

# Words and bots : An Emprical experiment vocabulary mastery with robotics in young children

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## WORDS AND BOTS: AN EMPIRICAL EXPERIMENT VOCABULARY MASTERY WITH ROBOTICS IN YOUNG CHILDREN

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Article Info	Abstract
<b>Article History</b> Received: October 2023 Revised: December 2023 Published: January 2024	<i>This study aims to determine the impact of educational robot on increasing English vocabulary as a foreign language. Pre-experimental research design was conducted with 35 first grade junior high school students as sample. The pre-post English vocabulary test was given to the sample and the research were done in eight meetings. In the control class there was no action treatment and did not use robots in learning but in the treatment class, researchers used educational robots, namely the Evoce robot in learning. From the comparison between the two classes both the control class and the treatment class from the pre and post English vocabulary tests, the result finding showed in the t-test score based on the value of <math>df = 35 - 1 = 34</math> at a significant level of 5%, a ttable of 1.0691 is obtained and at a significant level of 1%, a ttable of 2.441 is obtained. With a tcount of 9.899, which means that it is greater than ttable at a significance level of 5% and 1%, (<math>1.0691 &lt; 9.899 &gt; 2.441</math>) then <math>H_0</math> is rejected and <math>H_a</math> is accepted. In summary, the Evoce robot has given contribution in young learners' English vocabulary. It recommended that the educational robot may become one of alternative media to be used for recent days for English vocabulary class.</i>
<b>Keywords</b> Educational robot; Children; Teaching media; Vocabulary;	
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### INTRODUCTION

A novel and intriguing presence has surfaced in the field of education, where young minds are guided by curiosity and wonder: robots. These aren't just any old machines; they're lively friends that have the potential to completely transform the way our youngest students learn to read and write foreign language. In a future where vocabulary grows through bots and words are weaved through wires, picture this. Our remarkable activity begins with "Words and Bots: Analyzing Vocabulary Development with Robotics in Young Children." Do you think robot could increase children vocabulary?

Technological developments in today's digital era have a very important role in the world of learning. One application that is very useful and effective for increasing students' understanding of language is robot education (Wang et al. 2023). The development of this application encourages research groups to create fun and interactive learning methods for students (Hakim et al. 2020). Traditional methods are often considered boring and less attractive to students (Papadopoulos et al, 2020; Woo et al, 2021). Therefore, this robot education has a goal to solve the problem and provides alternative learning that is more interesting and fun (Eguchi, 2014). Various needs to support success in building vocabulary in robot education requires more learning methods which is fun and interactive way to learn, enrich and expand foreign language vocabulary (Alemi et al, 2015). By paying attention to students' needs in

learning language, such as motivation, interaction, and reinforcement (Belpaeme et al, 2018). This media provides interactive features, such as sound, model, and imitate to help students understand and remember new vocabulary (Keane et al, 2019).

Robots used in teaching are being actively investigated by many researchers (Ajlouni 2023) for a variety of purposes. For instance, Hong and his team (2016) claimed that using instructional robots was helpful for learning English. The usage of robots, according to Toh et al. (2016), improved students' understanding of mathematical topics. According to Ortiz et al. (2016) instructional robots can increase students' interest in engineering and provide them a clearer knowledge of scientific principles.

According to a meta-analysis conducted in 2022 (Lee & Lee, 2022), the benefits of Robot Assisted Language Learning (RALL) have been generally favorable with a medium average impact size. This study has demonstrated that language acquisition progress has been attained under RALL conditions, regardless of moderator variables (e.g., age group, target language, robots' role, interaction style). The following categories can be used to break down the RALL evaluation in greater detail for student learning advances in cognitive and affective domains. The first one is a reference to language learning success. The latter speaks of three things: (1) RALL-based teaching methodologies; (2) student motivation, self-assurance, and social behavior; and (3) robot-related technology features.

Vocabulary learning has received the most attention in RALL studies, followed by reading comprehension and speaking ability, with little study on grammar learning (Van den Berghe et al., 2019). Studies have indicated that, from the perspective of the learners, RALL has produced positive outcomes in aiding foreign language learners in acquiring reading (Hong et al., 2016) and grammatical skills (Khalifa et al., 2018).

Depending on the complexity of the tasks and the degree of flexibility in human-robot interactions, robots can play a variety of roles, such as learning partners, teaching aids, or even purposely create mistakes. Teaching communicative language (CLT) is more frequently used in RALL than teaching proficiency through reading and storytelling, according to a more detailed review of RALL's oral interaction that included 22 empirical investigations from 2010 to 2020 (Lin et al., 2022). The steps teachers followed in those robot collaboration experiments are also described.

