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# LEARNING SPECIFIC ACADEMIC VOCABULARY USING MALL: EXPERIENCE FROM COMPUTER SCIENCE STUDENTS

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## **Abstract**

This study investigated the experiences of students in learning specific academic English vocabularies (ESAP) through the use of a mobile dictionary called SPEARA. The mobile app was designed to help the students learn the use of specific words, providing definitions and examples of use from authentic sources. The study aimed at identifying points of learning students experienced when using the mobile-assisted language learning (MALL) by answering two questions: first, to what extent students improved their ESAP using MALL and second, how students perceived MALL for studying specific words in Computer Science. Data for this study were collected from 113 Computer Science students enrolled in English for Academic Purposes classes. Two data sets were compiled in this mixed-method study. The first data set consisted of test scores, and the second data set contained transcripts from interviews with students and students' essays. Findings showed significant learning improvement in the use of MALL to students' vocabulary knowledge ( $SD=0.992$ ). Students perceived leaning using MALL to be both positive and rewarding. Interestingly, students revealed the use of MALL could not replace human interactions. Human interactions could enrich students' understanding and allowed the exchange of ideas. Further implications on human-interactions in MALL and on the future investigation were also discussed.

**Keywords:** ESAP; MALL; mobile dictionary; Computer Science

## **1. Introduction**

English learning in Higher Education at present has been focusing on providing relevant and specific knowledge (Hanks, 2013; Hyland, 2017). For this purpose, studies have reported the provision of discipline-oriented learning rather than generic academic English (Bhatia, 2008, 2011, 2017; Flowerdew, 2001, 2012, 2013; Swales, 1990). These studies demonstrate that when exposed to the highly frequent discipline-oriented English words or expressions, students would become more successful in learning. Research also suggests that exposure to English for specific academic purposes (henceforth ESAP) is an important point of the learning process (Swales et al., 2010).

Within the context of ESAP, the aim of learning is to use a word in a typical academic context (Hyland, 2017). For example, in Computer Science, the word ‘attribute’ refers to the property of files, often related to metadata, and describes the speed and storage capacity of computers. Another example is the word ‘performance’, which would refer to computer performance, followed by details of the number of works or tasks accomplished by a computer system. From the point of view of ESAP, it is most beneficial for students to be exposed to such specific information (Hyland, 2012a, 2012b; Hyland & Tse, 2007). Most recent studies also highlight the importance of identifying the contexts of use (Dang, 2020; Dang & Webb, 2016).

ESAP in Computer Science provides a window of knowledge to this relevantly new Hard-Applied Science. As an emerging discipline Computer Science is considered to be developed in both Pure Science and Social Science. Computer Science often uses words familiar to Social Sciences, such as attributes and performance, but with different senses or definitions. Corpus studies on ESAP showed the frequency of occurrence for words (Pho, 2008), different frequency of use per word (Leech et al., 2001), different syntactical structures (Anthony, 2006), and different lexical bundles (Hyland & Tse, 2007). However, no studies have been done in portraying students’ vocabulary development prior to the use of the ESAP corpus, especially in Computer Science.

## **2. Literature review**

### **2.1. MALL and learners’ perceptions**

MALL has been used extensively in higher education and it also provides significant contributions for learning specific English. Studies have revealed important caveats leading to cater to these needs of learning. It is necessary to have an integrated and learner-oriented MALL. There were previous studies into the use of MALL, such as those conducted by Dashtestani (2016) and Müller (2017), which explored the application of MALL in higher education. Dashtestani investigated the practice of using mobile devices by Iranian students as well as their attitudes toward it for learning English as a foreign language. This study showed students considered mobile learning to be beneficial. Besides, students also revealed more opportunities were made available through ubiquitous learning and access to the Internet, the use of multimedia in the classroom, and portability. The study revealed the need for a guideline to integrate MALL for English as Foreign Language (EFL) context.

Meanwhile, Müller et al. (2017) explored the use of the web-based game for learning English idioms and examined attitudes on learning using the web-based game. Thirty-six EFL

learners from Iranian and Japanese students were involved in the study. The findings of this study revealed significant improvements in the knowledge of idiom. The study showed that the dominant factor for learning improvement was the students' motivation in learning English. Students' satisfaction and self-perception of learning improvement were significant forces in improving students' learning.

Another previous study investigated self-perception and identity (Simanjuntak et al., 2018). In this study, gender aspects, as well as academic cultures, became determining factors in designing a model for MALL. The study adapted previous studies by Viberg (2013) and Kearney (2012) and developed a questionnaire to map students' cultural identities. The results revealed 94% of the students preferred collaboration in MALL. Also, 92% of the students demanded authentic materials in the MALL. Students also were aware of their learning needs, and 70% of them wanted to have professional-related content in MALL. Another 84% of the students also preferred MALL to provide indulgences, such as games or connections to social-media.

