect more respondents if the writer could meet the respondents and explain to them directly.

From the questionnaire, it is known that most respondents rarely read English texts. This is shown by the average frequency of 2.93 (of the 6 Likert-scale range). Most of them often faced difficulties in understanding English texts; this was shown with an average frequency of 3.6 (of the 6 Likert-scale range). Most of the respondents often encountered obstacles in understanding the vocabulary in the English texts; this is shown with an average frequency of 4.13 (of the 6 Likert-scale range). The respondents also faced difficulties in understanding grammar in the English texts; the average frequency is shown 3.93 (of the 6 Likert-scale range). There were 73% of the respondents know about glossary in general, while 27% of them do not know about glossary in general. As explained in the table, the respondents agreed that glossary can assist them in finding the meaning of certain terms in Civil Engineering, it was

shown with the frequency of 5.46 (of the 6 Likert-scale range).

From the result of the questionnaire, it can be concluded that the respondents often read English texts and had difficulties in terms of grammar and vocabulary. The respondents stated that they could find a certain term in Civil engineering through the glossary. It was concluded that to assist the students in understanding English, a bilingual e-glossary for Civil engineering was developed.

Design

In the design stage, it was decided that due to the limitation of time, the bilingual e-glossary application of Civil engineering was set to be only available in the Android operating system. The items included in the bilingual e- glossary application were 250 Civil engineering terms in English, the translation of the 250 Civil engineering terms in Indonesian, and 250 example sentences in English and Indonesian. The Civil engineering terms were obtained from books and e-books related to the Civil engineering terms. The program which used to find the terms was AntConc. The program helped the writer find the most frequently used words in the e-books.

According to the responses in the questionnaires, 80% of the respondents agreed that the most appropriate format of a glossary was in a smartphone application, while 20% of them agree that a book is a proper format for a glossary, and 0% agreed that computer program is the suitable format for a glossary. From this stages that have been done; it can be concluded that the format of the glossary application will be on the Android platform.

Development

The development stage started with finding books and e-books in the field of Civil engineering. Unfortunately, due to the coronavirus pandemic, the writer faced difficulties to find what books they used in their class. The writer has tried to contact the students of Civil Engineering to ask the syllabus that they used. Unfortunately, the writer did not manage to get it. After some consultation with the advisor, the writer decided to use the books and e-books that are related to Civil engineering. To collect the terms that are mostly used in the e-books, The AntConc program was chosen. AntConc is a corpus analysis program that includes a powerful concordancer, word and keyword frequency generators, tools for cluster and lexical bundle analysis, and a word distribution plot according to Anthony (2005).

