The NAO Robot as a Teacher Assistant: Its Effects on Vocabulary Learning and Learners' Attitudes

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ABSTRACT

This study investigated the effect of using a robot as a teacher assistant on university language learners' vocabulary learning and their attitudes towards it. This study was conducted in Eastern Mediterranean University (EMU) in North Cyprus. First year English Language Teaching (ELT) students were the participants of this study. In this study a NAO robot which is an autonomous robot was used as a teacher assistant within the vocabulary course. In order to reach the aims of this study, a mixed-method research was designed. Both quantitative and qualitative data were collected. By a quasi-experiment, the effect of the robot on vocabulary learning was explored. Furthermore, a questionnaire and interview were used to explore the language learners' attitudes. Although, in this study the control group performed better than the experimental group, the results of statistical analyses did not show significant difference among them. In addition, data analyses showed that most of the learners have positive attitudes towards this technology despite of its limitations. Also this study found some of the limitations of this technology and the challenges of implementing it. Some suggestions were also posed by the participants to use this technology in more beneficial methods.

Keywords: Robot-Assisted Language Learning (RALL), Technology, Teacher assistant, Attitude, Mixed-method

ÖZ

Bu çalışma, bir robotun öğretmen asistanı olarak kullanılmasının yetişkin dili öğrenenlerin kelime öğrenmesi ve buna yönelik tutumları üzerindeki etkisini araştırmıştır. Bu çalışma Kuzey Kıbrıs'taki Doğu Akdeniz Üniversitesi'nde (EMU) yapıldı. Bu araştırmanın katılımcıları birinci sınıf İngiliz Dili Eğitimi (ELT) öğrencileriydi. Bu çalışmada, kelime dersinde öğretmen asistanı olarak otonom bir robot olan bir NAO robotu kullanılmıştır. Bu çalışmanın amaçlarına ulaşmak için karma yöntemli bir araştırma tasarlandı. Hem nicel hem nitel veriler toplandı. Bir yarı deneyde, robotun kelime öğrenmesi üzerindeki etkisi araştırıldı. Ayrıca, dil öğrenenlerin tutumlarını keşfetmek için bir anket ve mülakat kullanılmıştır. Her ne kadar bu çalışmada kontrol grubu deney grubundan daha iyi performans gösterse de, istatistiksel analiz sonuçları aralarında anlamlı bir farklılık göstermedi. Ek olarak, veri analizleri, kısıtlılıklara rağmen öğrencilerin bu teknolojiye karşı olumlu tutum sergilediklerini göstermiştir. Ayrıca bu çalışma, bu teknolojinin bazı sınırlarını ve onu uygulamanın zorluklarını buldu. Katılımcılar tarafından bu teknolojiyi daha faydalı yöntemlerde kullanmak için bazı önerilerde bulunuld. Katılımcılar tarafından bu teknolojiyi daha faydalı yöntemlerde kullanmak için bazı önerilerde bulunuldu.

Anahtar kelimiler: Robot-Destekli Dil Öğrenimi (RALL), Teknoloji, Öğretmen yardımcısı, Tutum, Karışık yöntem

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INTRODUCTION

1.1 Introduction

This chapter presents information about technology as well as its use in language learning and teaching. Based on specific research goals, integrated technologies, as well as their aspects in language learning and teaching, are first discussed. Secondly, the use of robotics in language learning and teaching is presented as a new form of research. Lastly, the purposes of the study and its research questions are mentioned.

1.2 Technology in Education

In the past, the technology we used to teach students was minimal – for example, a few decades ago, cassettes, although obsolete now, were used profusely in order to teach and learn languages. However, in the present time, due to certain technological advancements, the way we teach and learn languages have changed significantly.

Moreover, the definition of literacy has changed as well; in the past, a person who could read and write in their first language was considered literate; in modern times however, in order to be considered literate, you must be fluent in the language of technology. Since English is considered to be an international language, the field of learning and teaching English has attracted a colossal amount of attention amongst researchers. For instance, in 1960, when computers were integrated with language learning and teaching, researchers such as Groot (2000), Barani (2012), and Salmasi,

Bonyadi, and Alavinia (2015), investigated the effect of computers on several aspects of language learning and teaching.

Other than being able to read, write, listen, and speak in a specific language, language learners must focus on grammar and vocabulary as well; in order to be able to comprehend a text in a foreign language fully, learners should have a wide range of vocabulary. Nation (2001) mentioned that a student who wants to be successful should master 98% of the vocabulary in a text. In this digital age, we use technology in a multitude of ways, one of them being learning languages – there are specific computer programs and mobile applications for each skill.

1.3 Computers and Mobiles Integration in Language Learning and Teaching

Over the years, the use of technology in education, specifically learning and teaching languages, has changed significantly. According to Dudeney and Hockly (2012), it was only about forty years ago that computers started to find their place in language learning. Computer-Assisted Language Learning (CALL) is divided into three stages by scholars Warshauer (1996) and Bax (2003). This categorization is based on the development of computers and the way they are used in language learning. Teachers started using this technology in order to enhance the quality of their teaching and help students learn better. Additionally, through their studies, researchers, such as Groot (2000) and Barani (2012), have proven the effectiveness of CALL and its positive impact on learning vocabulary.

Shortly after being introduced to the public, portable devices, such as cellphones and tablets, became a daily part of our lives. Nowadays, almost everyone has a mobile

device which has the same capabilities of a standard computer. The availability and portability of these devices makes them somewhat even more effective than computers in language learning and teaching. Use of handheld devices for learning purposes which can occur anywhere and anytime is known as Mobile learning (Kukulska-Hulme, & Shield, 2008). Use of these devices in language learning is known as Mobile-Assisted Language Learning (MALL). For years, teachers and researchers have worked together in order to figure out how effective these devices are in terms of learning languages; for instance, Saran and Seferoglu (2010) found that sending multimedia messages using cell phones has a positive impact on learning vocabulary.

1.4 Robot-Assisted Language Learning (RALL)

Researchers are studying Robot-Assisted Language Learning (RALL) and how robotics could be used to improve language learning and teaching, specifically in classrooms. The effect of robotics on language learning and teaching, as well as students' attitude towards RALL, are also topics that researchers have worked on.

As compared to the technologies mentioned previously, RALL has more advantages. For example, in addition to being intelligent, robots can interact with humans and move autonomously; these capabilities make them more effective in language learning and teaching. Studies conducted, such as Vogt et al. (2017), Cheng et al. (2010), Shin, and Shin (2015) and Alemi, Meghdari, and Ghazisaedy (2014), have investigated the effectiveness of robots in different aspects of language learning such as speaking, reading, and listening. In addition, they have explored the anxiety that students may face as well as their attitude towards this technology.

1.5 Purposes of the Study

The attitude of adult language learners towards RALL has been left almost unexplored. This study aims to figure out how, as a teaching assistant, a NAO robot may have an impact on adults learning vocabulary. Additionally, the attitude of adults towards RALL, and its effectiveness in learning and teaching languages are explored as well.

1.6 Research Questions

Several studies have confirmed the positive impact of learning languages through technology. Participants of these studies were from different age groups. As mentioned earlier, very little research has been done on adult learners using RALL, especially with how the technology is used to teach and help adult learners learn vocabulary; this could be considered as the gap in the literature provided. The following questions were posed for this study:

1. Could a robot, as a teacher assistant, help with students' vocabulary learning?
2. What are the students' attitudes towards the robot and using it in vocabulary learning?

1.7 Summary

A brief introduction to technology and its use in education, language learning, and teaching in particular, was presented in this chapter. Computers, mobiles, and robots are technologies which have been discussed. Lastly, the gaps in the literature and research questions were stated. The next chapter presents a detailed literature review on integrating technology in language learning and teaching.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of the relevant literature provided on the use of technology in education. It reviews previous relevant studies on the use of information technologies, like computers and mobile devices, in learning and teaching languages. Lastly, it presents recent findings on the effect of using robotics in language learning and teaching, specifically vocabulary.

2.2 Vocabulary Learning and Technology

Vocabulary is an essential part of any language – without a proper amount of vocabulary, transferring a message is almost impossible. Miscommunication will occur if a communicator does not have enough lexical knowledge (Meghdari et al., 2013). Besides, Laufer (2001) proved that there is a remarkable relation between language learners' academic performance, reading ability, writing skills, and lexical knowledge of them. Similarly, Nation (2001) mentioned that a successful student is one who knows 98% of the words provided in a text. There are other studies such as Laufer and Sim (1985) as well as Read (2000) which have demonstrated the vocabulary's importance and the crucial role of it in language learning.

Knowing a word means to be aware of the receptive and productive aspects of it. The receptive aspect relates to listening and reading skills – this means that a learner must be able to recognize a word when it is heard or seen. In addition, language learners

should know the collocations of the target word; they should also know the specific meaning of the word as well as its other possible meanings in different contexts. The word must be used correctly within a sentence as well (Nation, 2001).

The productive aspect relates to writing and speaking skills – the learner must know the correct spelling and pronunciation of the word. Learners must be able to use the word properly in order to transfer the desired meaning. Similarly, the word must be used correctly along with its collocations; this means that the word should be suitable for the particular situation it is used in. When a learner learns the productive and receptive aspects of a word, it can be said that the learner knows that word (Nation, 2001).

There are many different approaches to learning or teaching a new word; repetition is one of them – however, it has been argued that repetition may be inefficient since it makes language learners lose interest in what they are learning. Explicit teaching is another common method used to teach new words; while this method is said to be essential, it is sometimes not enough for learners. Cunningham and Stanovich (2001) found that many words are learned indirectly when students face them in texts.

Memorizing is yet another approach to learning vocabulary. According to Chen and Chang (2008), learners see the process of memorizing lists of words as a boring activity. It is obvious that students' perception of an activity and their motivation to do it affect learning quality and its outcome. Certain new forms of technology have been used in order to learn and teach vocabulary – for instance, Dalton and Grisham (2011) suggested ten different ways of integrating technology with learning and teaching vocabulary; they are known as "eVoc" (p.306).

Integrating technology with language learning activities is extremely beneficial for the learners since it makes lessons more interesting. Many studies have proven that learners were more motivated to work, and even learned the languages better, when they used different forms of technology such as computers, mobiles, and robots. It should also be noted that technology benefits not only language learners, but their teachers as well. The use of technology in language learning and teaching, specifically vocabulary learning, and the findings of relevant studies are explained in detail in the following sections.

2.3 Computer-Assisted Language Learning (CALL)

2.3.1 Computers in Language Learning and Teaching

Before the invention of computers, outdated forms of technology, such as cassette players, were used in education. Since they were introduced to markets, computers and the role of them in language learning and teaching have changed dramatically in recent decades. At the beginning of the computer era, the use of computer in learning and teaching languages was extremely limited and restricted; this was because the available hardware and software were not developed enough. In addition to the limitations, teachers and scholars were not sure about how this technology may impact language learning and teaching. As time went by, many researchers worked hard to improve the hardware and software of computers. It was also proven that computers could positively affect language learning and teaching.

