

# FinDo: Vocabulary Learning System Based on Location-context

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**Abstract:** Recently, it has become more and more important to learn foreign languages with the aim of business or personal interests. However, it is not easy to increase the vocabulary of foreign languages because it requires a lot of time to learn many words. In this paper, we propose a smartphone application named FinDo which presents a vocabulary list related to the place that the user is located at. By utilizing the small periods of times during the user's daily activities, FinDo allows users to comprehend the meaning of unfamiliar words in the most efficient manner with the context related to their own location. For example, when a user is in a supermarket, he/she can learn all the related words of surrounding objects there. We held an experimental evaluation to compare the proposed system to a system without the location-context content with two groups. The experimental results show the group using FinDo were able to improve, although no notable difference can be seen between the two groups. However, the group using FinDo found it more entertaining and appealing.

**Keywords:** GPS, Location, Context, Vocabulary Learning, Smartphone.

## 1. Introduction

In recent years learning a second language has become more and more important, either for professional reasons, originating from the current globalization trends, or personal reasons. This trend has made learning a second language a necessity to attain bigger success in the modern world.

Since learning a second language is more important nowadays, many studies have revised the factors that come into play when learning a second language in a more detailed level. For example, Zheng, Ying (2008) [1] dives deeply into the relation of learning a second language with the human's mind and environment. This paper explores how learning a second language can be affected by different kinds of anxieties, from a cognitive point of view, to a cultural level and it also explains how the location is also a factor in the anxiety the learner might feel when learning a language.

Along with these studies about the human behavior when learning a new language, language learning methods have emerged utilizing current technology like computers or smartphones. However, the evolution of technology has been so fast that the creation of software for these devices has been changing constantly, which does not let the software receive the studies or analyses necessary to achieve a better understanding of the balance to achieve the best results possible in this environment. In consequence, smartphones or computers have turned into more of an optional tool that can be used out of convenience, which causes available language

learning software to be only an adaptation in digital format of the already existing physical methods.

This lack of innovation in utilizing language learning with current technologies, raises a need to find real new methods that will support the user's learning process, in a way that utilizes the tool not only to access the information more conveniently.

In this paper, we present a mobile application tool called FinDo, of which purpose is to effectively support the vocabulary learning process of the user using the surrounding context and the locations the user goes by utilizing the GPS capabilities of the device. Vocabulary learning tends to be the most repetitive and time-consuming part, as there is no other way but learning a new word by repetition until it is memorized.

By giving the user the possibility to use FinDo during the daily routine without affecting it, and by having the application designed to be used for short period of time but many times a day with the surrounding context during those periods, FinDo would effectively be able to support the user's learning process.

## 2. Related Works

### 2.1 Human Behavior when Learning Language

It has already been shown how utilizing the context in the learning process raises the learner's probability of effectively learning [2] [3]. Especially with ubiquitous systems becoming more common, it is making the user's physical location an

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important factor to consider when developing this kind of systems.

Shirkhani, S., & Fahim, M. (2011) [9] explains the importance of critical thinking when learning a second language. This term refers to the individuals' ability to think and make correct decision independently.

FinDo will be designed with critical thinking in mind, this way, there is less of a passive participation when utilizing the application, in other words, not only being a receptor.

## 2.2 Context Based Learning Systems

Tan Q, Chang W and Kinshuk (2015) [4] developed a location-based system that utilizes the Augmented Reality technology during the learning process. This study was focused more in the technology and implementation showing a way to accommodate the content in relation with the user's position. The system mostly just shows information about the location and while it showed some positive feedback, it lacked actual testing with bigger groups of participants.

Other works have been tested in more controlled environments, for example, Chianese, Angelo, et al. (2014) [5] utilized a system in a museum environment where they connected the context to the learning process by utilizing mobile devices. The system gave much more interactivity during the time of learning raising the student's interests and motivation.