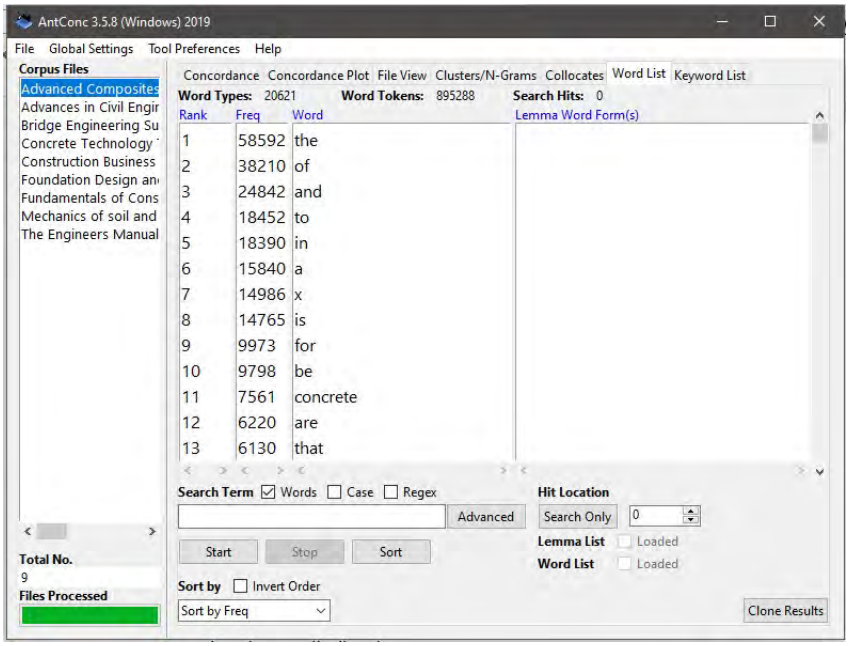
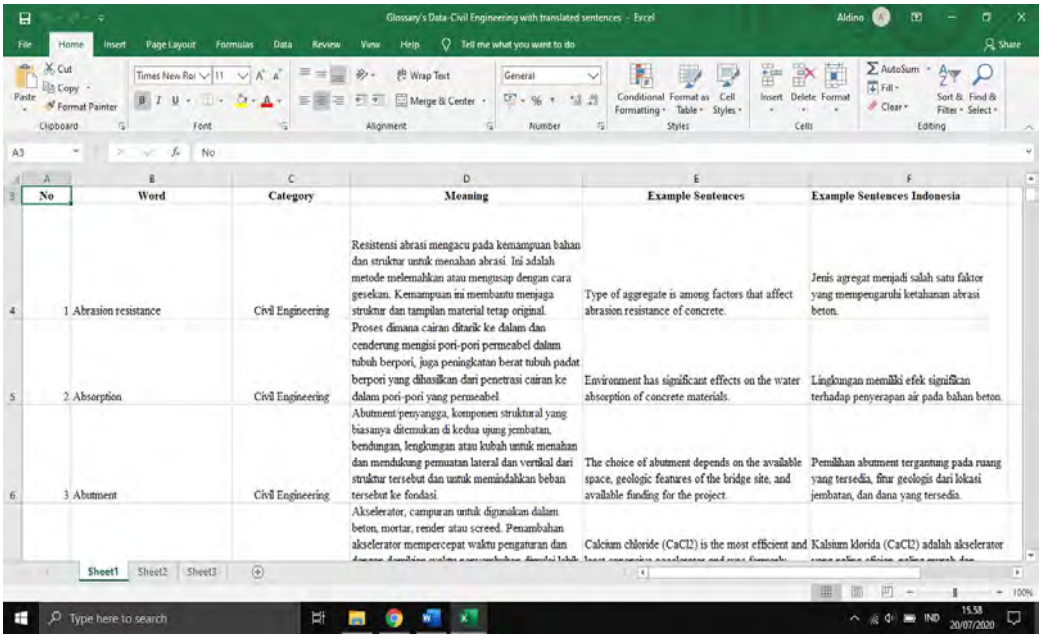


Figure 2 AntConc interface

After finding the 250 Civil engineering terms, the 250 Civil engineering terms were compiled in an Excel file. The next step was finding the examples of sentences for each Civil engineering terms in English. This step was not as easy as the researcher thought. In this stage, the researcher has to find the correct meaning and a good sentence example as well as the translation.

When finding the meaning, the researcher has to pay attention to find a contextual and also the lexical meaning. Then, he searched for the example sentence from several sources like books, e-books, articles, etc. The problem the researcher faced in this step was, not all of the terms or words have a good sentence example. So, he decided to remove the terms that were hard to find the sentence example



No	Word	Category	Meaning	Example Sentences	Example Sentences Indonesia
1	Abrasion resistance	Civil Engineering	Resistensi abrasi mengacu pada kemampuan bahan dan struktur untuk menahan abrasi. Ini adalah metode melemahkan atau mengusap dengan cara gesekan. Kemampuan ini membantu menjaga struktur dan tampilan material tetap original.	Type of aggregate is among factors that affect abrasion resistance of concrete.	Jenis agregat menjadi salah satu faktor yang mempengaruhi ketahanan abrasi beton.
2	Absorption	Civil Engineering	Proses dimana cairan ditarik ke dalam dan cenderung mengisi pori-pori permeabel dalam tubuh berpori, juga peningkatan berat tubuh padat berpori yang dihasilkan dari penetrasi cairan ke dalam pori-pori yang permeabel.	Environment has significant effects on the water absorption of concrete materials.	Lingkungan memiliki efek signifikan terhadap penyerapan air pada bahan beton.
3	Abutment	Civil Engineering	Abutment/penyangga, komponen struktural yang biasanya ditemukan di kedua ujung jembatan, bendungan, lengkungan atau kubah untuk menahan dan mendukung pemuatan lateral dan vertikal dari struktur tersebut dan untuk memindahkan beban tersebut ke fondasi.	The choice of abutment depends on the available space, geologic features of the bridge site, and available funding for the project.	Pemilihan abutment tergantung pada ruang yang tersedia, fitur geologis dari lokasi jembatan, dan dana yang tersedia.
			Akselerator, campuran untuk digunakan dalam beton, mortar, render atau screed. Penambahan akselerator mempercepat waktu penganturan dan	Calcium chloride (CaCl2) is the most efficient and	Kalsium klorida (CaCl2) adalah akselerator