According to Dudeney and Hockly (2012), about forty years ago, computers started to find their place in language learning and teaching. Using computers in language learning contexts is known as Computer-Assisted Language Learning (CALL). CALL is divided into three stages by scholars. This categorization is based on the

development of computers and the way they were used in language learning and teaching. According to Warschauer, and Healey (1998) the first stage is "behavioristic" CALL (p. 57). In this stage, the use of computers was extremely restricted due to technological limitations; only a small amount of hardware and software were available. It should be noted that, at the time, those computers could not be used by ordinary people. The second stage is "communicative" CALL. In this time period, computers could give better feedback to users. Additionally, computers could be used to help learners discover different aspects of a language. The final stage is "integrative" CALL. In this stage, computers became more developed and advanced. Learners could use them to communicate with others through the internet. Similarly, Bax (2003) has his own categorization and has named these stages "restricted", "open" and "integrated" (p. 21).

Computers have become a part of our daily lives; nowadays, almost everyone has a personal computer (PC). The technology is available for everyone and there is almost no barrier when it comes to using them for educational purposes. In addition to the availability of computers, many researchers have conducted several studies about the effectiveness of CALL on the four skills of language which are reading, speaking, writing and listening. The effect of this technology on learning vocabulary and grammar has been explored by many researchers. Also, the attitude students have towards CALL has been studied by several researchers. Almost all of these studies have shown that computers have had a positive impact on language learning and teaching.

2.3.2 Relevant Studies

Ayres (2002) has investigated language learners' attitude towards CALL and has found that CALL can effectively support language learning. In another study, conducted by Yanguas (2009), it was found that representing multimedia using computers positively impacts vocabulary learning. Groot, (2000) has investigated the efficiency of a particular computer program. The effect of this software, which was programmed to help the students' vocabulary learning, was tested in different experimental settings; it was developed to help students learn a large number of words within a short period of time. A quasi-experiment was designed and used in this study. The participants were pupils between the ages of 16 to 18 and first year university students between the ages of 19 to 20. In the control group, bilingual lists were used while the experimental group used the designed program named (CAVOCA). The words were selected from different linguistic categories. After analyzing the data and comparing the pre-test and post-test results, it was found that this program positively affected the students' vocabulary learning.

Similar to the above mentioned studies, Hung, Yeh, and Chiang (2016) have reported that using computers positively influence university students' vocabulary. This is the result of a quasi-experimental research that was conducted in a university in Taiwan. Forty-eight students participated in this study. They were all native Chinese speakers. The reported age was (M = 20.8; SD =1.56) for the participants. Similarly, Nejati, Jahangiri, and Salehi (2018) found that CALL had a positive impact on learning vocabulary. They designed an experimental study in order to investigate the effect of CALL on vocabulary learning through 40 pre-intermediate and intermediate language learners. These students were divided randomly into two control and two

experimental groups. The result of the study showed that the experimental groups performed better than the control groups.

In contrast to the aforementioned studies, some studies have shown that CALL is not always more effective than traditional approaches. For example, Salmasi, Bonyadi, and Alavinia (2015) examined the effect of CALL on grammatical accuracy in a rural area in Iran. They used two types of materials to teach students; the control group used printed paper whilst the experimental group used computer-based material. Thirty homogeneous students were randomly divided into two groups. Surprisingly, in this study, results were in favor of the non-CALL group. CALL group learned the targeted grammar structures, but a comparison between pre-tests and post-tests of both groups showed that the control group, who used printed materials, performed better than the experimental group.

2.4 Mobile-Assisted Language Learning (MALL)

2.4.1 Mobiles in Education

With the development of technology and portable devices, also known as mobiles, being introduced to markets, scholars started using them in educational settings, particularly language learning and teaching. Besides having somewhat the same capabilities of a computer, these devices are portable, and so, can be used anywhere. Mobile learning is defined as the use of handheld devices which can be used anywhere and anytime within a formal or informal context (Kukulska-Hulme, & Shield, 2008); this definition shows that mobiles have the potential to be beneficial for language learners and teachers. Using mobile devices in language learning and teaching is known as Mobile-Assisted Language Learning (MALL).

Several researchers have worked on the effectiveness of mobile devices on different language skills (speaking, reading, listening and writing). As well as the four main skills of language, some researchers have looked into the possible impact of these devices on vocabulary and grammar learning. It should be noted that mobile phones are the most popular mobile device amongst researchers. Pęcherzewska and Knot (2007) have reviewed MALL projects which were funded by the European Union since 2001. Their review showed that in MALL studies, mostly mobile phones are used. In addition, Duman, Orhon, and Gedik, (2015), who have reviewed the published articles between 2000 and 2012, found that vocabulary teaching is the topic most investigated by MALL researchers. Functions of these devices in language learning and teaching are discussed in the following subsection.

2.4.2 Functions of Mobile Devices

Mobiles have played different roles in language learning and teaching. The roles and functions of these devices are categorized by Wong and Looi (2010). The first function of a mobile device is to be a data collection tool; in this function, language learners use a mobile device to record voices or to capture pictures. Communication is the second function of mobiles – learners use a mobile device to communicate with other people who might be peers or native speakers. The third one is a language assistant. Some researchers have used these devices to give instructions or to support language learners. The fourth function on their list is to be a productive tool. Learners should use their devices, which may be tablets or cellphones, to produce something; they may use the pictures to make a clip. Here, results of some of the related studies are presented.

2.4.3 Relevant Studies

Motallebzadeh and Ganjali (2011) found that MALL can help language learners gain better vocabulary retention in comparison to traditional methods. They also reported that MALL improves reading comprehension. Similarly, Yildiz (2012) stated that using an iPad positively affected learners' vocabulary acquisition and phonological awareness. The listening comprehension of the learners also improved due to use of the same device in the same study. Likewise, a study conducted by Saran and Seferoglu (2010) showed that multimedia messages provided by cellphones had a positive impact on the vocabulary learning of language learners.

Parallel to the results of the above mentioned studies, Browne and Culligan (2008) found that using digital flash-cards via cellphones can help facilitate vocabulary learning. In a more general report done by Burston (2015), it was found that almost all reviewed studies, except three of them, reported that MALL had a positive impact on vocabulary learning. According to the reviewed literature, it is evident that MALL has positively influenced the performance and motivation of language learners.

2.5 Robot-Assisted Language Learning (RALL)

2.5.1 Robots in Education

Recently, robots have been introduced to markets, and it is an industry that is growing fast. In other words, robots are becoming more and more advanced day by day. Many scholars have predicted that this technology will be a part of our daily lives in the near future. They will be used in several fields for different purposes; these purposes vary from personal robots (PR) to industrial robots which are incredibly complex. As a consequence of this phenomenon, nowadays, human beings are being replaced by robots in many factories around the world. With the

advancements made in robotics, scholars have started using this technology within classrooms in order to teach different topics such as mathematics and physics. The overview of the literature shows that robots were mainly used to teach science, technology related topics, and languages. It is imperative to find out how this technology may impact not only language learning and teaching, but education in general.

Using robots for educational purposes does not have a long history; Seymour Papert (1993) started using robots in classrooms, becoming the first person to use an educational robot; he is said to be the father of this field. "Constructionism" is a teaching method suggested by Papert – this approach is opposed to "instructionism" (Aidinlou, Alemi, Farjami, & Makhdoumi, 2014, p. 12). According to Aidinlou et al. (2014), in this approach, students benefit from designing and using their own robots. Han (2012) stated that occupying robots to facilitate language instructions is known as Robot-Assisted Language Learning (RALL). RALL has been mainly investigated and explored in countries such as Korea, Japan, and Taiwan. It should be mentioned that within these countries, English is being taught as a second language.

2.5.2 Types of Robots and Their Roles

Robots are categorized into two major types – hands-on and educational. The first type is mainly used in science, mathematics, and engineering to increase the students' creativity and interest. Educational is the second type of robot. Autonomous robots are among the educational type. These robots have artificial intelligence. They can make relations with humans. This means that they can make the learning process more enjoyable for language learners. The anxiety and other barriers in learning may be reduced which leads to a better learning process (Han, 2010).

Educational robots are also categorized into three types. They are categorized based on their artificial intelligence's location. There are tele-operated robots which are controlled using a remote control by a person who is not in the class. The second type is autonomous robots. These robots have their own processor which means that they are intelligent and can act based on their designed artificial intelligence. The third type is the transformed type. This kind of robot can work autonomously or can be controlled by a person. In other words, they are a mixture of all the types mentioned above (tele-operated and autonomous) (Aidinlou et al., 2014). It should be mentioned that these robots can play different roles within the classroom which are explained below.

In several studies, robots have played variety of roles within classrooms. According to Mubin et al. (2013), these roles can be categorized into three main groups which are: 1.tool 2.peer, and 3.tutor. In addition, they mentioned several factors which affect the role of the robot in a variety of learning tasks. These factors include teachers, contents, students, activities, and costs. It is obvious that the role of the robot is affected by the needs of students. These needs vary according to the ages and types of students. Similarly, in another study conducted by Aidinlou et al. (2014), roles that a robot can play within the classroom are categorized into five different role groups which are: "1.storytelling 2.oral reading 3.action and command 4.cheerleader, and 5.question and answer" (p.16). For instance, Sugimoto (2011) has used a robot to narrate stories for students. The results showed a positive impact on students' motivation. In other words, students were more engaged.

2.5.3 Robots VS. Computers and Mobile Devices

Robots have some abilities which are not provided by computers or mobile devices. For instance, robots are able to walk autonomously; they can recognize voices and visuals. In addition, they can interact with people. They are intelligent and may sometimes have a friendly appearance that helps them communicate with students. Sensing is another capability that computers and mobile devices do not have. They are more flexible. Robots are able to make gestures and show their feelings (Meghdari et al., 2013). Robots may have a personality in addition to a history. A robot can introduce itself to students (Aidinlou et al., 2014). These capabilities and characteristics of robots, in addition to "digitization", give this technology the potential to support language teaching and learning (Chang et al., 2010, p. 15).

2.5.4 Limitations

Although this technology has a lot of capabilities, it has certain limitations as well. The first limitation reported in some studies is accurate voice recognition. The available voice recognition system is not developed enough to work in crowded spaces. This weakness is the reason that sometimes robots do not respond correctly to a question. The voice should be loud and clear. Sometimes researchers needed to use a technique which is called "wizard-of-oz"; in this technique a person is used to control the robot (Mubin et al., 2013, p. 2). Like the voice recognition system, movements and gestures of robots are limited. There are also many problems in implementing this technology. They are expensive, and not all schools can afford robots. In addition, robots should be pre-programmed, and most teachers do not possess this knowledge (Hong, Huang, Hsu, & Shen 2016).