Previous studies on MALL have addressed some issues related to perceptions of learners. Nevertheless, most of these studies focused on the technical and mechanical applications of MALL. A lack of in-depth investigation of perceptions shows a clear gap in the MALL research. A thorough study needs to address learning as an integral entity, including learners' opinions on the learning process, the interaction with the instructors, as well as learners' perceptions of their learning success. Addressing these issues needs to be immediately done to provide a comprehensive view of MALL beyond technology and learning content.

## **2.2. ESAP and learner corpora**

A comprehensive literature study was also conducted by Dashtestani and Stojković (2015) on English for Specific Purposes, who critically reviewed 55 previous studies on the use of technology in English for Specific Purposes (ESP) instruction. Results indicated differences in the study results for technology used in ESP-related teaching instructions as compared to the ones in EFL instruction, provided clear empirical evidence for the efficacy of the use of course/ learning management systems, corpora, and wikis in ESP instruction and identified the use of corpora to foster academic vocabulary, word combination learning, and the communicative ability for students.

Dashtestani's (2019) investigation on English for Academic Purposes (EAP) was aimed at revealing instructors' use and acceptance of technology in EAP courses. The findings revealed positive attitudes toward the use of technology in EAP courses. On the other hand, the

instructors demanded the development and access to more needs-based and major-specific software tools. The instructors were also expecting the application of technology to be made available for EAP students of different majors, following the needs analysis projects before employing any technology in the EAP courses.

In various fields of studies, the use of language features showed contextually-bound language. In the field of Psychology, Cooper's (2016) study identified the use of vocabulary and lexical bundles by undergraduate students in Psychology. Bhatia et al. (2004) revealed that some lexical items appeared frequently in the Computer Science field, and the recurrence signified the specific language in Computer Science. The study also explored the conventions in which these specific lexical items were used by the experts in the discipline. This study supported earlier studies, which looked at the use of language not merely as regulatory products but as 'text' of its own. However, both studies had not revealed the effectiveness of teaching these field-specific language features to students. Further research is needed to capture students' improvements when being exposed to specific content.

The study of learner corpora showed the necessary attention towards the use of learner language. Flor, Futagi, Lopez, and Mulholland (2015) investigated the misspelling patterns in L2 and L1 of examinees in the ETS corpus (GRE and TOEFL tests). Gilquin, Granger, and Paquot (2007) showed the use of learner corpora in material design, indicating which rhetorical functions are prominent in academic writing. Gablasova, Brezina, and McEnery (2017) investigated the use of collocations by language learners. The investigation was carried out to focus on identifying the relationships between two consecutive words and on the factors that contributed to the combinations of words, or collocates. It was concluded that there were multiple influencing factors, such as individual preference and selection of topics pertinent to the use of collocations.

The study of learner corpora from different first language backgrounds had also been done. Bedmar (2009) explored the written learner corpora by Spanish students of English. Data were compiled from the project called the INTELeNG Project, comprised of 5 research groups, collected students' errors in a Microsoft Access database. The analysis was based on Computer-Aided Error Analysis and Contrastive Interlanguage Analysis methods to describe the students' proficiency level and their interlanguage. Computer-learner corpora were considered important source of information for designing materials for teaching and learning.

On the other hand, Abe (2003) contrasted the use of language in spoken and written forms by Japanese-speaking learners of English. The study further investigated the variability of interlanguage by observing the style-shifting of various grammatical features and word

formation errors by tagging errors in 297 learners' data. There were differences in learners' errors from the perspective of grammatical and word formation. One determining factor for such variability was the English proficiency level of learners.

In Brazil, Dutra and Goide (2015) focused on learner corpus, CorIsF-Inglês, They explained how the corpus was essential to describe the language preference made by Brazilian university learners. Frequency analysis revealed learner choices when they performed different written tasks. Independent tasks, such as argumentative essay, invited learners to use a high frequency of nouns, as well as mental state verbs and some adjectives. On the other hand, in integrated tasks, such as when presenting information in written and oral texts or even in infographics or graphs, prominent use of nouns was prevalent. The results showed students used a high number of arguments as they needed to convince the audience of their position. Mental state verbs were used in supporting argument construction. It was apparent that some nouns were of high-frequency level because these nouns were directly related to the task topic (e.g. 'coffee', 'divorce').

These previous studies into learner corpora had focused more on the texts as students' products of learning. However, further research is needed to reveal students' perceptions of their language productions. Such exploration is deemed as important for more comprehensive, balanced, and fair judgments on English learning. Previous studies showed the benefits in implementing MALL in Higher Education level. However, the studies have not addressed the implementation of MALL in learning discipline-related English, or ESAP. None of the studies has also provided a thorough analysis from the point of view of learners. It is clear that there is a gap in investigating MALL in ESAP. This study aims at filling the pertaining gaps by providing answers to the contributions of the MALL for learning ESAP by answering these questions:

- 1 To what extent does MALL improve the learning of ESAP?
- 2 How did students perceive their success in using MALL for learning ESAP?