Figure 3 Glossary's Excel File

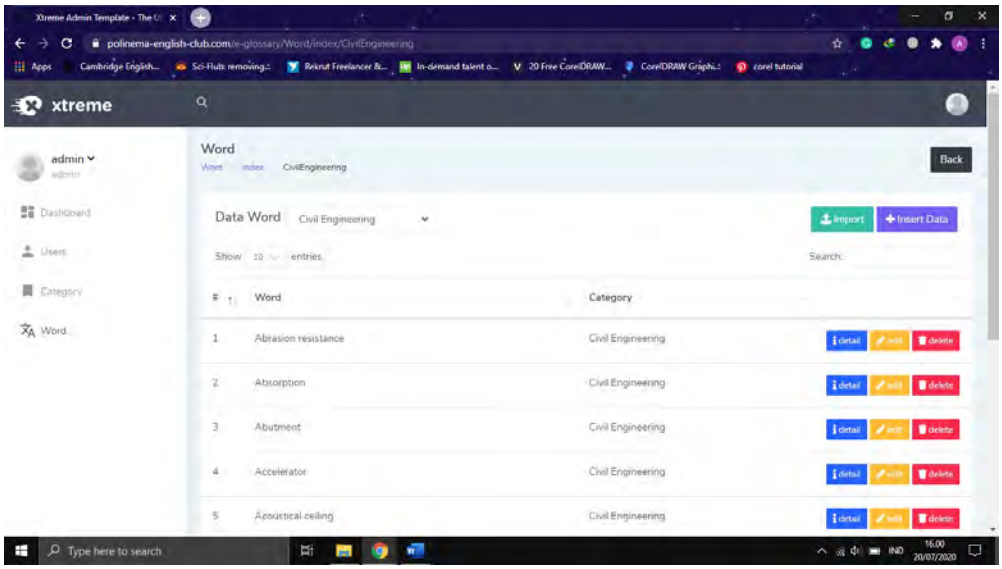


Figure 4 Glossary's Website

and find another term to replace it. It almost took three months to complete all of the data. More sample content of the glossary can be seen in Appendix 2. The Excel file which was already filled with the glossary's content was imported to the glossary's website.

After importing all the glossary's contents, the mobile application for the bilingual e-glossary for Civil Engineering automatically synchronized with the website. The bilingual e-glossary application for Civil Engineering is presented in Figure 5, 6, 7 and 8.