2.5.5 Related Theories

Affective filter hypothesis is provided by Karshen and Terrel (1983). According to this hypothesis, the acquisition of a language will be facilitated if learners are in a relaxed environment. Besides, they should be highly motivated. Self-confidence should also be high. This hypothesis can be considered as one of the rationales behind the use of robots in language learning and teaching. It is reported by some studies that robots have improved the motivation of students. For instance, Alemi, Meghdari, and Ghazisaedy (2014) found that RALL has increased the motivation and interest of learners. It has also been reported that robots have decreased the anxiety of learners.

Total physical response approach (TPR) is a well-known teaching approach. The emphasis in this approach is on learning through actions and movements (Asher, 1982). Usually, in this approach, there is a commander and learners play the role of actors. Robots can act and play these roles (Wu, Chang, Liu, & Chen, 2006). So these robots can help teachers in applying this approach. Also, it is discussed in the literature that native English speaker teachers (NESTs) can positively affect language learners' motivation (Pae, 2017). Robots can act as a native speaker with a good accent. For instance, Kada and Ishiguro (2005) mentioned that robots can act as a foreigner; so students can communicate with them and benefit from this technology.

2.5.6 Related Studies

The available literature shows that RALL has a positive impact on language learning. For instance, in a study conducted by Hong, Huang, Hsu, and Shen (2016) it was found that the used robot had positively affected the listening and reading skills of the language learners. In this study, they used a mixed-method design to look into the impact of a robot on the performance and motivation of the language learners. This

study was conducted in Taiwan. The name of the robot they used was Bioloid which is a human-like, programmable robot. The quantitative data analyses showed that the experimental group got significantly higher marks in their reading and listening post-test. In addition, qualitative data showed that the learners were motivated.

In another experiment that was conducted in Iran by Aidinlou et al. (2014), it was reported that language learners of the experimental group, who were taught by a robot, were more motivated to learn new words. Participants of this study were forty-six middle school students. They were all female. It was also reported that the level of anxiety was lower in the experimental group. In this study, the NAO robot, which is an autonomous robot, was used. The findings of this study also revealed that learners of the RALL group had better performance in comparison to the non-RALL group when it came to learning vocabulary. Similar to this study, it was found that language learners show more interest in language learning when a robot is used in comparison to audiotapes and books, (Han, Jo, Jones, & Jo, 2008).

Hyun, Kim, Janf, and Park (2008) found that students learn vocabulary better by using a robot in comparison to computers. They also found improvement when it came to the word recognition of the learners. This study was conducted in Korea. Similarly, it was reported by Movellen et al. (2005) that language learners learned vocabulary better with the help of a Rubi robot. It should be noted that this study was reported in the early stages of this robot.

Few studies looked into the effect of robots on the adult language learners. Most of the studies in this field have focused on young learners. There are some studies such as Iio et al. (2018) which tried to explore the effect of RALL on adult language

learners; these studies are so limited and restricted. Iio et al. (2018) have tried to explore the effect of RALL on adult language learners speaking. Although their results showed that this technology enhanced adult learners' speaking, their sample size was too small. Their experiment included 9 female Japanese language learners who have used robots as a tutor for only one week. It should be mentioned that they stated that their experiment was for piloting their method; they are aiming to use their method in high school and universities in the near future.

Han (2012) has reviewed some studies that have investigated the effect of RALL on education in general. Most of these studies showed the positive impact of robots on language learners' performance and motivation. In these studies, a variety of robots with different capabilities were used. It should also be noted that these studies were conducted in several countries such as Canada, Taiwan, Korea, and Japan. In above mentioned studies, robots have played different roles such as tutor, peer, teacher assistant, and a tool for teaching.

2.6 Summary

A review of technological integration with language learning and teaching, specifically vocabulary learning, is presented here. Relevant studies to CALL and MALL are reviewed here. Lastly, robotic integration with language learning and teaching (RALL) and related studies are presented in this chapter. The next chapter presents the methodology of this study.

Chapter 3

METHODOLOGY

3.1 Introduction

The first section of this chapter provides information on the purposes of this study and the research questions. In the next section of this chapter, the research design (the NAO robot, the setting of the study, participants, data collection instruments, and the procedures of the study) is presented. Finally, the data analysis process is explained.

3.2 Purposes of the Study

The primary purpose of this study is to examine the effect of using a NAO robot as a teacher's assistant on the vocabulary learning of university students. Additionally, students' attitude towards this technology and its use is explored as well. Robotics is a fairly new technology which can be beneficial for language learners. Robots are usually autonomous, intelligent, and able to interact with learners which gives them the potential to be more effective and beneficial than previous technologies such as computers and mobile devices. Investigating the effect of robots on language learning and teaching, as well as language learners' attitudes towards it, may have some educational implications. It may help language teachers use this technology in a more appropriate way. In addition, this study may help other researchers design and conduct better studies to investigate the unexplored aspects of using a robot for language learning and teaching purposes.

3.3 Research Questions

As mentioned earlier in chapter 1, few studies have explored the effect of robots on adult language learners' vocabulary learning. Similarly, their attitude towards this technology is almost unexplored. The following research questions are posed to fill the above mentioned gap in the literature.

This study is designed to answer the following questions:

1. Could a robot, as a teacher assistant, help with students' vocabulary learning?
2. What are the students' attitudes towards the robot and using it in vocabulary learning?

3.4 Research Design

Based on the purposes of this study, and previous studies which have investigated the effectiveness of technology on language learning and teaching, a mixed-method research is designed to answer the above mentioned research questions. In this method of research, both quantitative and qualitative data are collected. In this research, a quasi-experiment (pre-test, 2 weeks treatment, post-test) was designed to collect quantitative data which is needed to answer the first research question. In order to answer the second research question, a questionnaire was given to the experimental group to collect quantitative data. In order to triangulate and find a better answer for the second question, a semi-structured interview was used to collect qualitative data. It should be mentioned that written consent forms were filled by instructors and participants.

In the following subsections, information about the NAO robot, which is the robot used in this study, the participants and the setting of the study is presented.

3.4.1 NAO Robot

In this study, a commercial robot named NAO, which was designed and produced in France, was used as a teacher's assistant to teach new vocabulary. This robot can recognizes voices, speaks, grabs items, and moves around in autonomous or manual mode. In manual mode, the robot is controlled by a person who can give orders to it simply by using a software called Choregraphe. This software is user-friendly and can be used by anyone who knows how to use a computer. To use the autonomous mode, the robot must be pre-programmed. By using the same software, the robot can be programmed. After programming, the program should be uploaded to the robot's memory. Programming the robot is not complicated; it can be programmed by people who know the syntax of this software.

This robot has a humanoid appearance. The robot is fifty-eight centimeters tall. It has many sensors which help it detect obstacles. These sensors also help it walk around and detect objects. It has two 5 megapixels cameras which help it detect faces. NAO has a good processor and high speed RAMs. The available hardware helps it do processes quick. It has the ability to stand up again if it falls. NAO is also able to walk around, dance, and play football. This robot was also used in other studies and contexts such as Vogt et al., (2017). A picture of this robot is provided in Figure 3.1.

Figure 3.1: NAO Robot

3.4.2 Study Setting

Eastern Mediterranean University (EMU) is an international university which is located in Famagusta, North Cyprus. This university has the highest ranking among the universities of Northern Cyprus. Also, this university is the biggest in its country. Since English is the medium of instruction at EMU, students must pass an English proficiency test to enter their department. This study was conducted at EMU, in the department of English Language Teaching (ELT) in the spring semester of the 2017-

2018 academic years. The students at EMU come from many different nationalities and language backgrounds. There are native and non-native English speakers who are studying ELT at EMU.

It should be noted that this project is the result of an interdisciplinary cooperation between Foreign Language Education department and Electrical and Electronic Engineering department. Since the robot is an expensive tool, access to this technology without the help of Electrical and Electronic Engineering department was almost impossible.

3.4.3 Participants

Participants of this study were ELT first year university students who had taken the vocabulary course. This course is a compulsory course and passing it is necessary for all bachelor students of ELT. Sixty-five students have taken this course. They were divided into two groups by the ELT department administrator. Both classes were held at the same time on Mondays and Wednesdays. According to the results of the pre-test, eighteen students in each class were chosen as participants of the quasi-experiment. Others were excluded from the experiment due to their good vocabulary knowledge. The participants of the experiment were homogeneous in the case of vocabulary knowledge of targeted words. The average age of the experimental group was 20.44 (SD=2.03). This group consisted of 6 males and 12 females. The average age of the control group was 19.61 (SD=1.94). This group consisted of 4 males and 14 females. According to the above mentioned data, it can be said that the participants of the experiment were homogenous in terms of gender and age.

To investigate adult learners' attitude towards NAO and its use for vocabulary learning, almost all students of the experimental group (29 out of 33) filled out the

questionnaire. In other words, 29 students participated in the second part of the study. These students saw and interacted with the robot. Ten of them (3 males and 7 females) participated in the voluntary interview. It should also be noted that two of the interviewees were native English speakers.

3.5 Data Collection Instruments

3.5.1 Pre-test

To prepare a pre-test for this study, 88 words were selected from the students' course book (Focus on Vocabulary 2). The familiarity of students with these words was tested through the pre-test. This vocabulary test is an adapted version of the first task in their course book. This kind of test is also mentioned in Nation (2001) as a way to check the students' familiarity with the words. Students should choose one of the four available options; these options vary from I don't know to I know it completely. The pre-test is appended in the appendices (appendix E). The words, which were completely unknown to the participants, were chosen as target words to be taught in the experiment. It should also be mentioned that the results of this test were also used as a filter to select the participants and exclude other students from the quasi-experiment.

3.5.2 Post-test

To design a post-test, a test which was designed by Schmitt and Clapham was adapted and re-designed according to the words which were used in the study. The format of this test is available in Schmitt (2000) and Schmitt, Schmitt, and Clapham (2001). This test is also cited in Nation (2001). This test, which is a matching test, is known to be a reliable way to test vocabulary knowledge. This test includes twenty-four items. The purpose of this test was to examine the knowledge of students on the meanings of twenty-three academic words out of the total item numbers. By piloting

the test, validity of it was checked. Two native speakers took the test and they got the complete mark; after discussing the options, they assured the researcher that there was no ambiguity within the test. Additionally, the reliability of test was checked by the intra-rater reliability; two different raters have marked the post-tests, the intra-rater reliability is 100% for the post-test. See appendix F.