Again, in a controlled environment Chiang, Tosti Hsu-Cheng, Stephen JH Yang, and Gwo-Jen Hwang [6] test a context-based system in a science class environment that also shows the positive results of utilizing context with a portable device in a learning process.

However, as mentioned previously, these two last works are tested in more closed or controlled environments, there has been little advancement towards a broader approach, in less controlled environments, when learning using context, to learn with context in a wider, less controlled area is one of the challenges FinDo is meant to overcome.

## 2.3 Location Based Entertainment

Another important point of the context-based system is to create a more entertaining approach to what could be considered as a mundane activity. With the purpose of creating a new social experience with current technologies, Procyk, J., & Neustaedter, C. (2014, February) [7] designed a system which shows a creative way of sharing experience by utilizing location and context.

The study shows positive results but with some implications, particularly some participants did not want to go too far away from the places they normally go just to access other user's

content. Because of this, one of FinDo's most important point is to always have content available representing common places, like restaurants, supermarkets, schools, etc. and to become part of the user's daily routine without needing to go to farther places, but always having the possibility available to do so.

## 2.4 Language Learning Location-Context System

Particularly, a study that also focused language learning with a location-based system by Edge, Darren, et al. (2011) [8] tried an approach against a less controlled environment. The results show that while it had good effects in the participants of the experiment, they had trouble when selecting the area from the system's list in order to access the content.

As for the learning process, it was designed for users that were living abroad to promote them to talk with natives, but only flashcards with common phrases were shown. Some participants were still beginners and were far from being able to talk with the language.

For FinDo we will utilize a different approach more focused in the learning process and locations by already having the places the user can access always available and giving more importance to the selection of the location, rather than selecting from a list that might not have the location the user is on.

We will also focus in learners that are in an intermediate level, which tends to be when the learners feel more accustomed to the language, and instead of common phrases, the focus will be in vocabulary where they need to be memorized before being able to use in normal conversations.

FinDo will bring all the points discussed in this section together: exploiting critical thinking, relating location with context more closely doing so in an open, un-controlled environment, create a new and entertaining way to do something that can be considered a mundane activity and to aim for users that can effectively use this to support their language learning during their daily routine.

## 3. Proposed System

### 3.1. System Design

To recapitulate, we hypothesized the following: 1) The users will be able to memorize the vocabulary with less repetitions because of the location-context factors. 2) The users will be able to use FinDo as a support tool that allows them to study constantly without affecting their daily schedules, by being utilized for short periods of times, many times a day. 3) FinDo will help them maintain motivation and develop healthy study habits.

In order to benefit as much as possible from learning based in location-context, it was necessary to have the method available in a device that the user carries with themselves, so it was decided to work in an application for smartphones.

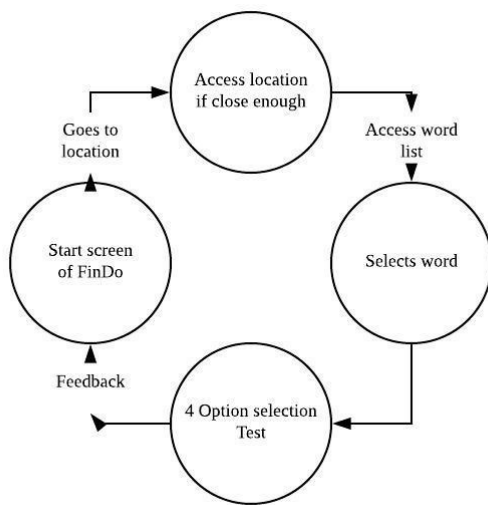


Fig. 1 FinDo Application Diagram

The application would show a map to the user, based on his or her own location, and places the user can access. These places would be labeled and separated by categories with their descriptions. For example, two different Supermarkets would be labeled only as “Supermarket” in the application’s map.