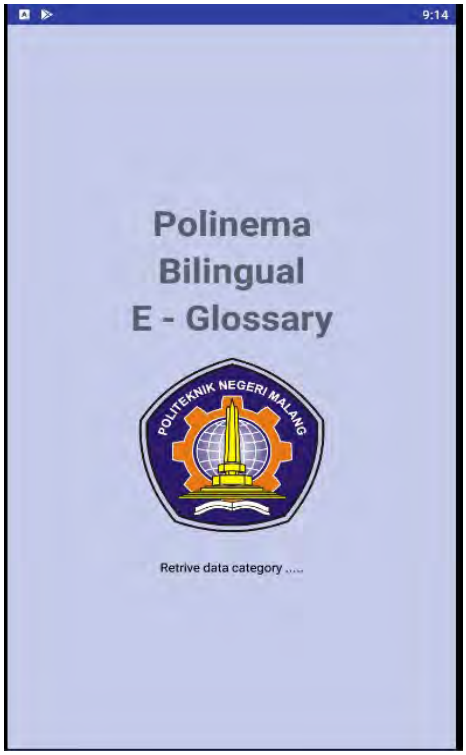


Figure 5 Polinema Bilingual E-glossary's welcome page

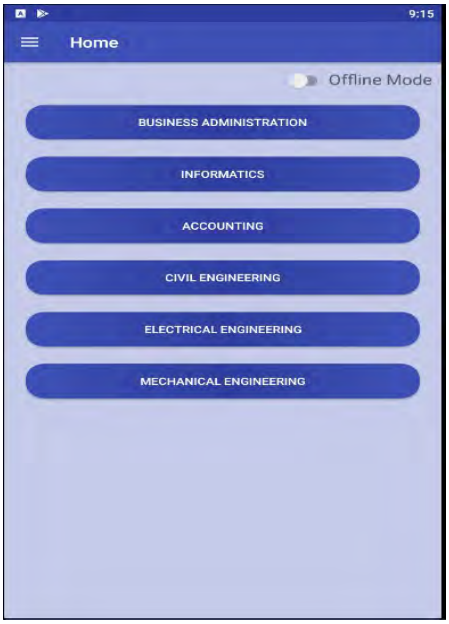


Figure 6 User Interface

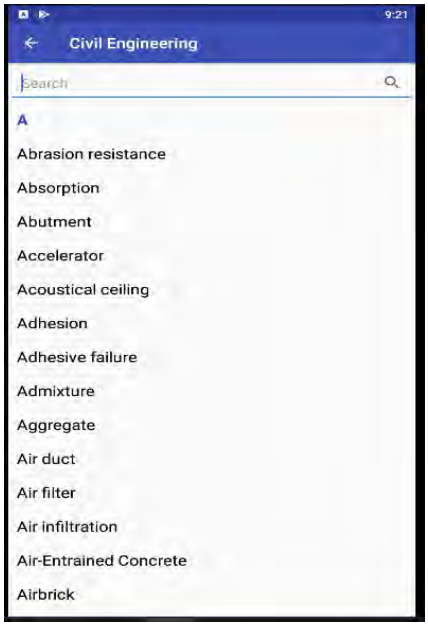


Figure 7 List of the Civil Engineering terms

Figure 8 Glossary's content in the mobile application

Expert validation

In the stage of expert validation, the contents for the bilingual e-glossary application of Civil Engineering were validated by the experts to know whether the materials in the e-glossary application meet the criteria of validity.

The expert who was involved in validating the product was a lecturer from the Civil Engineering Department of the State Polytechnic of Malang. The expert focused on reviewing both the language and the contents in the glossary. The reviews were gained from the interview which was done online. *(Full interview can be seen at appendix 3)*

After the interview with the expert completed, there were some suggestions and comments provided by the expert. First, the contents of the glossary supposed to consists of the bilingual meaning only. Second, the example sentences are not necessary, because the writer did not have the background knowledge of English for Specific Purpose. Last, the meaning provided in the glossary app should be contextual meaning, not lexical meaning.

Evaluation

In the evaluation stage, the bilingual e-glossary application for Civil Engineering was tested by the users and the revision of the contents of the bilingual e-glossary application for Civil Engineering was carried out in this stage. To know whether the bilingual e-glossary application for Civil Engineering met the criteria or not, the bilingual e-glossary for Civil Engineering application and questionnaire were distributed.

During the bilingual e-glossary for Civil Engineering application field testing, there were few aspects which were assessed, the first aspect was regarding the contents of the bilingual e-glossary. The users found that the words or terms in the glossary were appropriate according to the average of 5.42 (of the 6 Likert-scale). The second aspect was about the meaning of the terms in the bilingual e-glossary. It was easy to understand in terms of the meaning because the average score was 5.93 (of the 6 Likert-scale). In terms of the translation of the example sentences, it received an average score of 5.6 (of the 6 Likert-scale). It can be categorized that the Indonesian translation was easy to get the point.

The users found that the design of the bilingual e-glossary application for Civil Engineering is interesting; this was shown with the average of 5.2 (of the 6 Likert-scale) The font and size of the contents received an average score of 5.42 (of the 6 Likert-scale) since the contents inside the bilingual e-glossary application for Civil Engineering were easy to read.

From the respondents' responses, it can be concluded that the words o terms were appropriate to the Civil Engineering context. The meaning of the terms in the bilingual e-glossary application was easy to understand. The bilingual e-glossary application for Civil Engineering was also quite easy to use, and the respondents admitted that the bilingual e-glossary application could assist them in understanding English texts.

Discussion

Following the previous research by Wang (2017) which was conducted with the title of "Designing Mobile Apps for English Vocabulary Learning", the findings of the current study add the evidence of the effectiveness of mobile application in assisting the teaching

and learning process. The research focusing on designing a mobile application to improve and motivated the students to learn English by apps. In the current research, the researcher uses a bilingual e-glossary for Civil Engineering students in the form of a mobile application for assisting the students in understanding English texts. The research by Wang (2017) designed a vocabulary learning app that aims to make students more active in learning, control their learning progress and review what they have learned, and this corresponds to the advantages of using technology in language learning. While in the current study resulted in the use of the developed bilingual e-glossary application for Civil Engineering to assist students in understanding English texts.