3.5.3 Questionnaire

A four Likert scale questionnaire was adapted from Lee et al., (2011). The reported Cronbach alpha was .73 in the above mentioned study. In order to increase the reliability of the questionnaire, a neutral option was added to the available options. The Cronbach alpha was checked after adaptation. The Cronbach alpha for the adapted questionnaire, which is a five Likert scale questionnaire, is 0.88; it means that the adaptation had increased the reliability. This questionnaire was used to check the students' attitudes towards the robot. This questionnaire includes ten statements about the robot's appearance, voice, gestures, and its abilities. This questionnaire is appended in the appendices (appendix G).

3.5.4 Semi-structured Interview

A semi-structured interview was designed by the researcher to collect the qualitative data. This interview consists of 9 questions. Students were asked to express their feelings about the NAO robot and the way it was used in the classroom. They have described what they really think about this technology. Their voice was recorded by two voice recorders and transcribed later. The combination of quantitative data collected by the questionnaire, as well as the qualitative data collected by the interview, could be considered as a good resource to understand how students see RALL. See appendix H.

3.6 Procedures

Firstly, roles of the researcher, the instructors, the robot, and the students are described. This section is continued by explaining the procedures of the research which are followed by students.

3.6.1 Researcher's Role

In this study, the researcher played several roles. At first, he was an arranger. He arranged a meeting with the instructors to explain his research objectives. This meeting was followed by introducing the NAO robot and its abilities to them. The researcher also played the role of a trainer. He trained the experimental group's instructor to use the robot appropriately. He also designed and adapted the necessary instruments of the study. Programming was the next role of the researcher. He had to pre-program the robot before treatment sessions. As mentioned before, NAO needs to be pre-programed to act independently.

3.6.2 NAO's Role

The NAO robot played the role of a tool which was used as a teaching assistant in the experimental group. It was pre-programmed and ready to answer the students' questions. It was ready to provide the targeted meaning in two different ways. The first definition was a dictionary based meaning and the second one was a paraphrased version of the first one. Each definition was supported by an example. After providing a combination of a definition and an example, the robot asked whether the answer was clear or not. If the students replied with a yes to each of the combinations, the robot would praise them by saying "Great!" or "Perfect!". For the first time, if the answer was no, the robot would provide the second combination and ask to check the clarity of the second combination. If the answer was still no, the

robot would ask students to repeat the question. The robot would go through the same process for all the targeted words and would repeat them as much as required.

3.6.3 Instructors' Role

In the beginning of the study, the instructors participated in a meeting with the researcher and discussed the way NAO was going to be used. Since each group had a different instructor, it was essential to reach an agreement on the way targeted words were going to be taught. Instructors and the researcher reached an agreement after a consultation meeting. Instructors were in control of their class and taught the words according to the approach they had agreed on; each time they faced a target word, they used the same procedure. In the control group, instructor vocalized the intended meaning in addition to an example. This process continued by rephrasing the meaning and providing the second example. In the experimental group, the instructor had a student ask the meaning of the word from the robot. Here, the robot provided those meanings and examples which were provided by the instructor of the control group. In other words, the same sentences were vocalized in both groups. An example for each word was written by the instructor of each group on the whiteboard.

3.6.4 Students' Role

Students should be more active in this process – they should interact with the robot in a proper way. It was explained to the students that the words should be pronounced correctly, their voice should be loud enough to be understood by the NAO, and that they should pay more attention to hear what the robot is saying since it has a native accent and speaks a bit faster than the instructor. They had to stand close to the robot and ask the robot to define a word. Then, they would listen to the answer and ask for it to be repeated. In this method, students were more active rather than passive.

These are the steps that the students followed.

3.6.5 Step 1

At first, the students filled in the written consent form. It was explained to them that participation was voluntary and that they could withdraw at any step they wanted. In the same session, they took the pre-test. As mentioned earlier, this test included 88 items. The pre-test took about 40 minutes. This test was given to both groups on the same day, in order to avoid any possible bias.

3.6.6 Step 2

In the second session, students of the experimental group were introduced to the NAO robot. Introducing the robot in a proper way was suggested in the literature by Fridin (2014), Westlund et al. (2016), and Vogt et al. (2017). The robot was pre-programmed and ready for an introduction session. The students listened to the robot while it introduced itself. Then, the researcher explained the robot's capabilities to the students. After that, they saw the abilities of the robot such as walking and dancing. Also, some of the students were asked to talk to it. At the end of the session, some of them took photos with the NAO.

3.6.7 Step 3

The third session could be considered as the starting point of the treatment. NAO was pre-programmed completely and was ready to assist the instructor. The students started reading each paragraph. If there was a target word within the paragraph, the instructor would ask one of the students to ask the meaning of the target word from the NAO. All the students listened to the NAO's answer. When NAO asked them about the clarity of the answer for the first time, they usually responded with no. NAO provided the second combination and checked the clarity of its answer; after the second combination was provided by NAO, students usually responded with yes.

This process continued until all of the targeted words were taught to the students. The whole teaching process lasted for 4 sessions within 2 weeks.

3.6.8 Step 4

Students of both groups took the post-test in the first session after the treatment. The students of the experimental group also filled out the questionnaire. Volunteer students filled out the questionnaire when the post-test was finished. It should also be mentioned that the test was given to both groups on the same day. After that, the students of the experimental group were asked to participate in the interview. Ten out of all volunteers, including the two native speakers, were chosen as interviewees. The interviewees were asked to set a time for the interview. Appointments were set and the class ended.

3.6.9 Step 5

Interviewees filled in a consent form for the interview. They were informed that their voice had to be recorded for the analyzing process. Each interview took about 10-15 minutes. They were asked to be honest and try to express their true feelings. This was the end of data collection process.

3.7 Data Analysis Process

This study has looked into the NAO robot's impact on vocabulary learning of university students and their attitude towards it. The Statistical Package for the Social Sciences (SPSS) version 22.0 was used to analyze the quantitative data collected from the post-test and the questionnaire. Independent samples t-test was used to compare the performance of the control group and the experimental group. It should be noted that this test is valid for small sample sizes and there is no minimum number for using this test (Michael Chernick, 2018). Also, the questionnaire was analyzed by the same software in a descriptive way. In addition, qualitative data,

which was collected from interviews, was transcribed by the researcher. Findings of the data analyses are reported the next chapter.

3.8 Summary

This chapter has presented detailed information about the purposes of the research and research design. At first, the study purposes and research questions are explained. Then, research design, which consists of the setting of the study, participants, instruments and procedures of the study, are presented. Finally, the processes of data analyses are reported. In the next chapter, results of the quantitative and qualitative data analyses are presented.

Chapter 4

RESULTS

4.1 Introduction

This chapter presents the analyses of the collected data (both quantitative and qualitative) and the results. The quantitative data was analyzed by using SPSS (Statistical Package for Social Sciences) Version 22. Also, the qualitative data from semi-structured interview was transcribed and analyzed.

4.2 Quantitative Data Analyses

The pre-test and the post-test were used to explore the possible impact of robotics on the language learners' vocabulary learning. The tests were given to two different teachers to be checked and scored. Inter-rater reliability was also checked for these tests. The inter-rater reliability shows 100% agreement among the raters. The independent t-test was used to check whether there was a significant difference between the improvement of the control group and the experimental group or not. In this section, some information about the gender and the age of each group are provided, and then, the results of the tests are reported.

4.2.1 Gender and Age of the Participants

Table 4.1 illustrates the frequency of males and females in both groups. It can be said that both groups are homogeneous in terms of gender since the number of males and females are almost the same. There were 4 male participants (22.2%) and 14 female participants (77.8%) in the control group (see Table 4.2); in the experimental group (Table 4.3) there were 6 male participants (33.3%) and 12 female participants

(66.6%). Since it was a quasi-experimental research, the researcher could not make any changes to balance out the genders.

Table 4.1: Gender in both groups

Male	Female	Total
% (n)	% (n)	% (n)
27.8 (10)	72.2 (26)	100 (36)

Table 4.2:Gender in the control group

Male	Female	Total
% (n)	% (n)	% (n)
22.2 (4)	77.7 (14)	100 (18)

Table 4.3: Gender in the experimental group

Male	Female	Total
% (n)	% (n)	% (n)
33.3 (6)	66.6 (12)	100 (18)

It can also be said that both groups were homogenous in terms of age. The mean and Standard Deviation (SD) were calculated for the age. The mean is the central tendency and the SD is a way commonly used by researchers to check the distribution variability. This concept illustrates the closeness of the data from the mean. In other words, variability of data is shown by SD. Low SD shows homogeneity while high SD demonstrates the heterogeneity of the data. Mean and SD of age are calculated for each group and presented in Table 4.4.

Table 4.4: Age

Control group	Experimental group
Mean (SD)	Mean (SD)
20.44 (2.03)	19.61 (1.94)

As it is illustrated in Table 4.4, the control group's age mean was 20.44 while it was 19.61 in the experimental group. The SD was 2.03 in the control group and 1.94 in the experimental group. Since the mean and SD of both groups are close to each other, it can be said that both groups are homogenous in case of age.

4.2.2 Results of the Pre-test

Pre-test was used to find words which were not known by the participants. Eighty-eight words were selected form the three chapters (chapter 20, 21 and 22) of the students' course book (focus on vocabulary 2). The familiarity of students with these words was checked using the pre-test. In addition, the pre-test was used as a filter to exclude students who had a sufficient amount of vocabulary knowledge. In other words, it was used to choose a homogenous sample for the experiment. Thirty-three words were unknown to thirty-six students who were chosen as participants for the experiment. These words were selected as target words to be taught in the treatment period. These words were from different linguistic categories. Almost all of the words were academic words. These words are presented in Table 4.5. The pre-test is appended in appendices. Check appendix E to see the pre-test.

In other words, since none of these words were known by the participants, the pre-test results for both groups were considered as zero. These words were taught using the robot within the experimental group and the instructor in the control group, and then, the students were given the post-test.

Table 4.5: Selected Words from Pre-test

Induce (v)	**Massacre (n)**	**Preliminary (adj)**	**Legislation (n)**
Cease (v)	**Prestigious (adj)**	**Deviation (n)**	**Susceptibility (n)**
Interpret (v)	**Prominent (adj)**	**Consent (n)**	**Destructive (adj)**
Interval (n)	**Accustomed (adj)**	**Distorted (adj)**	**Fatigue (n)**
Subsequent (adj)	**Albeit (con)**	**Consultation (n)**	**Irritation (n)**
Ideological (adj)	**Equivalent (adj)**	**Integral (adj)**	**Institute (v)**
Implicit (adj)	**Ambiguous (adj)**	**Contradictory (adj)**	
Violation (n)	**Correspond (v)**	**Resent (v)**	
Segment (n)	**Amend (v)**	**Inconsistent (adj)**	

4.2.3 Results of the Post-test

The post-test included twenty-four items. Twenty-three academic words were the target words of the post-test. The words were from different linguistic categories such as verbs, nouns, and adjectives. The focus of this test was on the meaning of the academic words which were taught during the treatment. These words can be seen in Table 4.6. The result of the post-test was analyzed by SPSS and the independent t-test was used to compare the results. The result of post-test is shown in Table 4.7 and Table 4.8 demonstrates the t-test result.