Viewed from the aspect of language development, this aspect is intended so that children are able to express thoughts through simple language appropriately which are able to communicate effectively and generate interest in being able to study foreign language. It is very important to provide an introduction to English from an early age. By mastering English, people will easily enter and be able to access the world of information and technology. The right time is from pre-school age (Papadopoulos et al. 2020). These are the golden and most effective times to get used to listening to English which can add vocabulary for early childhood so that it is easy to learn English later (Movellan et al, 2009). As stated by Tanaka et al (2012) that children have extraordinary memory abilities, especially at young age. So based on the above research finding, researchers noticed that this period is the right time to introduce foreign languages according to the abilities and needs of children. That's the reason why the researchers tried to find out the effective and interactive instructional media to be researched for teaching English vocabulary at SMP Negeri 35 Pekanbaru, the purpose was to provide the knowledge needs of mastering a lot of vocabulary so that when children continue their level education to a higher level they will not get any difficulties. Therefore, the main focus in teaching English is vocabulary mastery. By mastering a large vocabulary, children can easily master other language skills.

Recognition of the mastery of English vocabulary among SMP Negeri 35 Pekanbaru is considered to be lacking, both through the habit of hearing, pronunciation, and knowing the meaning of each word. Especially found in SMP Negeri 35 Pekanbaru, English vocabulary is

also relatively low. This is due to the lack of habituation at school due to the teacher's lack of knowledge in that field in selecting teaching materials and supporting media to teach English vocabulary. From this, it is very necessary to provide an introduction and learning of English at SMP Negeri 35 Pekanbaru.

Based on several previous studies, the gaps of this research is to find answers on how the process of introducing basic vocabulary is introduced to early childhood with educational robot (Evoce) and compositions built in them. What distinguishes the previous studies in educational robots was in this study from others in different studies that the Evoce as educational robot selected here were produced with a selection background and produced interactive robot as learning media combined with technology of movement and sound. The novelty of this research is the usage of Evoce (English vocabulary for children) robot as the media to give to students in acquiring English vocabularies Thus, the research question in this manuscript was "Does the robot succeed in assisting students in acquiring English vocabulary in the classroom?"

## RESEARCH METHOD

One experimental group received treatment, a <sup>8</sup> pre-test, and a post-test in this quasi-experimental design. Treatment class had Evoce robot to be implemented during studying vocabulary while control class used pencil and paper during vocabulary learning.

### Research Design

Quasi-experimental design employed in this study which examined how well junior school children at SMP Negeri 37 Pekanbaru might learn foreign language and improved their other skills when exposed to engaging robot activities and materials as two variables on this research. The experiment was conducted at SMP Negeri 37 Pekanbaru. A total of 35 first grade students participated in the intervention which attended all four sessions and provided accurate feedback. The instrument of the research was multiple choice vocabulary test was created for both classes control and experiment class.

Students received assessment sheet to record their learning results (including pre-post vocabulary test), which included their own evaluation, peer evaluations, and teacher evaluations. When a didactic session was over, the students themselves recorded the vocabularies they remembered in the self-evaluation column. Each session might include peer evaluation as students trade evaluation forms with their friends to rate their vocabulary use, cooperation abilities, and success in the exercise. Once both students in the same working group finished practicing using the Evoce robot and recorded all the vocabularies they found, the teacher also assessed the students' vocabulary test. The treatment class as a medium for learning English especially for introducing vocabulary to students, the Evoce Robot included a learning mat containing pictures of learning objects. In the research activities, learning material was illustrated below with the title "At Cici's Farm". This material is to introduce the vocabulary of animal types to students, the mattress used was a mattress that displayed several examples of animal images.

### Data Analysis

To analyse and evaluate students' knowledge of utilizing the Evoce Robot both at home and at school, data analysis done by SPSS 24. Two classes was employed, one using Evoce Robot and the other not. Finally, the data has been analysed using SPSS 24 to make a comparison between before and after the students used Evoce Robot to learn to read and pronounce English vocabularies. Pre and post vocabulary test was given to 35 students. After having pre-test, 35 students were grouped into two types of classes namely control and treatment class. Both classes got vocabulary test in form of multiple choice test for pre-test and essay test was given at post-test in form of arrangement of jumble words and spelling (SHIN et al., 2022).