### **3. Methodology**

#### **3.1. The aim of the study**

The present study took 6 (six) months or one academic semester. The context for this study was the use of MALL in an ESAP class for Computer Science students, entitled 'English for Business Presentation'. This course aimed at improving English skills when doing oral

presentations. Students presented their business ideas, such as innovations on technology, and worked on their scripts for oral presentations. At the end of the course, students presented their innovative products or innovative ideas (such as new applications or technology) through short video presentations and product knowledge as the supplement for the video presentation. Students used MALL, called SPEARA, when acquiring specific words in Computer Science. SPEARA was employed to look up for the definition of the word students wanted to use. They could find more information on the use of the word in sentences, which were actual examples from journal articles. These examples were considered as models of use for students to use in their writing or speaking productions. The knowledge for specific words and terminologies for Computer Science was considered very important for the course because the students would present their ideas to a knowledgeable audience. Throughout the course, students were able to access SPEARA from their smartphones.

### **3.2. Participants**

Participants for this present study were 113 students enrolled in English for Business Presentation (EfBP) course. Only students with a minimum TOEFL of 450 (Intermediate Level) could enroll in this course. Students obtained TOEFL scores at the beginning of the university year as part of the new students' orientation program at the university. Participants came from two classes taught by the same lecturer and were all in the fourth semester of their college year.

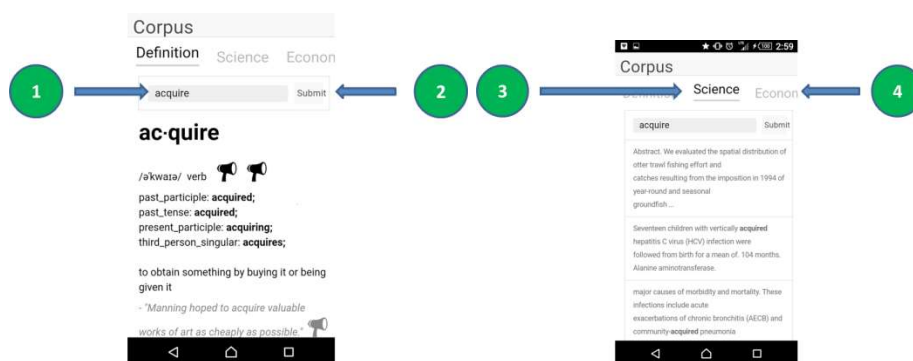
EfBP course provided opportunities for students to present ideas in a semi-business format. The objective of this course was to enable students to come up with innovative ideas to international communities. These ideas would include new technology, such as applications and gadgets. Specific words related to Computer Science and technology in the presentations became central attention in this English course.

### **3.3. Design and procedure**

The present study explored the use of MALL for word-search and concordance. *SPEARA* was the object of investigation for understanding the perceptions when students learn specific words. *SPEARA*, short for Specific English as Research Assistant, is available as a free application in Playstore (Appendix 1). This mobile-app was available since 2017 and funded by the Indonesian Higher Education Directorate, Ministry of Education and Culture, under the Grant Letter Number 003/SP2H/LT/DRPM/II/2016 and 214/SP2H/LT/DRPM/III/2016. As the description of *SPEARA* found in the About menu of the mobile app reads, it is "...a corpus-

based word-search mobile-app. *SPEARA* aims at helping students learn and use English, especially in their academic majors.” *SPEARA*’s interface can be seen in Figure 1 below.

Figure 1. Manual for the mobile-based dictionary, *SPEARA*



As seen in the above figure, there are some steps students can follow to obtain information: (1) a student types the specific word/terminology they want to know in the provided window, and (2) clicks submit, then (3) looks-up how the particular word is used in sentences as found in journal articles by clicking the field of study and by finding out more in different field of study or different disciplines by (4) sliding to the chosen field of study or discipline.

### 3.4. Data collection tools and procedures

There were two procedures for data collection to obtain two sets of data: (a) test scores, and (b) interview codes. For collecting the first set, the procedure was as follows: first, students did a pre-test. They used the list of words in the pre-test as entry words in the mobile-app, *SPEARA*. After nine weeks of independent learning using *SPEARA*, the second step was to ask students to take the post-test, which consisted of the same items and instruction. The pre-test and post-test contained a list of 50 words taken from textbooks in Computer Science and considered as the most frequently used words in Computer Science. There were two sections of the tests. In Section 1, students identified their familiarity with the words by ticking the box next to the list of words. In Section 2, students wrote a sentence using the same word-list as in Section 1. Scores from both tests were compared and Pearson’s correlation statistic was conducted for both test scores in IBM-SPSS.

The second data set came from students’ essays and interview transcripts. The corpus consisted of 5,708 words from 29 student essays and 2,448 words from the interview transcript. The present study used a corpus as a systemized collection of English usage to identify the recurring words, which indicate themes and issues in the discussion (Conrad and Biber, 2005, Biber and Barbieri, 2007, Hyland, 2008). Using a corpus not only could reveal the key message



in the data but also display students' understanding of English in a specific context of use (Adolphs, 2008).