Table 4.6: Post-test Target Words

Consent (n)	**Legislation (n)**	**Interpret (v)**	**Preliminary (adj)**
Equivalent (adj)	**Inconsistent (adj)**	**Integral (adj)**	**Cease (v)**
Subsequent (adj)	**Amend (v)**	**Correspond (v)**	**Consultation (n)**
Deviation (n)	**Implicit (adj)**	**Ideological (adj)**	**Distorted (adj)**
Violation (n)	**Albeit (con)**	**Contradictory (adj)**	**Institute (v)**
Interval (n)	**Induce (v)**	**Ambiguous (adj)**	

Table 4.7: Group Statistics

Control group Mean (SD)	Experimental group Mean (SD)
16.55 (4.51)	15.22 (4.69)

Table 4.8: Independent Samples Test

	Levene's Test for Equality of Variances	t-test for Equality of Means
	Sig.	Sig. (2-tailed)
Equal variances assumed	.721	.391
Equal variances not assumed		.391

It is clearly evident that, in Table 4.7, the control group performed better in the post-test. Both groups learned new words; the vocabulary knowledge of the students improved in both groups. Since the Sig. is more than 0.05, equal variances should be assumed. In other words, the row with this assumption is used for analyzing. The result of the t-test does not show any significant difference among the groups since

the 2-tailed sig. is higher than 0.05. The interviewees mentioned certain factors during their interviews which may explain why the score of their group is lower than the control group. These factors are stated later in the qualitative data analyses section.

4.2.4 The Questionnaire

The questionnaire was given to almost all the students of the experimental group who had seen the NAO robot and interacted with it in order to explore their attitude towards it. Twenty-nine students filled in the questionnaire. This questionnaire had ten items which explored the opinion of students about the robot. The students could choose one of the five options presented. These options were based on five point Likert scale and varied from strongly disagree to strongly agree. This questionnaire was an adapted version of the questionnaire used by Lee et al. (2011). For checking the reliability of the questionnaire, Cronbach alpha was calculated. The Cronbach alpha is 0.88 in the current study. This is higher than the one reported previously which was .76. The frequency of the students' answers to each question is calculated and reported here.

4.2.4.1 The Robot Looks Smart

The purpose of the first question was to see whether or not the robot seemed smart. As it can be seen in Table 4.9, most of the students (69%) saw the robot as intelligent; only 13.8 % of the students disagreed with this statement. The Figure 4.1 is also used to illustrate the students' answers.

Table 4.9: The robot looks smart

Disagree % (n)	Neutral % (n)	Agree % (n)
13.8 (4)	17.2 (5)	69 (20)

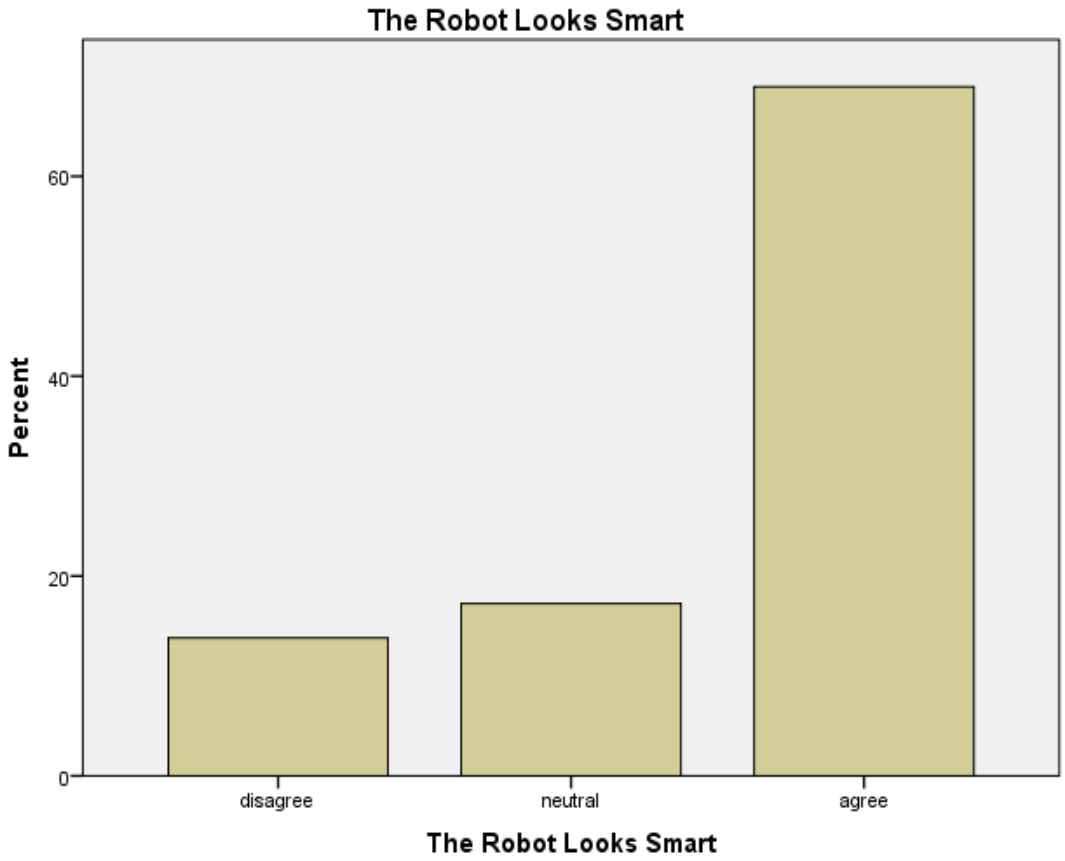

Figure 4.1: The Robot Looks Smart

As it is shown in Figure 4.1, about 70% of participants see the robot as an intelligent tool. Only 13.8 % of them think that the robot is not intelligent.

4.2.4.2 The Robot Can Watch You

The purpose of the second question is to see whether or not students think the robot can watch. As it was mentioned earlier, the robot has the capability of detecting faces and seeing objects using its sensors and cameras; the students' opinion on this ability was investigated by this question. Table 4.10 demonstrates that 72.4 % of students (21 out of 29) believed that the robot could watch them. This issue is also illustrated by the Figure 4.2.

Table4.10: The robot can watch you

Disagree % (n)	Neutral % (n)	Agree % (n)
17.2 (5)	10.3 (3)	72.4 (21)

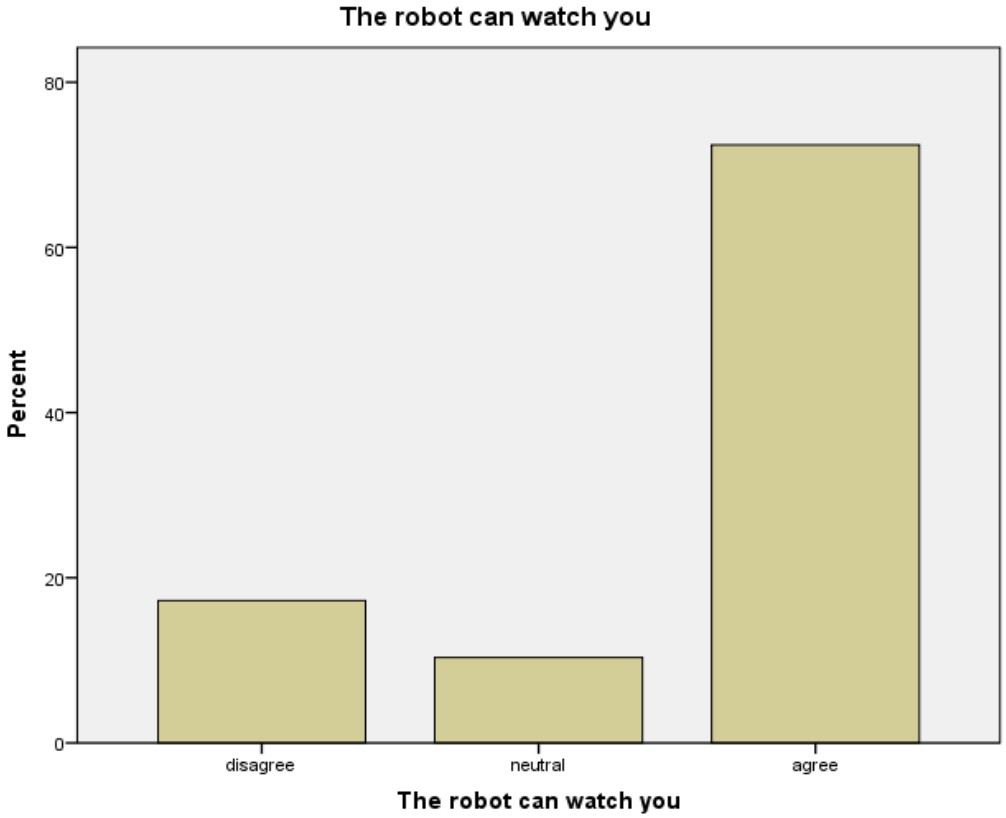

Figure 4.2: The robot can watch you

Figure 4.2 illustrates students' opinions about the robot's watching ability. As it can be seen, more than 70% of students think the robot can watch them. Less than 20 % of them disagreed with this statement.

4.2.4.3 The Robot Can Listen to Your Song and Speech

The purpose of the third question was to check whether or not students believed the robot could listen to them. The students spoke to the robot and it answered them in the classroom. Few problems occurred within this process. It was mentioned before that the system of voice recognition needed improvement. This issue was also mentioned by a few of the interviewees. For instance, Native 1 said that "I know just

one thing will be improving the robot ability to hear, receive sound because sometimes it has problems, voice recognition". Despite this issue, twenty-two students agreed with the statement that the robot could listen to their speech. Only two students disagreed with this statement. Table 4.11 shows the frequency of the students' answers to this question. Figure 4.3 illustrates the content of Table 4.11.