It is possible to develop FinDo in a moderate amount of time for a big scale implementation thanks to available resources or service providers. There already exist online databases of vocabulary related to places, where they return a list of words related to locations. And for map locations, there are many maps application that already categorized different places in the world’s location defined with tags representing the locations, for example, searching for “hospitals” in a map application will show you all the hospitals close to you.

When the user wants to learn some words, he or she must go to a place, though having to be exactly in the location’s coordinates would cause too many problems. Making the application too restrictive, hence, the main requirement to access the list of that location will be for the user to be a certain distance to the location, calculated from the location’s coordinate and the user’s current location coordinate. Even so, it still needs to be close enough for the user to be conscious of the location.

When accessing the locations, the user could see the list of words and the images related to the vocabulary, after selecting a word of interest. It is necessary go through a testing process in order to obtain or reinforce the knowledge. This process must be short enough not to interrupt the user’s life (e.g.,

shopping, eating, etc.) but long enough to successfully create episodes with the surrounding context and learn or reinforce the word correctly.

### 3.2. Interface

The system is shown in Figure 1. The user can either go to location or open it when already in the location in order to access the vocabulary list.

As shown in Figure 2, the user will first start the application and the map will be shown. It will always show all the pins that represent different places, for example, Home, University, Park, Super Market, Convenience Store, Station and so on.

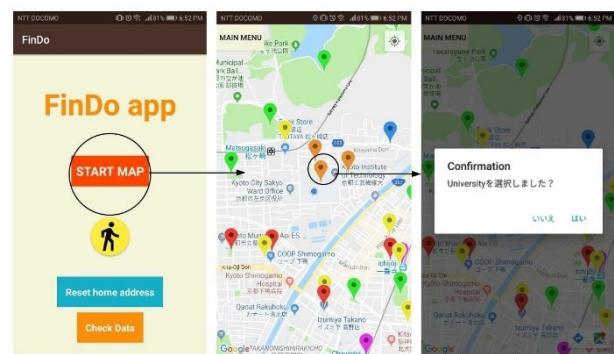


Fig. 2 FinDo’s Map Flow

The map always starts centered on the user, and all the pins seen are set in their respective place in correlation with the real world, except for the pin representing the “Home” category, which was designed as a draggable pin the user can move to set it in his/her house’s coordinates, by just moving the pin from the map screen.

Once the vocabulary list is accessed, the user will see a list generated randomly with related words to the location, having with a picture representing the meaning of the word next to each one. Once the user selects one, the screen shows again the selected word with its respective picture, and 4 options.

It was decided that the testing method would be with a 4-options selection question format, the user will see the word in his/her language and must select the correct translation between the 4 options.

The user must pick one and receives feedback to let him/her know if the option is correct or not. If the option is incorrect, the correct answer will be given, this process will be shown in Figure 3.

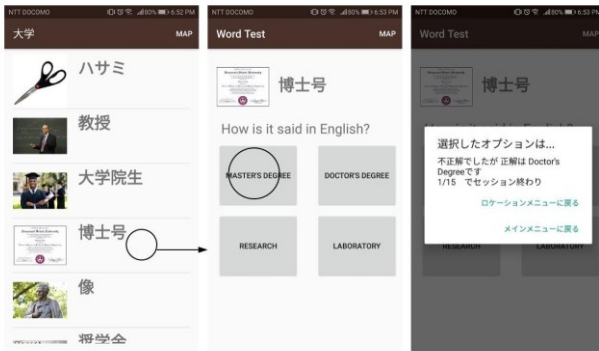


Fig. 3 FinDo’s Word Choice Flow

As mentioned in the previous part, the user would not be able to access the vocabulary list of the location unless the distance requirement is satisfied. When the user selects a pin in the map, if not inside the range, it will show the distance between the place and the user and requests to get closer.

This method of language studying is made to work from any language to any language.

## 4. Experimental Evaluation

### 4.1 Implementation

The words were handpicked, and each category has around 50 words. The vocabulary included in the application are nouns, which help in representing the location more easily and it was made for Japanese native speakers learning English.