29 students submitted their essays at the end of the semester, in which they would describe their experiences when participating in the project. Students were also encouraged to write about their learning improvements. Following the post-test, ten students were selected randomly for a semi-structured interview. Transcript from the interview session was thematically-coded, to identify pertinent issues regarding the use of MALL. The interview was conducted in English using prompt questions as follows:

- 1 How do you feel about your learning?
- 2 How does SPEARA help you throughout the course?
- 3 In what way SPEARA help you to learn new words?

Data analysis revealed the improvements made on learning specific words through the use of mobile-based learning. Learning improvement was identified from the results of pre-test and post-test scores. This analysis followed the students' perceptions. Students' perceptions taken from the semi-structured interviews and essays were thematically-coded. Codes were obtained from recurring words, expressions, and statements found in the transcripts and essays. These codes were analyzed in conjunction with the theme of using MALL for learning ESAP.

Word generation tool *AntConc 3.5.8* (2019) was used to identify frequently occurring words. The tool also provided concordances, which showed the words in the sentence or clause. Thematic coding was vital in revealing the theme, issue, and problems the students had throughout the learning. Following the principles of grounded theory for qualitative analysis from Charmaz (2014), Strauus, and Corbin (1998), thematic coding was successful in identifying the underlying message in the data. These codes were further analyzed to reveal the perceptions of the students, including praise and concerns arising from mobile-based learning. Therefore, this present study used a mixed-method approach for a comprehensive analysis.

#### **4. Findings**

This present study revealed the effect of MALL on learning and students' positive perceptions of the use of MALL. The first finding was related to score improvements. More in-depth analysis on the perceptions of learning showed insights on the use of MALL in learning ESAP.

##### **4.1. Improvements in learning ESAP using MALL**

Learning improvements can be seen from the results of the pre-test and post-test. The Means, Median, and Modes of both tests can be seen in Table 1 below:

Table 1. Mean, Median, Mode in Pre-Test and Post-Tests (N=113)

Test	Mean	Median	Mode	Minimum	Maximum	Std. Deviation
Pre	58.90	59	52	53	83	9.48
Post	66.27	64	57	23	100	14.87

Table 1 showed higher scores for Mean, Median, and Mode. The higher scores were all shown in the post-test, as compared to the scores from the pre-test. The results showed the scores to be positively skewed (SD=9.48 and SD=14.87). The results showed regression to the right of the Mean scores. The regression in the post-test scores shows apparent differences in the distribution of scores in the post-test. Also, there was a decline in the minimum score of the post-test. The pre-test scores ranged from a minimum of 53 and a maximum of 83. The post-test had positively skewed scores. In the post-test, the minimum score was 23, and the maximum score was 100. The results showed improvements between pre and post-test scores, which were 83 and 100.

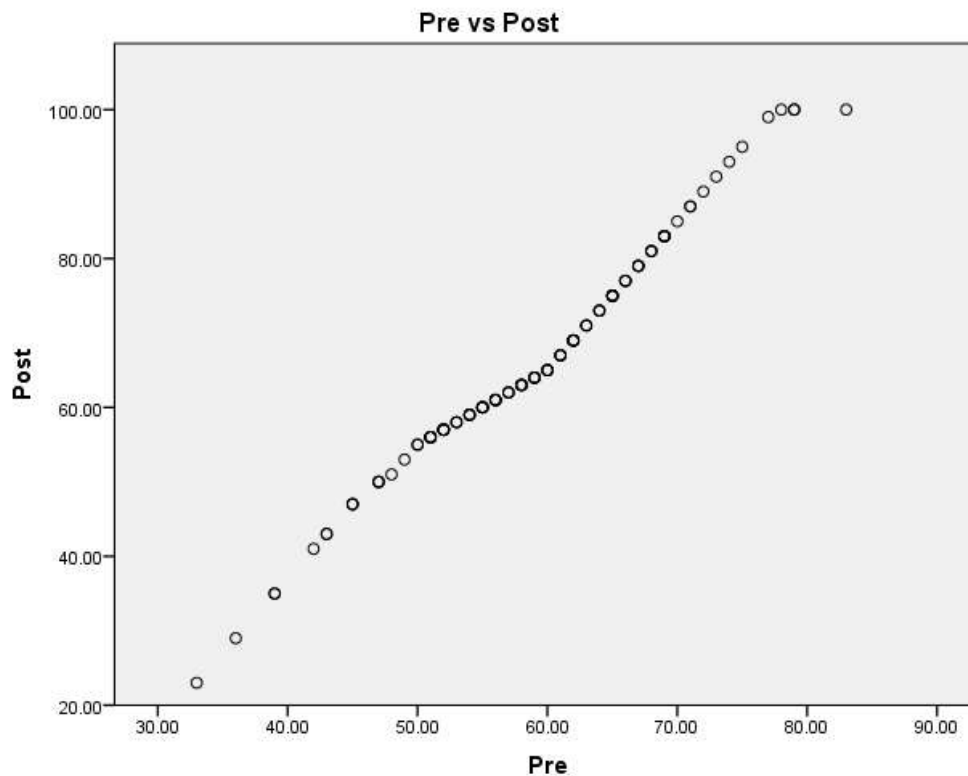
Table 2. Correlation between Pre-Test and Post-Test