Table 4.11: The robot can listen to your song and speech

Disagree % (n)	Neutral % (n)	Agree % (n)
6.9 (2)	17.2 (5)	75.9 (22)

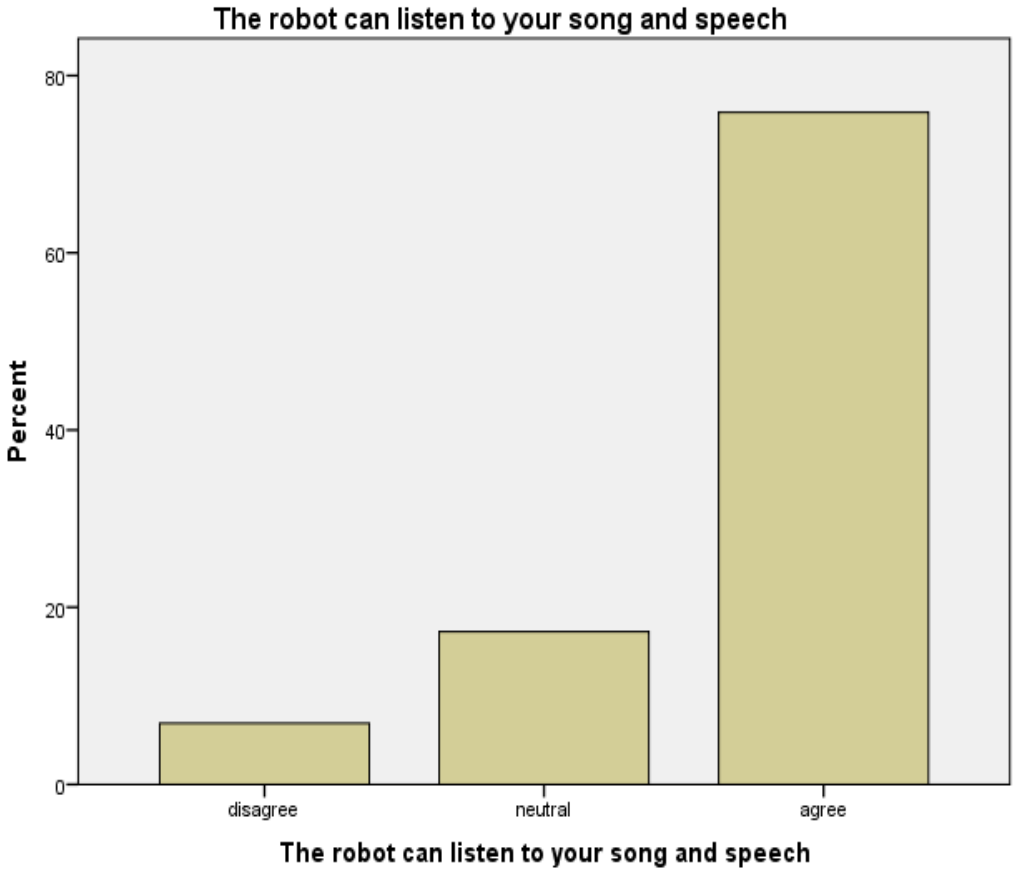

Figure 4.3: The robot can listen to your song and speech

As it can be seen in Figure 4.3 more than 75% of students think that the robot can listen to them. Only two students (6.9%) disagreed.

4.2.4.4 The Robot Can Come to You

The purpose of the fourth question was to investigate whether or not students believed the robot could walk. The robot's walking ability was demonstrated in the classroom for the students, but most of the time, the robot stood still and did not move around. The students' opinion on this ability was explored through this question. As it can be seen in Table 4.12, almost half (44.8%) of the students were neutral about this issue and the same number agreed that the robot could walk. It was mentioned by participant 7 that "the movements were great; the robot could walk and talk". The frequency of answers was also illustrated in Figure 4.4.

Table 4.12: The robot can come to you

Disagree % (n)	Neutral % (n)	Agree % (n)
10.3 (3)	44.8 (13)	44.8 (13)

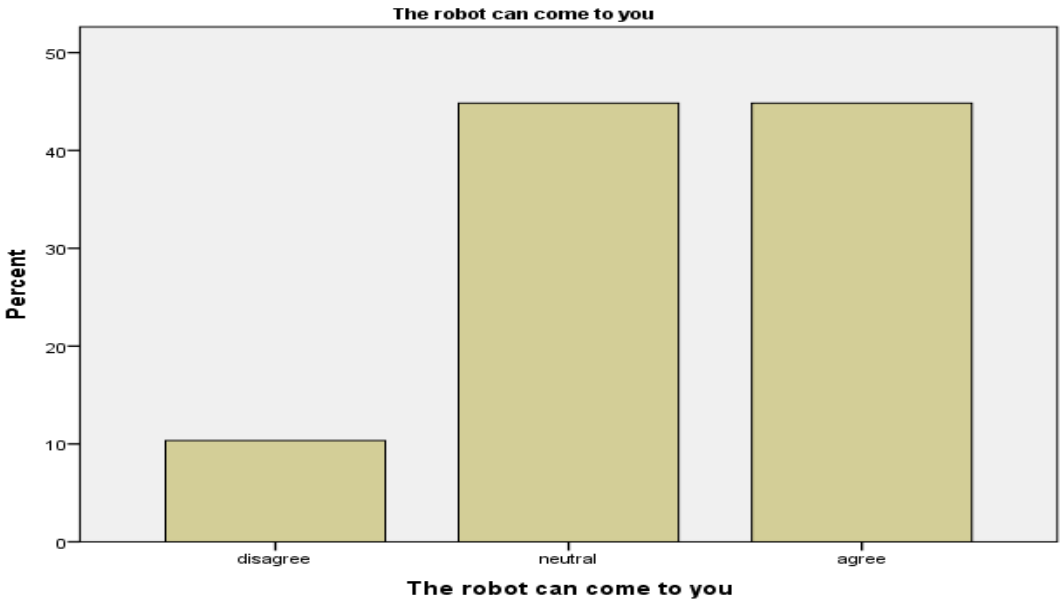

Figure 4.4: The robot can come to you

Figure 4.4 shows the same amount of agreement and uncertainty among the participants about the robot's walking ability. Almost 45% agreed that it can walk while the same percentage of the participants were neutral regarding this issue.

4.2.4.5 The Robot's Appearance Looks Comfortable for Learning

The purpose of this question was to investigate students' opinion on the appearance of the robot and the suitability of the robot for learning environments. The NAO robot has a friendly human-like appearance. The statistics show that most of the students (65.5%) liked the NAO's appearance and thought it was comfortable for classrooms; in fact, it was also mentioned by some of the interviewees that they quite liked the robot. For example, Participant 4 said that "robot looks like so cute that's why I fell so comfortable I don't felt I am under pressure". In a similar way, Participant 1 said that "I want that in my house, I liked it". Table 4.13 shows students' agreement with this statement which is also illustrated in Figure 4.5. Only 17.2 % of the students disagreed with this statement.

Table 4.13: The robot's appearance looks comfortable for learning

Disagree % (n)	Neutral % (n)	Agree % (n)
17.2 (5)	17.2 (5)	65.5 (19)

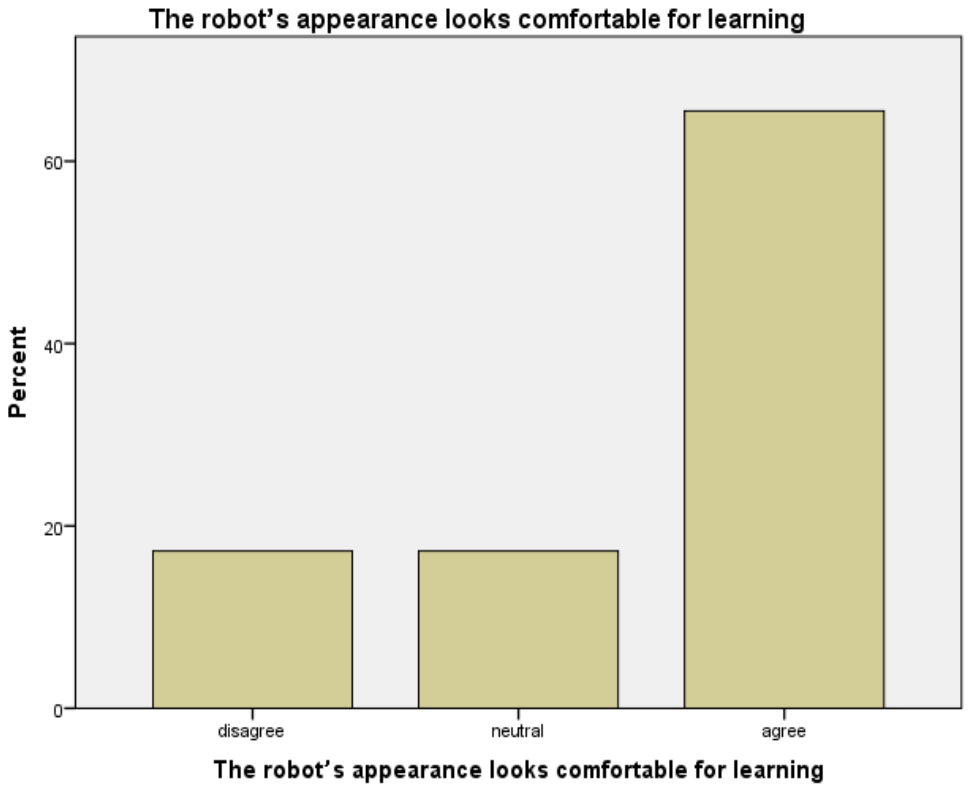

Figure 4.5: The robot's appearance looks comfortable for learning

Figure 4.5 shows the students feelings about the appearance of the NAO robot. As it can be seen more than 60% of them liked the appearance of the NAO robot. Some students (17.2%) disagreed and the same percentage (17.2%) of them were neutral regarding this issue.

4.2.4.6 The Robot's Body Looks Comfortable for Moving Around in a Classroom

The purpose of this question is almost in line with the fourth question – it asks about the comfortability of the robot moving around in the class. Sixty-two percent of the students agreed with this statement. About 24% disagreed and 13.8% of students were neutral about this issue. It should be mentioned that the robot has a human-like body and can move around easily with the help of its sensors and cameras. Table

4.14 demonstrates the frequency of students' agreement with this statement and the Figure 4.6 illustrates the results in a more comprehensible way.