Following Putrawansyah (2018) who conducted research entitled "Design and Implementation of Android-Based Civil Engineering Dictionary Applications using Eclipse Juno" which study aims to produce an Android-based Civil Engineering dictionary application with digitizing a conventional Civil Engineering dictionary into a digital dictionary, the researcher in this study developed a bilingual e-glossary application for Civil Engineering students. The contents of the Civil Engineering dictionary were only the English terms and its translation in Indonesian while in this current research, the output was a bilingual e-glossary application which can be accessed through mobile phone and the contents of the bilingual e-glossary application for Civil Engineering have English terms, the translation of the terms, the example sentences in both English and Indonesian.

CONCLUSION AND SUGGESTION

Conclusion

This study focuses on developing the bilingual e-glossary application for the Civil Engineering Department. The final product of this research is an Android mobile application named "POLINEMA Bilingual E-Glossary". The bilingual e-glossary application for Civil Engineering contains English the terms, the translation, and the example sentences in English and Indonesian. The development aims to assist the users in understanding English texts.

As determined from the stages that have been completed, the researcher found that the Civil Engineering students have difficulties in understanding English texts in terms of vocabulary and grammar. They still have difficulty in understanding the materials in English. Through the questionnaire, the students agreed that the bilingual e- glossary for Civil Engineering should be developed to assist them in understanding English texts.

After receiving the responses from the questionnaire, the design of the bilingual e-glossary application for Civil Engineering was decided. The product has been validated by the expert and tested by the users. It considered as an interesting, easy to use glossary, and could assist them in understanding English better.

In conclusion, this project is not an essay task. It requires hard work, patience, and as well as background knowledge in the specific field.

Suggestions

After this research is completed, the researcher found there were some weaknesses. First, the meaning, sentences, and translation provided by the researcher are not 100% excellent because the researcher did not have the background knowledge of Civil Engineering. Second, the product is only available for the Android operating system. Third, the product still needs some improvement because some of the users face problem like could not scroll down the app. The researcher hopes that these weaknesses can be improved in future research.

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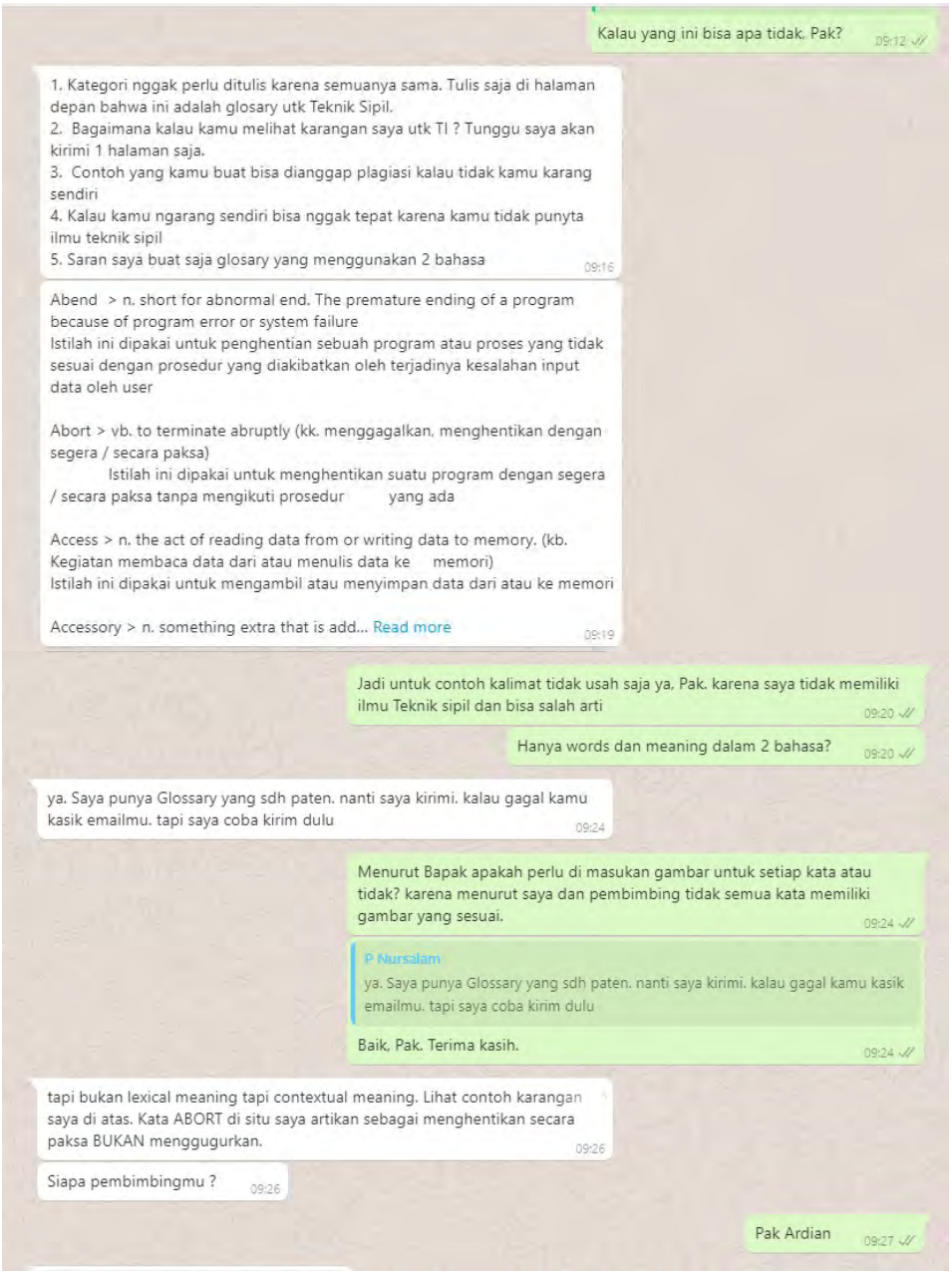
APPENDICES