	Correlation	Pre	Post
Pre	Pearson Correlation	1	.992**
	Sig. (2-tailed)		.000
	N	113	113
Post	Pearson Correlation	.992**	1
	Sig. (2-tailed)	.000	
	N	113	113

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 2 showed that there is a significant correlation (SD=0.992) between pre-test and post-test scores. The results showed most of the students had shown improvements in their test scores after nine weeks of learning using a mobile app. The scatter plot in Figure 2 also confirmed the increasing trend for the learning.

Figure 2. Scatter plot for pre vs post tests



The scatter-plot showed data points clustered around higher scores. There was also a cluster of data points at the lower-middle part of the population. There was a small number of data points clustered at the bottom of the plot. The data cluster at higher scores indicated improvements had taken place. The data showed that learning had taken place. Students' post-test was also correlated with their TOEFL score to gain more understanding about their learning. The results were seen in Table 3 as follow:

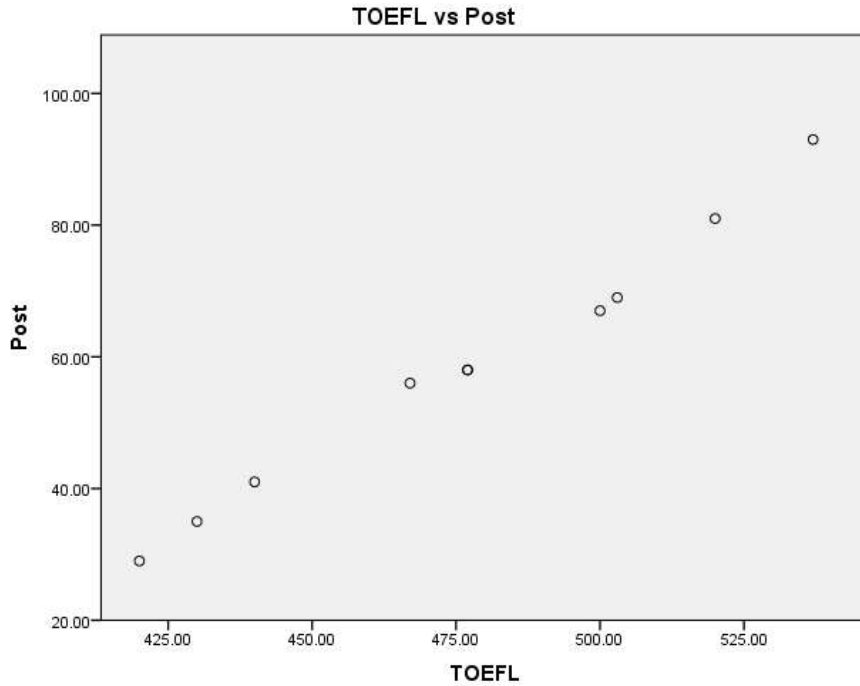
Table 3. Correlation between Post-Test and TOEFL scores

	<b>Correlation</b>	<b>Post</b>	<b>TOEFL</b>
Post	Pearson Correlation	1	.994**
	Sig. (2-tailed)		.000
	N	10	10
TOEFL	Pearson Correlation	.994**	1
	Sig. (2-tailed)	.000	
	N	10	10

\*\* . Correlation is significant at the 0.01 level (2-tailed).

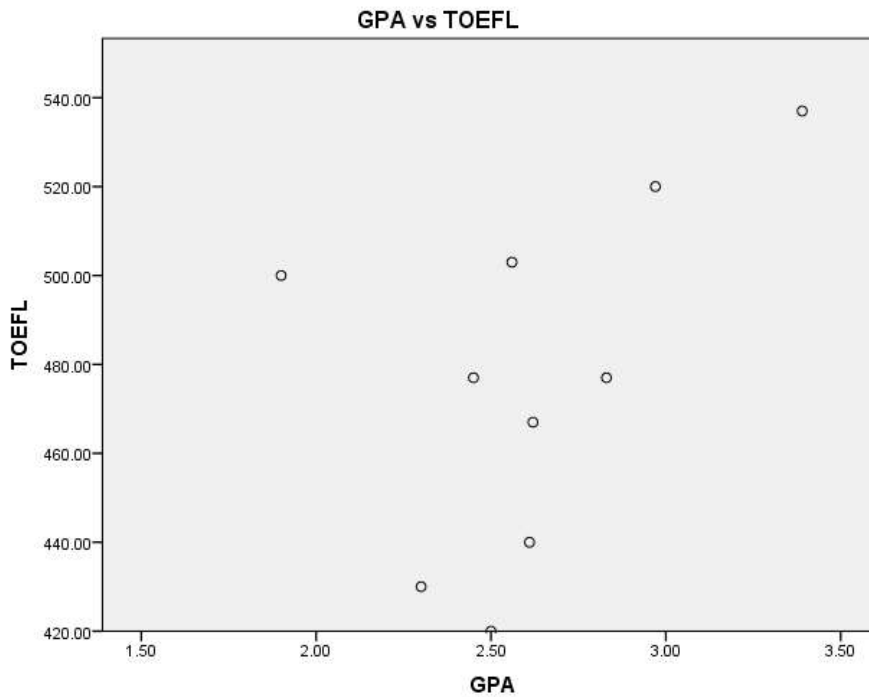
As can be seen in Table 3, there is a positively strong correlation regarding students' post-test scores and the TOEFL score. The TOEFL scores were obtained at the beginning of students' university years and were used as entry requirements to join this ESAP (English for Business Presentation) course. From the data, students with high TOEFL scores would likely have high post-test scores. This inference can be confirmed from the scatter plot in Figure 3 as follows:

Figure 3. Scatter Plot for TOEFL scores vs Post Tests



The scatter plot showed a correlation between post-test scores and students' TOEFL scores. On the other hand, students' TOEFL scores did not always correlate with students' previous academic achievements as represented by their grade point average (GPA), as seen in scatter plot in the following Figure 4:

Figure 4. Scatter Plot for GPA vs TOEFL scores



As evidenced by Figure 4, students with higher TOEFL scores (>500) appeared to have high GPAs. Meanwhile, students with TOEFL scores of 500 and lower had various GPAs.

#### 4.2. Perceptions of success in using MALL for learning ESAP

Perceptions on learning success are shown in students' essays and interviews with students. Participants also provided important information on how they perceive themselves and others throughout the learning process.

##### 4.2.1 Students' perceptions as seen from students' essays

In students' essays, there were some high frequently recurring words found. These words are as shown in Table 4 below:

Table 4. 50 most frequently occurring words in students' essays

No	Freq	Word	No	Freq	Word	No	Freq.	Word	No	Freq	Word
1	376	I	16	17	You	31	11	present	46	8	interested
2	214	my	17	16	need	32	11	product	47	8	practice
3	145	presentation	18	16	speaking	33	10	class	48	7	bad
4	97	audience	19	15	expect	34	10	improving	49	6	relax
5	35	nervous	20	15	give	35	10	public	50	8	talking
6	34	think	21	14	point	36	9	business			
7	32	hope	22	14	say	37	9	confident/nce			
8	29	good	23	14	want	38	9	memorize			
9	23	attention	24	13	English	39	9	part			
10	23	expectation	25	12	contact	40	9	pay			
11	20	speak	26	12	eye	41	9	talk			
12	19	better	27	12	gesture	42	9	understand			
13	18	presenting	28	12	get	43	9	voice			
14	17	people	29	12	improve	44	8	feel			
15	17	they	30	11	know	45	8	future			

As can be seen in Table 4, most frequently recurring words were about self, including *I* (376 times), *my* (214 times). Such frequently occurring words could be further identified as having similar themes, namely:

- 1 words referring to self, including *nervous* (35 times) and *hope* (32 times)
- 2 words referring to audience, including *audience* (97 times) and *people* (17 times),
- 3 words referring to English skills, including *speak* (20 times) and *speaking* (16 times)

Students reflected on their feelings and concerns regarding their learning. They used the words *nervous* (35 times), *hope* (32 times), *attention* (23 times), and *confident/confidence* (9 times). These frequently used words inform the themes that occur in students' essays. It can be concluded that students felt nervous about their presentation and what their audience would think of them, as can be seen in the following examples:

1. When I present my group project, I was really nervous and also scared. (Kthn)
2. I can relate the talk with good eye contact and gesture which will make it great to me to

understand, and if I can control all things of myself like nervous and everything, the audience hopefully will be interested with my presentation.(Erc)

3. My pronunciation\* is quite good when im\* talking casually, but when presenting I became nervous and it end up badly. (Kvn)

As can be seen from the examples, students were mainly concerned about the success of their presentations and projects. Their perceptions of success were closely related to accomplishing the task (presenting group project) as well as getting the attention of the audience.

Students were very concerned about how the audience would react to their presentations. The words related to this theme included *audience* (97 times), *people* (17 times), *they* (17 times), *you* (17 times), and *public* (10 times). In this theme students perceived other people as their audience. Examples of students' sentences on this theme were:

- (1) I also want to present the points I want to tell to the audience clearly, with no points missed because I forgot to tell it. (Own)
- (2) I expect that I can be more confident when I speak in front of public, understand most of the material I am presenting. (Wlm)

From these examples, the students were aware of the importance of getting the presentation messages across. Students also recognized the importance of quality materials as well as the use of persuasive tone in a video presentation.