## RESEARCH FINDINGS AND DISCUSSION

### Research Findings

This study sought to determine whether teaching vocabulary to junior high school first graders using the Evoce robot was effective. The results of the pre-test and post-test between students in the experimental group (taught using an Evoce robot) and students in the control group (taught using PowerPoint presentations) are shown in this section.

Table 1  
Paired Samples Statistics (Control Class)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest Control	66,4286	35	8,62379	1,45769
	Posttest Control	69,5714	35	7,21227	1,21910

Table 2 above shown that the average results of the pre-test and post-test of student's vocabulary (Control Class) did not show any significant difference between the average pre-test results of (66.42) compared to the average post-test results (69.57 ).

Table 2  
Paired Samples Correlations (Control Class)

		N	Correlation	Sig.
Pair 1	Pretest Control & Posttest Control	35	,885	,000

The table 3 above shown that the significance value (Sig) of the correlation results of the pre-test and post-test of Student's Vocabulary (Control Class) of 0.000, which means it is smaller than 0.05, so it can be concluded that there is a relationship between the average of the pre-test and post-test results on the score.

10 Table 3  
Paired Samples Test (Control Class)

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest Control - Posttest Control	-3,14286	4,03764	,68249	-4,52983	-1,75588	-4,605	34	,000

Table 4 above described about the significance value (2-tailed) between the pre-test and post-test scores, a value of 0.000 is obtained, which means it is smaller than 0.05, it can be concluded that there is a difference in the results between the pre-test and post-test of Student's Vocabulary (Control Class).

Based on the value  $df = 35 - 1 = 34$  at a 5% significance level, a  $t^{table}$  of 1.0691 is obtained and at a 1% significance level a  $t^{table}$  is 2.441. With  $t^{count}$  of -4.605, which means it is smaller than  $t^{table}$  at the 5% and 1% significance level, ( $1.0691 > -4.605 < 2.441$ ) then  $H_0$  is accepted and  $H_a$  is rejected. In other words, there is no significant difference between Student's Vocabulary between the pre-test and post-test in the Control Class at both the 5% and 1% significance levels.

Table 4  
Paired Samples Statistics (Experiment Class)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest Experiment	67,2857	35	8,16582	1,38028
	Posttest Experiment	78,4571	35	7,17980	1,21361

Table 5 above described the average results of the pre-test and post-test on Student's Vocabulary (Control Class) show that there is a significant difference between the average post-test results which is greater (78.45) than the average pre-test results (67.28).

Table 5  
Paired Samples Correlations (Experiment Class)

	N	Correlation	Sig.
Pair 1 Pretest Experiment & Posttest Experiment	35	,782	,000

We can see the table 6 above that the significance value (Sig) of the pre-test and post-test correlation results, it is 0.00, which means it is smaller than 0.05, so it can be concluded that there is a relationship between the average pre-test and post-test results in the experimental class.

Table 6  
Paired Samples Test (Experiment Class)  
Paired Differences

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 Pretest Experiment - Posttest Experiment	11,17143	5,15344	,87109	12,94170	9,40116	12,825	34	,000

Table 7 above shown that the significance value (2-tailed) between the pre-test and post-test scores, a value of 0.000 is obtained, which means it is smaller than 0.05, it can be concluded that there is a difference in the results between the pre-test and post-test from the results of the student's vocabulary test on experimental class. Based on the value  $df = 35 - 1 = 34$  at a 5% significance level, a  $t^{table}$  of 1.0691 is obtained and at a 1% significance level a  $t^{table}$  is 2.441. With  $t^{count}$  of 12.825, meaning it is greater than  $t^{table}$  at the 5% and 1% significance levels,  $(1.0691 < 12.825 > 2.441)$  then  $H_0$  is rejected and  $H_a$  is accepted. In other words, there is a significant difference between Student's Vocabulary between the pre-test and post-test in the Experimental Class both at the 5% and 1% significance levels. From the significance value (2-tailed) between the pre-test and post-test scores, a value of 0.000 is obtained, which means it is greater than 0.05, it can be concluded that there is a significant difference between the student's vocabulary score on the student's pre-test and post-test. in Experiment Class.

Table 7  
Paired Samples Statistics (Experiment Class)

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Posttest Control	66,4286	35	8,62379	1,45769
Posttest Experiment	78,4571	35	7,17985	1,21361

Table 8 above described about the average results of the control class post-test and the experimental class post-test on the Students' Vocabulary ability results show that there is a significant difference between the average post-test results of the experimental class which is greater (78.45) than the average post-test results in the control class (66.42).