The selected vocabulary was divided by difficulty utilizing a vocabulary database from a website named English profile [10]. This site contains vocabulary that can be categorized by levels from various national English language exams, showing what vocabulary should be known by someone in a certain English level.

With handpicked words depending on their difficulty, it would let us focus the vocabulary for intermediate level users in order to lower variables during the experiment.

For this experiment, the distance was decided to be at least inside a 100 meters radius from the location’s coordinates requirement, so the user can access the selected place.

The FinDo application is developed for android phones utilizing Android Studio. It utilizes the map generated by google maps API. For the user’s location, most Smartphones have GPS technology installed and were used for this purpose.

The application was made targeting Androids 4.0.3 and later, so it can work in most android devices.

### 4.2. Method

An experimental evaluation was made between two groups: An experimental group utilizing FinDo, and a control group utilizing an application, that does not have the map or context related content, named VocList. It has the same vocabulary content as FinDo, but only gives the randomly generated list when starting the application. It does not have any requirement to access the list of words related to the places FinDo has access to.

An outsourced application called App Usage Tracked is used to track how much time the participants utilize their respective application.

Figure 4 shows the basic framework for the experiment.

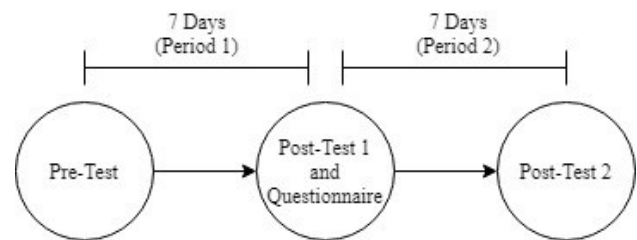


Fig. 4 Experiment Flow

The experiment started with a vocabulary pre-test. After the test, the users were separated into two groups that had a same level of English knowledge and were divided as follows:

- 1) Group A’s participants with FinDo.
- 2) Group B’s participants with VocList.

When the groups were made, the users were asked to utilize their respective application at least 2 times or more daily during the first week, this part is labeled as period 1, seen in Figure 4.

After period 1 ends, another exam was made containing the same content as the pre-test but with the options in different order. It also contained a questionnaire in the end.

During period 1, the data obtained was as follows:

- a) For FinDo: 1) How many times the user access location and what location it was. 2) How long the application is used.
- b) For VocList: 1) How many times the user accessed the list. 2) How long the application was used.

Lastly, when period 2 starts the participants were asked instead to freely use their respective applications. When period 2 finishes, another exam of the same content and different order of questions and answers. This last test was made to test retention of previously learned words.

Other data obtained was the three exams grades, and the questionnaire after the first period. Group A had 2 extra questions different from Group B with the purpose of asking

for more feedback about FinDo. Unlike for period 1, during period 2 the times accessed or time using the application was not taken.

**4.2. Results and Discussions**

The number of participants is thirteen, Group A has seven, and Group B six. They are bachelor or master students.

The results of the three tests were as follows:

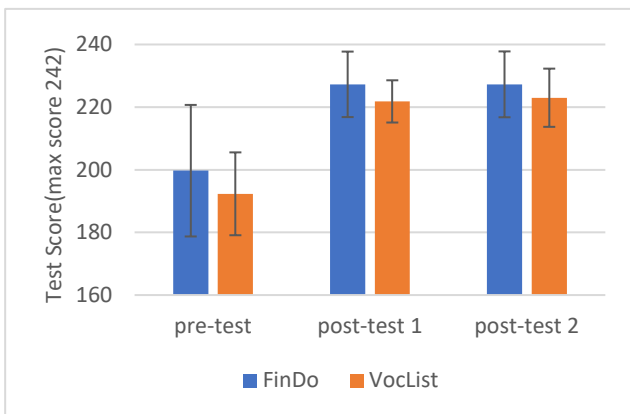


Fig. 5 Test Score

Between the participants' grades of the pretest there is no significant difference ( $p=0.508$ , Group A  $M=199.71$ ,  $SD=21.001$  vs Group B  $M=192.33$ ,  $SD=13.22$ ). It means that both groups have the same level of vocabulary and can be compared with each other.