As regards their perceptions of improvement, students perceived improving English skills as central in completing the course projects. The theme appeared as students frequently used the words *speak* (20 times), *speaking* (16 times), and *product* (11 times) in their essays. An example of the sentence using the word *product* can be seen below:

- (1) The goal of the presentation is to convey idea of the product including all of its features. (Yvn)

As can be seen from this example, student Yvn wrote the word *product* in association with the word *features*. The student intuitively used the word *product* together with the word *features*. The combination is acceptable or seen as common in the Computer Science context. She then conveyed in the sentence her acknowledgment of the concept and successfully made her point as the goal for her project's presentation.

Another example of use was shown in the sentence below with the word *speak*:

- (2) I'm not used to speak in English since I was a little kid so that's why my spoken English has so many lacks (ex: pronunciation, vocabularies, accent) here and there. (Mlv)

As can be seen in this sentence, student Mlv gave her evaluation of her spoken performance. She concluded that her speaking ability was lacking since she was not used to speaking in English from the beginning. However, the way she explained her situation indicated full

knowledge of how to be successful in speaking. As a speaker, she was fully aware that she needed to work on pronunciation, vocabularies, and accent.

These sentences prove students knew how to complete their tasks. They also showed a relatively low confidence level in terms of performing their language skills.

#### 4.2.2 Students' perceptions as seen from the interview session

Ten students were selected randomly for a semi-structured interview session. The ten students answered questions on the use of *SPEARA* as MALL for ESAP. Students were prompted with three questions: (1) How do you feel about your learning? (2) How does *SPEARA* help you throughout the course? and (3) In what way *SPEARA* help you to learn new words? Results were obtained from students answers. Using thematic coding, the results obtained from interview session revealed several themes.

When asked the question, "Do you think you have been successful in doing this course?" almost all of the ten students responded they had successfully improved their confidence and presentation skills. One student regarded himself as still not confident in doing a presentation in English, despite his high score for the course. Prompted with another question, "Do you learn new words, especially in Computer Science?" the students all answered yes with various responses, such as:

VNY : I think I did. I learnt new words like the ones you gave us on the quiz,...  
query... attributes.

JUV : Yes, certainly. There are words I already know. But, I also learn new words,  
such as query. I learn to making sentence using that word.

Both transcripts demonstrate that students confirmed that *SPEARA* had helped them. Students' feeling of confidence were related to new skills or information they received from learning new words.

Students agreed that *SPEARA* was easy to install and use. Students were able to navigate between the menu in the mobile-app easily. Some students provided further comments:

VNY : I think *SPEARA* is pretty easy to use, no confusion

GEO : (it is) quite easy, just slide to the menus

JUV : Using *SPEARA* is easy, (you) just have to type the word

From above responses, students in general perceived *SPEARA* as the MALL to be easy to use. Also, the mobile-app was considered as having the features that the students preferred. One of the favoured features was word-pronunciation ("so we know how the word sounds" –Vny), which sometimes confused. Another positive remark was about the size of the mobile app, which was small (<10MB). Students also admitted that something they remember about the

learning was the use of a mobile-based dictionary in their course. Even after the course completed, they still kept the mobile-app in their smartphones for future use.

Students particularly noticed the large amount of information provided by *SPEARA*, from their interactions with the MALL. When asked to recount their experience using *SPEARA* one common theme that always appeared in the interview transcript was the amount of information students received from the mobile app. The reason being upon typing the keyword the students could see concordance-lines, which are lines of sentences from multiple sources containing the word. Some students reminisced:

HMW : Yea, you *gotta* select what you want to read, though, there are so many information

MLV ; So much information, which is quite useful for reference

Such overflowing of information as the students recalled, could be overwhelming, as in their words:

KTN : ... (there is just) too much information, (I am) not sure where to read first

BRY : I could not understand them. The sentences are difficult to understand. There are too many lines (of sentences)

When prompted further what they did to manage the situation, both of these students recalled the time when the lecturer provided the explanations on these sentences. Both students asked the lecturer during the lesson to explain the sentences they found in the mobile-app. Upon receiving an explanation from the lecturer, the students said the information from the lecturer was most helpful for them.

Finally, students provided answers on whether they would use *SPEARA* again for their learning purposes. All ten students agreed that *SPEARA* was an effective tool for assisting their study. Students again highlighted that it would be ideal if there would also be someone who could help them with further explanation.

Based on the data provided in the tables and figures of students' test results, it could be confirmed that MALL had a positive impact on students' learning. The data has significantly shown correlations between the tests as well as revealed the effectiveness of MALL. It was shown that students could achieve maximum results in the post-test. The achievement further confirms that students had been able to provide the learning outcome by using MALL. These findings are in line with the previous studies (Kearney, 2012; Müller et al., 2017).