Table 4.14: The robot's body looks comfortable for moving around in a classroom

Disagree % (n)	Neutral % (n)	Agree % (n)
24.1 (7)	13.8 (4)	62.1 (18)

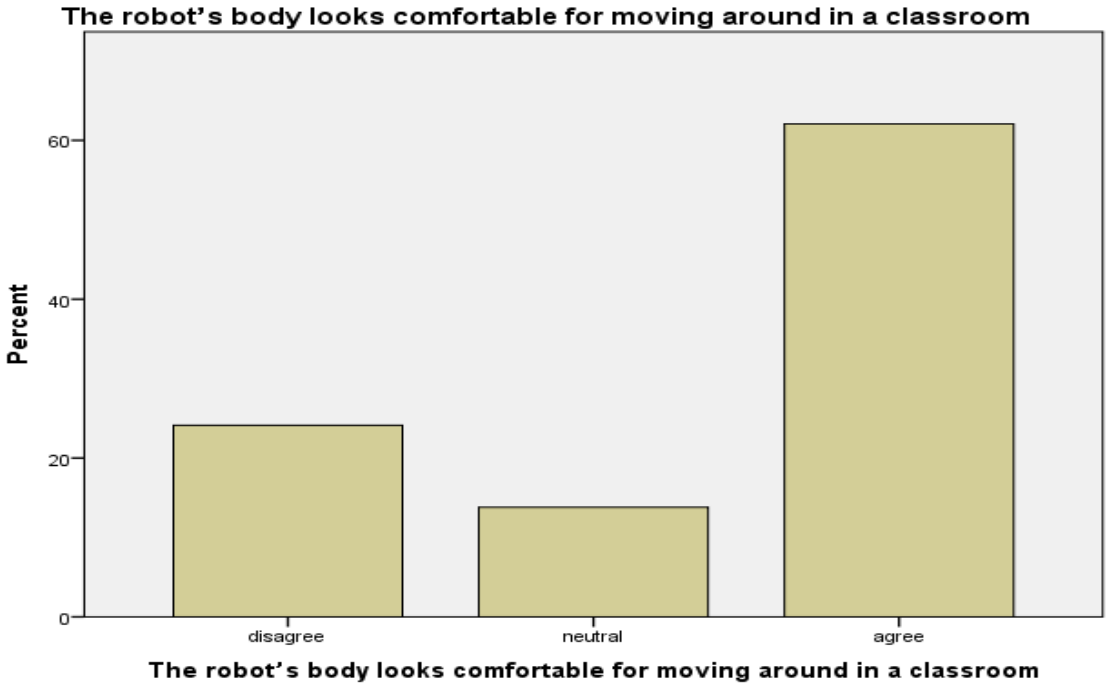

Figure 4.6: The robot's body looks comfortable for moving around in a classroom

As seen in Figure 4.6, more than 60% of the students believed that robot's body is appropriate for moving in the classroom while about 24% of them expressed disagreement.

4.2.4.7 The Robot's Facial Expression Looks Comfortable to You

The robot can show a few facial expressions. For instance, by flashing green lights, it shows that it can understand what others are saying. The comfortability of these facial expressions was investigated by this question. The students were asked whether or not they were comfortable with these facial expressions. As it can be seen

in Table 4.15, 58.6% of the students were comfortable with these expressions and 27.6% of them were neutral about this issue. Only four students (13.8%) were not comfortable with the robot's facial expressions. Figure 4.7 illustrates the rate of agreement and disagreement on this statement.

Table 4.15: The robot's facial expression looks comfortable to you

Disagree % (n)	Neutral % (n)	Agree % (n)
13.8 (4)	27.6 (8)	58.6 (17)

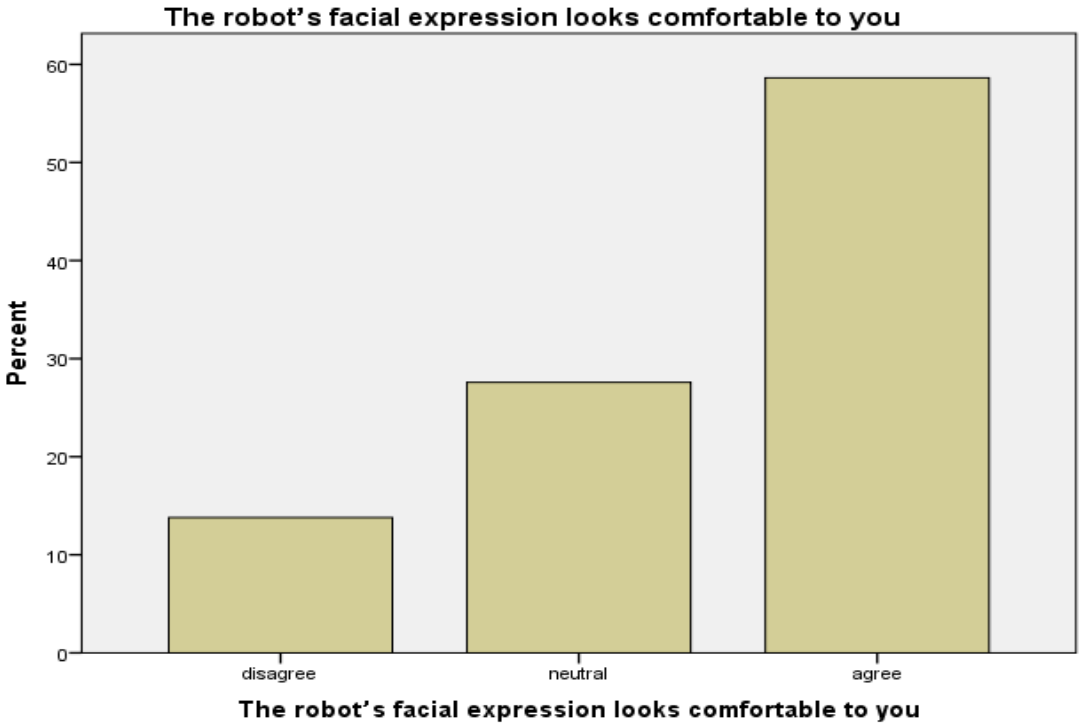

Figure 4.7: The robot's facial expression looks comfortable to you

As shown in Figure 4.7, nearly 60% of the students (i.e. 58.6%) think that NAO's facial expressions are comfortable for them. About 14% of students did not like the facial expressions and think that they were not comfortable.

4.2.4.8 The Robot's Compliment is Pleasing to you

The robot complimented students with words such as "Perfect!" and "Great!". These compliments may have a positive impact on the attitude of students. The purpose of this question was to explore whether or not these compliments were pleasing to the students. The result of the data analyses shows that 65.5% of the students found the compliments pleasing. Additionally, 24.1 % of the students were neutral about the compliments. Only three students (10.3%) out of 29 students disagreed with this issue. These findings are illustrated in Table 4.16 and Figure 4.8.

Table 4.16: The robot's compliment is pleasing to you

Disagree % (n)	Neutral % (n)	Agree % (n)
10.3 (3)	24.1 (7)	65.5 (19)

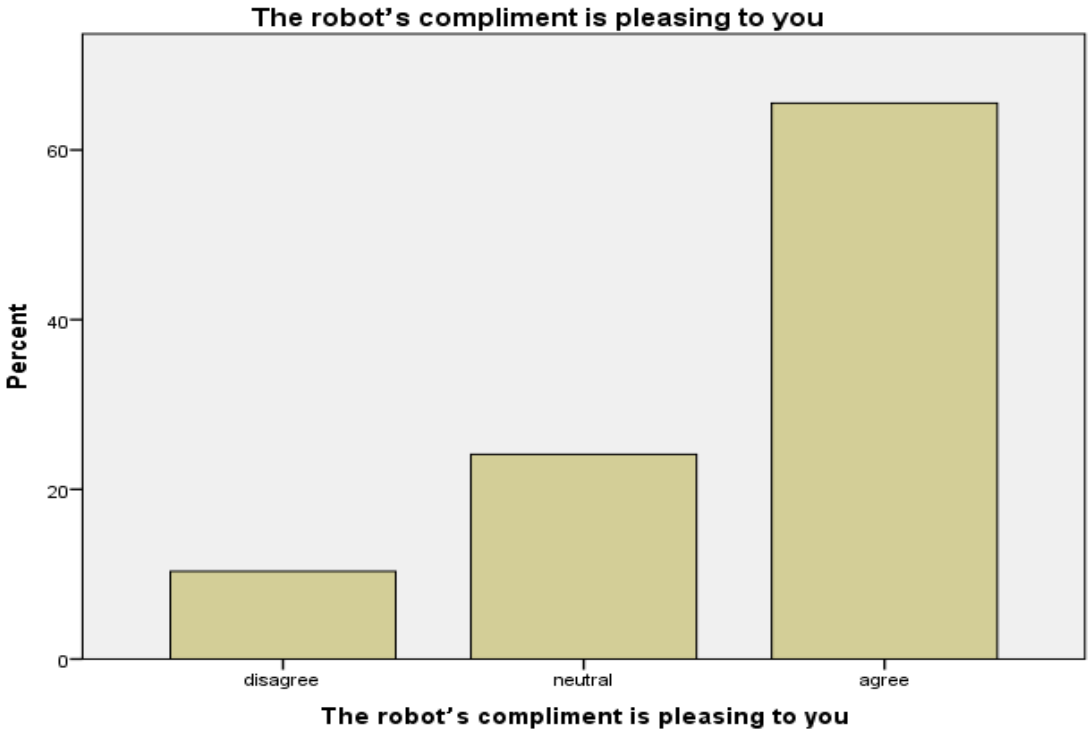

Figure 4.8: The robot's compliment is pleasing to you

As it can be seen in Figure 4.8, more than 65% of the students liked the NAO's compliments. Only 3 students (10.3%) did not like the compliments.

4.2.4.9 The Robot's Voice is Pleasing

The aim of the ninth question was to explore students' opinion on the robot's voice. The voice must be pleasing and help students interact with it. The statistics show that 65.5% of the students (19 students) found the voice of the robot pleasing and only 13.8% of them did not like the robot's voice. However, there were a few contradictory statements on the voice; some believed that it was "not clear" and had "no emotion" (Participant 7 and Participant 6 respectively) – others believed that the sound was "clear" and "understandable" (Native 2 and Participant 4 respectively). The results are demonstrated in Table 4.17 and Figure 4.9.