A comparison was made with the test grades of the third week for both groups, showing how Group A ( $p=0.0098$ , Week 1  $M=199.71$ ,  $SD=21.001$  vs week 3  $M=227.285$ ,  $SD=10.51$ ) and Group B ( $p=0.0045$ , Week 1  $M=192.33$ ,  $SD=13.22$  vs Week 3  $M=233$ ,  $SD=9.29$ ) grew during the two weeks of using their respective application.

However, when comparing the third test scores between Group A and Group B no significant difference was seen in neither week 2 ( $p=0.33$ , Group A  $M=227.28$ ,  $SD=10.45$  vs Group B  $M=221.83$ ,  $SD=6.74$ ) or week 3 ( $p=0.49$ , Group A  $M=227.28$ ,  $SD=10.51$  vs Group B  $M=223$ ,  $SD=9.29$ ).

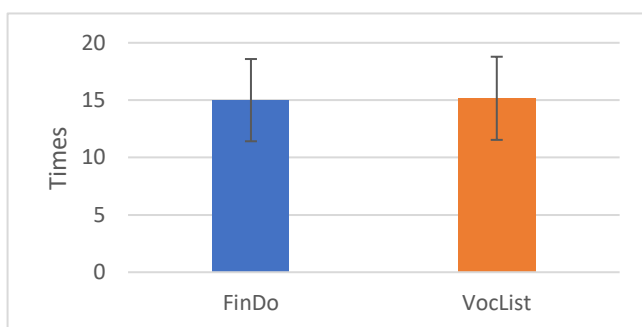


Fig. 6 Access Times

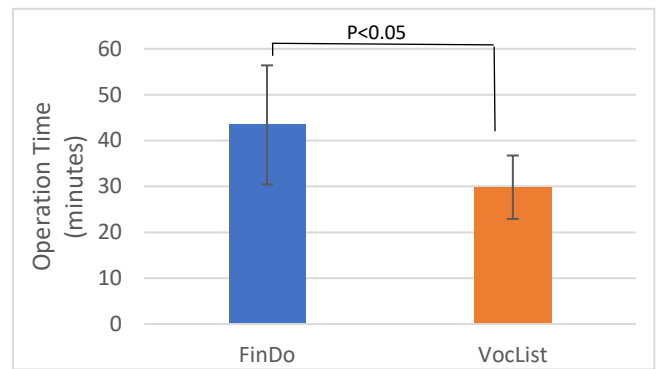


Fig.7 Operating Time

For the usage data, Figure 6 shows the times accessed the vocabulary list. A t-test was done to compare Group A and B. The results show no significant difference between the two groups ( $p=0.94$ , Group A  $M=15$ ,  $SD=3.58$  vs Group B  $M=15.16$ ,  $SD=3.62$ ). On the other hand, Figure 7 shows the total time and there was a significant difference in the one-tail t-test ( $p=0.028$ , Group A  $M=43.42$ ,  $SD=12.98$  vs Group B  $M=29.83$ ,  $SD=6.91$ ). These results show participants used FinDo for longer periods of times, which means there were more repetitions of the word learning flow shown in Figure 3.

But it is important to note that it is also possible the participants of group A utilized more time because they were checking the map, in consequence, this data might not completely be accurate. Nevertheless, we believe that the difference of mean is big enough to prove it was not just the usage of the map that could make such a wide difference.

The questionnaire has five questions made to both groups in the questionnaire, the answers were modeled after the Likert scale. With strongly agree being option (1) and strongly disagree being option (5). These questions were asked in Japanese; however, they will be translated in English for the purpose of this paper.