The data also revealed students' test results to be consistent with higher academic English. It could be concluded from this study that students' success in ESAP could be determined by students' readiness in learning highly contextual English. In this present study, students joined a high-intermediate level course. This present study also revealed that an ESAP



course would not only require sufficient knowledge in academic English but also other academic skills. A consistent rise in students' test results could be seen in students with a high GPA (>3.00) and TOEFL scores (>500). Students with sufficient knowledge in both aspects had been shown to gain maximum benefits from the MALL. This finding supports previous research on ESAP, arguing that the English courses in university-level would only be meaningful when it is aligned with students' field of study (Flowerdew, 2012, 2013; Hyland, 2007),

The use of MALL had also been perceived as positive in this present study. Students' essays and interviews had confirmed the benefits of using a mobile-based dictionary to provide specific information as needed by the students. The provision of MALL was also considered as convenient due to the ubiquitous nature of the technology. MALL allowed students to access the materials at their convenient times. Students had also professed that the use of the mobile-app would last even after the course had resumed. This finding supports the previous research, in which efficient measures were always one of the preferences in adopting MALL in formal education (Dashtestani, 2016; Fortunati, 2012).

The main finding of this study is arguably the autonomous tenet of MALL. Autonomy is the prerogative of the students, in which students felt they have control over their learning. This study showed students had a strong proposition on learning. They felt confident when producing the language in their projects. These themes kept appearing in students' essays. The recurrent information revealed the ultimate value for students as users and owners of the language. Students no longer lingered upon structures and rules of the language but on the functions and strategic values of English. This study conformed to the study of learner corpora and ESAP (Bedmar, 2009; Biber & Barbieri, 2007; Conrad, 2005).

This present study had also successfully employed a grounded approach to reveal important realities as shown in qualitative data. An important finding revealed the importance of navigating MALL. In the present study, students appreciated the freedom provided by the MALL. Such an opportunity means that students could use MALL any time and in any way they wish. Using MALL in this way makes students the centre of the learning process. This present study had also revealed that students do tend to underrate their performance, which may be related to levels of confidence. Data have also shown that students preferred to have their lecturer to be their learning guide. The amount of information made available by MALL could make students felt overwhelmed. Accordingly, students would need the necessary guidance to sieve through the information. Human interactions also are considered important to meet with the socio-cultural expectations of learning, in this case, students with lower confidence levels

or students with low independence levels. The pedagogical value in the use MALL as to complement and not to replace human interaction as identified in this present study conform the proposition made in the previous studies (Abe, 2003; Dashtestani, 2019; Flowerdew, 2013; Fortunati, 2012; Hyland, 2012a).

This present study has revealed the improvements of learning as well as students' perceptions on learning English in Higher Education. It could be seen that in Higher Education MALL could empower students to be the centre of the learning. Students could navigate their own learning process and the MALL provided them with the opportunities to reach their learning outcomes. On the other hand, the use of MALL also increased the value of student-lecturer interactions. Students perceived lecturers as experts and value the discussion throughout the learning process.

## **5. Practical applications in the classroom**

This present study could be useful in applications in the classroom, especially for three purposes:

First, in the integration of MALL at universities, administrators could apply MALL in conjunction with other main courses. In different contexts, some classes may use languages other than English. Therefore, a pre-test could function as a needs analysis. The needs analysis usually becomes a starting point for the teaching-learning process. On the other hand, a test would also become a point of inspection on the learning progress but also to identify possible problems faced by the students.

Second, the MALL used to teach ESAP can be customized. An example would be adding the list of high-frequency vocabularies in a specific discipline. Apart from using MALL as a means for independent learning, which tends to be focused on generic academic English, customization would enable learners to be effective in using the words applicable to their disciplines or field of studies. Corpus-based tools are the best tools to generate the vocabulary list.

Third, a MALL developer could consider the integration of chat-room or other communicative/collaborative features. This human-human interaction would supersede the artificial communication provided by the mobile-app and would provide a needed balance to human-computer-interaction. This provision could result in adding the menu to contact the facilitator or to open a group-chat or video-conference. In the classroom setting, a lecturer/instructor could open a thread in the Discussion Forum. Lecturers could also initiate the topic for discussion. For example, a chat thread allows students and lecturers to discuss

more instances. This way, the student-lecturer interactions become fruitful and more engaging. Students would also feel less stranded upon communicating their worries to the lecturer/instructor.

## 5. Conclusion

The provision of a MALL in English education has contributed to the demand to provide the most necessary language elements for the students. Efforts to provide both important and effective learning models for relevant English learning are necessary. This study has shown that a combination of MALL to teach ESAP is a successful step towards ideal English pedagogy in Higher Education level.

This present study has explored the possibility of both and presents promising results. The present study has shown that approaching ESAP through MALL is possible. A proposition on the use of MALL shows the vital importance of students' perceptions. The roles of the students are central in the learning process as they become the active producers of the language they learn.

Finally, the present study has argued that MALL would be successful through the provision of human interaction. Developing human-interaction in mobile-app would be the necessary interactions needed for real communications. The ESAP approach in MALL abridged the interactions with experts in the field. Future study could investigate the human-interaction during the application of the MALL in an ESAP classroom. The investigation of how students interact with their peers and their lecturer/instructor would provide a more comprehensive view on the integration of MALL in English education. Collaboration and peer-review would be other aspects worth exploring in the future.

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