Appendix 1 Excerpt of Written Interview with the Expert for Validation



Appendix 2 Sample of Bilingual e-glossary application for Civil Engineering's contents

No	Word	Meaning	Example of English Sentences	Example of Indoneisan Sentences
1	Abrasion resistance	Resistensi abrasi mengacu pada kemampuan bahan dan struktur untuk menahan abrasi. Ini adalah metode melemahkan atau mengusap dengan cara gesekan. Kemampuan ini membantu menjaga struktur dan tampilan material tetap original.	Type of aggregate is among factors that affect abrasion resistance of concrete.	Jenis agregat menjadi salah satu faktor yang mempengaruhi ketahanan abrasi beton.
2	Absorption	Proses dimana cairan ditarik ke dalam dan cenderung mengisi pori-pori permeabel dalam tubuh berpori, juga peningkatan berat tubuh padat berpori yang dihasilkan dari penetrasi cairan ke dalam pori-pori yang permeabel.	Environment has significant effects on the water absorption of concrete materials.	Lingkungan memiliki efek signifikan terhadap penyerapan air pada bahan beton.
3	Abutment	Abutment/penyangga, komponen struktural yang biasanya ditemukan di kedua ujung jembatan, bendungan, lengkungan atau kubah untuk menahan dan mendukung pemuatan lateral dan vertikal dari struktur tersebut dan untuk memindahkan beban tersebut ke fondasi.	The choice of abutment depends on the available space, geologic features of the bridge site, and available funding for the project.	Pemilihan abutment tergantung pada ruang yang tersedia, fitur geologis dari lokasi jembatan, dan dana yang tersedia.
4	Accelerator	Akselerator, campuran untuk digunakan dalam beton, mortar, render atau screed. Penambahan akselerator mempercepat waktu pengaturan dan dengan demikian waktu penyembuhan dimulai lebih awal.	Calcium chloride (CaCl2) is the most efficient and least expensive accelerator and was formerly very popular.	Kalsium klorida (CaCl2) adalah akselerator yang paling efisien, paling murah dan pernah menjadi paling populer.
5	Acoustical ceiling	Plafon ini di implementasikan untuk mengontrol gema suara di aula di mana ada kemungkinan perambatan suara besar untuk membuat zona pendengaran yang nyaman.	The acoustical ceiling material is made from fibrous materials that would absorb sound energy unlike other materials like plaster or gypsum ceilings.	Bahan plafon akustikal terbuat dari bahan berserat yang akan menyerap energi suara berbeda dengan bahan lain seperti plester atau gipsum.
6	Adhesion	Adhesi, pengikatan satu bahan dengan yang lain, yaitu perekat ke substrat, karena berbagai kemungkinan interaksi.	The phenomenon of adhesion is caused by molecular interactions between the substrate surface and the adhesive.	Fenomena adhesi disebabkan oleh interaksi molekuler antara permukaan substrat dan perekat.
7	Adhesive failure	Kegagalan perekat terjadi ketika sistem perekat lepas atau terpisah secara prematur dari salah satu permukaan atau substrat.	Adhesive failure occurs when the adhesive system debonds or separates prematurely from one of the surfaces or substrates.	Kegagalan adhesif terjadi ketika sistem perekat terlepas atau terpisah secara prematur dari salah satu permukaan atau media.