These questions are as follow:

- 1) It was difficult to make time to study with this learning method.
- 2) I thought this learning method was boring.
- 3) I believe I did not learn with this learning method.
- 4) It was difficult to use this learning method throughout this week.
- 5) I do not want to keep studying English with this learning method.

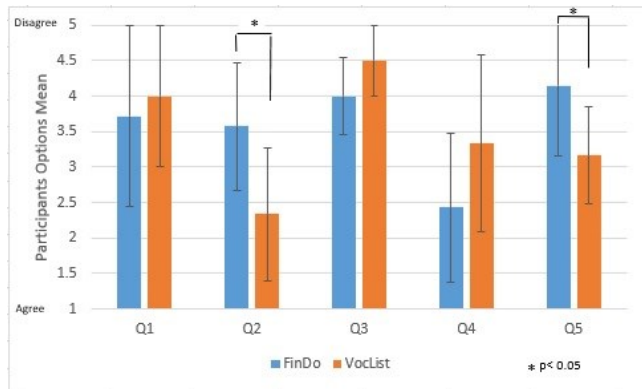


Fig. 8 Questionnaire Result

We utilized t-test to compare all the question’s answers between the two groups.

In question 1, there was no significant difference between the two groups ( $p=0.69$ , Group A  $M=3.71$ ,  $SD=1.227$  vs Group B  $M=4$ ,  $SD=1$ ), which means that neither group had problems when utilizing the applications.

For question 2, a significant difference was seen ( $p=0.048$ , Group A  $M=3.57$ ,  $SD=0.90$  vs Group B  $M=2.33$ ,  $SD=0.94$ ). The data shows that the participants in Group A felt FinDo was more entertaining to use than Group B.

Question 3 had no significant difference ( $p=0.13$ , Group A  $M=4$ ,  $SD=0.534$  vs Group B  $M=4.5$ ,  $SD=0.5$ ) between the two groups. But the mean was high in both cases, hence, both groups felt they were learning correctly when utilizing the applications.

Question 4 also did not have any significant difference between the two groups ( $p=0.21$ , Group A  $M=2.42$ ,  $SD=1.04$  vs Group B  $M=3.33$ ,  $SD=1.24$ ). The data shows both did not have a major difference as of terms in difficulty. However, from the data it can be seen from FinDo’s mean, it was more in a middle point of difficulty for the questionnaires’ answers. This level of difficulty might be caused by the limitations of the application’s development for the experiment, as only the area surrounding the University could be accessed.

Question 5 is aimed to know the participant’s motivation to keep learning by using their application. The results show a significant difference for the one-tailed t-test ( $p=0.044$ , Group A  $M=4.14$ ,  $SD=0.98$  vs Group B  $M=3.16$ ,  $SD=0.68$ ) and shows that Group A’s motivation was much higher than group B’s.

Group A had two extra questions prepared in the test after period 1, a follow up question for question 3, and a sixth question.

To answer the follow up question 3.1, the participant needed to have picked either option 5, 4 or 3 of question 3 and it was as follows: 3.1) What do you think the reason is? With 3 answers

and multiple choices could be made: 1) Surrounding Context made it easy to remember, 2) Because of the pictures next to the words, 3) Others (free writing).

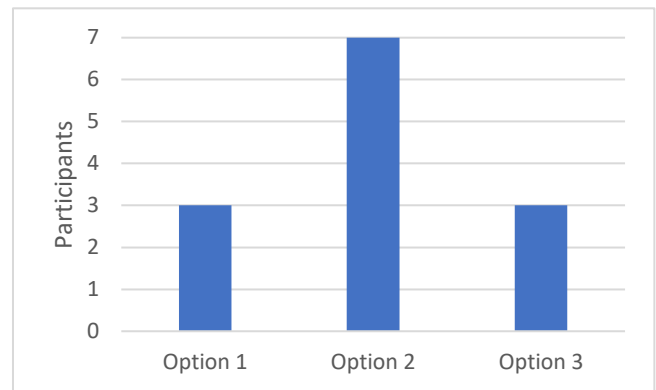


Fig. 9 Result of Question 3.1

As shown in Figure 9, 7 out of 7 participants selected option 2, 3 out of 7 selected option 1 and 3 out of 7 selected option 3 and wrote their answer.