Table 8  
Paired Samples Test (Experiment Class)  
Paired Differences

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 Posttest Control - Posttest Experiment	11,9285	11,9285	,9285	10,0714	13,7857	12,825	34	,000

Pair 1	Posttest Control - Posttest Experiment	12,02857	7,18858	1,21509	14,49793	9,55921	9,899	34	,000
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Table 9, we can see that the results of the t-test based on the value of  $df = 35 - 1 = 34$  at a significant level of 5%, a t-table of 1.0691 is obtained and at a significant level of 1%, a t-table of 2.441 is obtained. With a t-count of 9.899, which means that it is greater than t-table at a significance level of 5% and 1%, ( $1.0691 < 9.899 > 2.441$ ) then  $H_0$  is rejected and  $H_a$  is accepted. In other words, there is a significant difference between the student's Vocabulary results between the post-test in the experimental class compared to the post-test results of students in the control class both at a significance level of 5% and also 1%.

From the significance value (2-tailed) between the students' post-test scores on Student's Vocabulary abilities in the experimental class and the post-test on Student's Vocabulary abilities, a value of 0.000 is obtained, which means greater than 0.05, it can be concluded that there is a significant difference between student's vocabulary score on the post-test in the experimental class compared to the post-test results of students in the experimental class on Student's Vocabulary ability.

Table 9  
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Control	20	60.00	85.00	70.0000	7.94719
Pre-Test Experiment	20	50.00	85.00	71.5000	8.59927
Valid N (listwise)	20				

The table 10, we can see that the mean of pre-test at control and experiment class can be seen as above. Mean of control class is 70, while mean of experiment class is 71.5. it means that there is an increasing score on students' vocabulary in using educational robot (Evoce).

## Discussion

The purpose of this study was to evaluate the impact of Evoce robot media on English vocabulary. The results demonstrated that students got significant impact about studying English vocabulary with the Evoce robot as a medium of learning. There are also some useful recommendations on how to integrate the findings into English teaching media. This study discovered that junior high school English foreign language students considered the instructional robot used by Evoce Robot to learn English vocabulary to be extremely engaging. The students completed the assignments on schedule and were enthusiastic about learning English vocabulary. The interactive robot was one factor that assisted to boost engagement in studying English vocabulary. The instructional program was simple for students to become familiar with educational program in Evoce robot. Since the Evoce robot captured their attention, the students shown rising levels of active involvement when the vocabulary programming inside the maps were taught using the robot.

A rigorous analysis of the instructional methodologies employed, distinguishing between students instructed through traditional paper-and-pencil methods and those utilizing the Evoce robot, illuminated a noteworthy disparity in academic performance. The students utilizing the Evoce robot attributed the observed significant difference to the immersive and interactive experiences facilitated by this technological medium, along with the active engagement of available resources. The incorporation of these dynamic elements not only marked a departure from conventional teaching approaches but also yielded an enhancement in the students' comprehension of the instructional material. These findings resonate with the conclusions drawn by Hong et al. (2016), who posited that the integration of educational robots could be a facilitative factor in English language learning. The interactive nature of the Evoce

robot seemingly contributed to a more effective language acquisition process, aligning with the recommendations of Movellan et al. (2019). These scholars highlighted the potential of educational robots in making substantial contributions to the improvement of students' English vocabulary. The congruence of the current study's results with prior research underscores the promising role that educational robots, such as Evoce, can play in optimizing language learning outcomes. This lends empirical support to the proposition that innovative technologies have the potential to reshape and elevate traditional paradigms of language instruction, particularly in the realm of English language acquisition.

The pronounced outcome derived from the aforementioned research underscores the notable engagement and attentiveness exhibited by students interacting with the Evoce robot, forming the foundational basis for the empirical experiment central to this study, which specifically scrutinized vocabulary acquisition. This observation aligns with the findings of Nomoto et al. (2022), who conducted an experimental study involving ten students interacting with virtual agents and another group with an embodied robot. Nomoto et al. reported that the cohort interacting with the educational robot exhibited a notably elevated proficiency in language acquisition, particularly in the realm of vocabulary. The outcomes of both studies converge, substantiating the potential efficacy of educational robots in augmenting language learning outcomes, particularly in the domain of vocabulary acquisition. Nomoto et al.'s findings additionally serve to delineate prospective directions for Research on Autonomous Language Learning (RALL) studies. The reported success in utilizing educational robots for language attainment prompts considerations regarding the development and implementation of robots designed to assist in language acquisition and vocabulary learning. These directions, elucidated in the extant literature and supported by empirical evidence, contribute valuable insights to the ongoing discourse on innovative pedagogical approaches and the integration of technological tools in language education.