Option 2’s data shows everyone was acknowledging the images as part of why they felt learning was effective. Option 1’s data tells us participants are not actively relating their learning with their surrounding context yet. But it is still possible for it to passively be affecting their learning.

Option 3’s answers were as following: 1) There wasn’t much vocabulary, so it was easy to memorize, 2) Because it took such a short amount of time, I did it so many times I ended up memorizing it very well, and 3) Because the words were things I see many times during my daily routine, so they felt very familiar to me. Particularly answer 2) and 3) go well in line with our hypotheses.

As for the last extra question for group A, numbered as six in the questionnaire, it is as follows: 6) It was not interesting to see words related to the place I am.

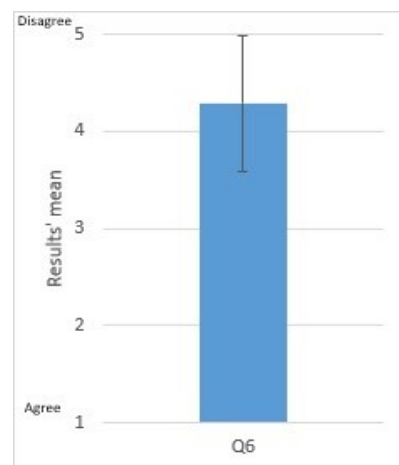


Fig. 10 Result of Question 6

Figure 9 shows ( $M=4.28$ ,  $SD=0.69$ ) that there was a lot of interest from the participants to be learning words of the things they can see close to them.

After period 2, one of the participants comments “It would had been better if I could go to any place. I normally go the places available but close to my house, not just around the University”. This comment shows how having a limited area for the experiment most probably caused unnecessary difficulties to the participants.

Although other comment by one of the participants after the last test was “Not being able to answer some words in the test made me go to one of the places I didn’t go during period 1”. It means that there exists a possibility to motivate the users of FinDo to go to places they might have not gone but with the purpose of learning a word.

## 5. Conclusions and Future Works

In this paper, we have presented “FinDo”, a system that utilizes real world locations in conjunction with the technology provided by the smartphones, in order to support the learning of vocabulary of a foreign language.

FinDo is a new way to learn a foreign language that utilizes the smartphone not just as a source to get the information, but to study along with it. Without affecting the daily schedule by finding its way inside the user’s lifestyle, yet remaining effective and motivating, helping create healthy study habits.

Through the comparative evaluation, we found that the FinDo application was taken as a more entertaining and attractive approach for the users. Although there is still not enough data to show utilizing this system is more effective than a method that doesn’t uses context-location, it still shows that is an effective way to study.

We believe that many limitations existed during the experiment that could have affected part of the results to a certain point, specifically, while it works as a starting point for a less controlled environment, limiting the usage of the application to only the area around the university is too small of an area to really learn about all the possibilities of the system.

The little change between after period 1 and after period 2 tests, show that one-week period might have been too small of a range to really see differences for grades. The initial grades were also very high from the beginning, so adding even more words would possibly show clearer results. More participants are also necessary to see more differences between the control and experimental group.

Considering the participants’ comments and questionnaire, it would be effective to add different ways to motivate the user

to pay more attention to their surrounding context. Gamification inside the application could help the user challenge going to new areas when he or she so desires. Image recognition is another technology that could suit very well with FinDo’s learning method.

We hope that for the future, other works can remove these limitations and give new ways to different learning methods.

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