The students also mentioned the value and appeal of educational robots, which helped them be more enthusiastic about acquiring English vocabulary while they were taking classes. Due to the vocabulary context's superior hints for identifying the meanings of unknown terms, Evoce Robot made the process of expanding one's English vocabulary simple. The students developed a passion for learning new words and became more driven to do so. This confirmed (Schicchi et al, 2018; Gratani and Giannandrea, 2021) findings that students had a favorable perception of the usage of educational robots for vocabulary development. Additionally, the research revealed that instructional robots are useful in accelerating the learning of language abilities like letter identification, vocabulary expansion, and instructional programming. Therefore, it is clear that the instructional robot was crucial in helping the children learn English language. The students were interested in the Evoce robot as an educational robot and keen to learn new words (de Wit et al, 2018).

The integration of educational robots in classroom settings has proven instrumental in enhancing student engagement and sustained involvement. Notably, the Evoce Robot has demonstrated efficacy in fostering improvements across various linguistic domains, particularly vocabulary development, accuracy, and fluency, as evidenced by studies conducted by Harinandansingh (2022) and Nomoto et al. (2022). The literature underscores the positive impact of educational robots on diverse aspects of language learning, positioning them as valuable tools within pedagogical frameworks. The observed benefits of utilizing the Evoce Robot were particularly pronounced in classroom activities, where children consistently displayed heightened levels of engagement and motivation. Empirical data further substantiates these observations, revealing a positive correlation between the incorporation of educational robots in lessons and heightened enthusiasm among students. This enhanced enthusiasm, in turn, translated into tangible improvements in language learning abilities. These findings resonate with broader educational research emphasizing the importance of interactive and

innovative approaches to instruction, with educational robots emerging as effective catalysts for fostering a dynamic and participatory learning environment. As such, the integration of educational robots, exemplified by the Evoce Robot, holds promise as a transformative pedagogical strategy, enhancing both student motivation and language proficiency.

The major conclusions from a pedagogical standpoint that can be made from the current study. For starters, it is strongly advised that educational robot like Evoce be incorporated into lessons to encourage students to learn and retain new terminology in English vocabulary. As demonstrated, Evoce not only encourages greater lexical gains but also provides students with a fun and engaging learning environment. Teachers should advise their students to learn vocabulary in small groups and practice frequently on the Evoce robot rather than attempting to retain a lengthy list of terms in a brief amount of time. Despite its usefulness, this learning method should only be used seldom because excessive repetition might become monotonous (Van den Berghe et al, 2019; Kasahara et al, 2021). Teachers should also keep an eye on how their students utilize their robots while integrating technology into the classroom.

## CONCLUSION

The purpose of this study is to determine whether educational robots can help junior high school students learn more words in English vocabulary. The results shown that students' engagement has been steadily rising, but the learning outcomes have not followed this trend. First, two markers of the students' involvement in their learning—enthusiasm and active participation in the educational robot—were noted.

Exercises, activities, and instructional programming were planned to achieve the goals of the experiment of Evoce robot. Results and information were gathered both using questionnaire and vocabulary test. SPSS was used to analyze and decide the pre- and post-test activities and results, while teachers' surveys only recorded their responses in interpretation. The experiment carried out for the current study was quite successful and attested to a distinct difference in the vocabulary levels of the students. The process of using Evoce robot to improve English vocabulary.

The study successfully demonstrated how junior high school students' vocabulary has improved. Collaboration between teachers and students in regards to sharing academic performance is another technique to raise students' vocabulary levels by giving rewards of achievement. Students must be encouraged to use the Evoce robot to expand their vocabulary for alternative media in learning English vocabulary.

Based on educational robot development, it is anticipated that robot interactivity will increase and that a wider spectrum of regular people would utilize RALL, replacing the original robotics enthusiasts and professionals. As noted by Belpaeme et al. (2018), resolving technical issues and implementing new teaching methods call for closely coordinated efforts. If language learning institutions, government agencies, research centers, and the market can cooperate, that is the problem. Then, it will assist in identifying the obstacles and outlining RALL's future while also enhancing our comprehension of the issue from a variety of angles and helping to strike a compromise between what is necessary and what is doable.

Regarding the research findings and the data analyzed, this study might have certain limitations. The current study, however, provides vital information about the impact of Evoce robot initiatives in new media of language teaching and learning among low proficiency students in the setting of English as a foreign language. To confirm or more closely examine the results of the current study, future research may focus on a broader subject area and employ more experimental methods.

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