Table 4.17: The robot's voice is pleasing

Disagree % (n)	Neutral % (n)	Agree % (n)
13.8 (4)	20.7 (6)	65.5 (19)

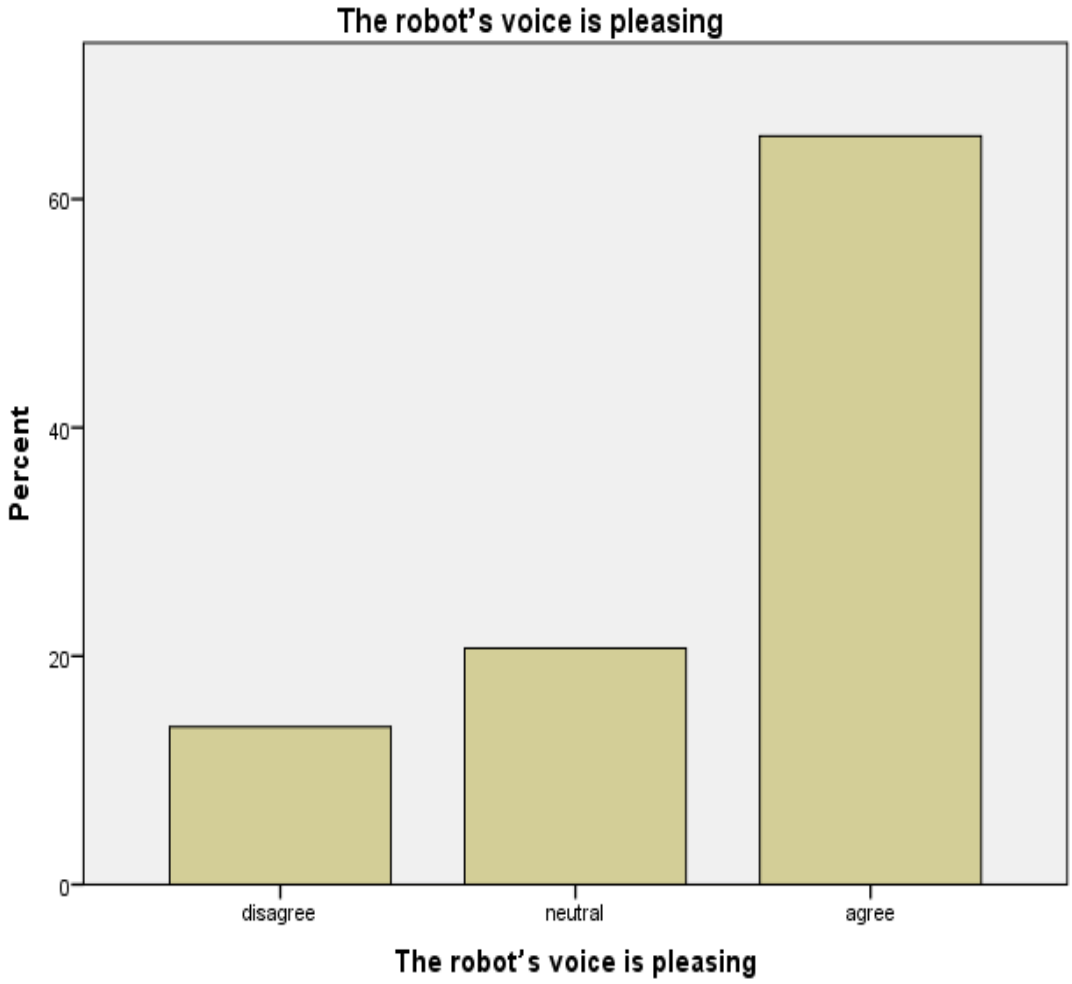

Figure 4.9: The robot's voice is pleasing

As it is shown in Figure 4.9, the voice of the robot was pleasing for more than 65% of the participants. About 14 % of students did not like the voice of the NAO robot.

4.2.4.10 The Robot Seems Secure

This question investigates the students' attitude towards the safety of the robot; some people may not want to get close to the robot because they may think that this new technology is dangerous. Most of the students, about 72%, felt that the robot was safe to use. In addition, 24.1 % of the students were neutral about this statement. Only one student disagreed and felt that the robot was not secure. This high percentage of agreement shows that the students felt safe when they wanted to interact with the

NAO. The frequency of answers is demonstrated in Table 4.18 and illustrated in Figure 4.10.

Table 4.18: The robot seems secure

Disagree % (n)	Neutral % (n)	Agree % (n)
3.4 (1)	24.1 (7)	72.4 (21)

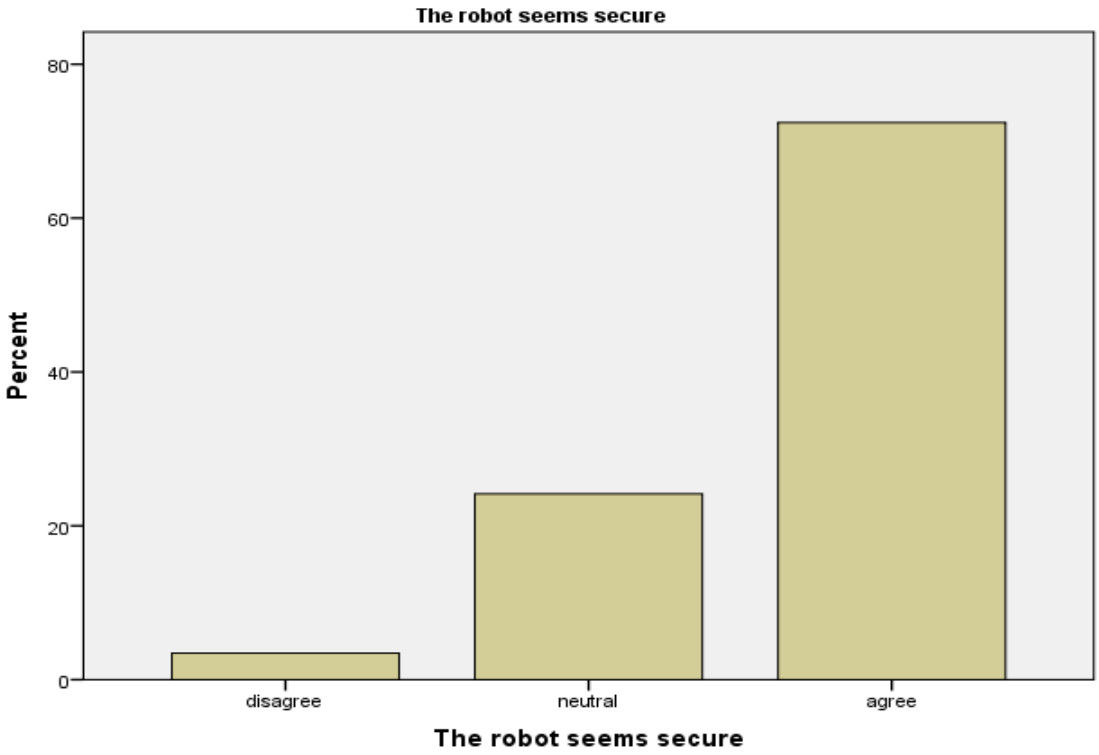

Figure 4.10: The robot seems secure

As it can be seen in Figure 4.10, most of the students see the robot as a safe tool. Only one student disagreed with this statement.

To sum up, it can be said that students' attitudes were positive towards the NAO robot. Statistical analyses show that the rate of agreement is higher than 50% in all the cases. This shows that most of the students liked this technology and its abilities. It should also be mentioned that there were some negative comments about some of

the robot's abilities which showed that students had mixed feelings about the robot. These comments are stated in the following section.

4.3 Qualitative Data Analyses (Interviews Findings)

A semi-structured interview, which consists of nine questions, was used to collect qualitative data. The main goals of these questions were to explore students' attitude towards the robot, its effectiveness, and the way it was used. The opinions of the students on the limitations of this technology were also explored. Ten students from the experimental group voluntarily participated in the interview sessions. It should be noted that two of the interviewees were native English speakers. They filled in the written consent forms. Their voices were recorded by two recorders and then transcribed by the researcher. Each interview lasted about ten to fifteen minutes. The transcriptions were analyzed. Major points were selected and categorized into three sub-headings which are reported here.

4.3.1 Students' Attitudes towards the Robot

It was the first time most of the students had seen a robot in the flesh; Participant 1 said "it was my first time that I saw a robot; I haven't like this experience before". Similarly, Participant 8 reported "I see the robot for the first time in my life, I liked when it moves or dancing, it was interesting". Some of them mentioned that they were scared of the robot at the first; the reason behind this was that they were scared of becoming unemployed and being replaced by the robot in the future. For instance, Participant 1 said "I was afraid a little bit that robots come in the future and take our job, I was afraid of being unemployed". Participant 2 also shared the same feeling by saying "… I will teach there because the robot changing next years I will be teacher it's not good (you mean it will replace you?) Yes". Participant 1 was asked whether or not she was scared of the robot itself – she responded with "I was not afraid of it,

he was like my friend, it was like asking a question from a friend". Other participants used positive adjectives to describe the robot such as "cool and interesting" (Native 1) "interesting" (Participant 8), "exciting" (Participant 7) and "attractive" (Participant 4). It should also be noted that a few participants did not like the robot and found it "boring" with "no emotion" (Participant 6). According to the comments made by interviewees, it can be interpreted that participants had mixed feelings about the NAO. Their feelings were positive in most of the cases.

4.3.2 Advantages of the Robot

Participants' opinions on the advantages of using the robot in classrooms were explored in the interviews. They mentioned that certain factors benefited them – repetition is one of the benefits of the robot that most of the interviewees talked about. For instance, Participant 4 said that "the robot explains again and again so the repetition was helpful". Similarly, Participant 2 said that repeating "twice or more is helpful". This issue was also considered as a benefit by Native 2 who said that "the robot was able to clarify itself and give some examples and definitions so I like that part".

The ability of answering fast and providing immediate examples were also considered as one of the advantages of the NAO robot. Even some of the participants believed that this capability made the robot better than the teachers. For instance, Native 1 said that "… it has a lot of potential in ELT field and sometimes even like that teachers are no able to think about good example for a word so definitely the big advantage that has it can explain the words". In addition, she said that "it was better than a teacher in some way and giving synonyms and giving example suggestions was really helpful".

Likewise, Participant 8 said that “he answers immediately and if you don’t understand you ask again and it gives another example”. This capability is emphasized by Native 1. She mentioned that it is sometimes hard for her, a native speaker, to define the words or provide an example, and so, the robot can help her as an assistant. She said “I really use it as an assistant because you know personally I’m a native speaker I know what a word mean, I know synonyms but synonym is hard for me to explain it clearly or think of an example. So I see it's actually helpful for me as a teacher if I have a trouble in explain a word I need it to give some examples to my students I teaches as a robot to and they can ask virtually that’s it”.

Another advantage is providing sentences as examples for each word. Participant 2 mentioned that “the robot sentences was good”. In a similar way, Participant 1 said that “repeating examples was helpful cause I have problems making a sentence and the robot gave some ideas for making sentences to me, it helped me, it forced me to study harder about words.”. The robot provides context for the learners; learning in context is beneficial for learners. Participant 3 said that “when I asked it questions, it gave so many sentences, as I mentioned before it doesn’t give you just a meaning but also in context so this is the best way that I can learn the language, I mean words”.

Almost all of the interviewees agreed that NAO helped them learn new vocabulary. Native 2 said that “it helped me to learn a few words that I didn’t know for example albeit”. Interacting with the robot was also mentioned by Participant 4 to be beneficial for learning new vocabulary. She said that “we interact with it that's why I learned vocabulary”. These were factors which were considered by participants as the advantages of the robot.

4.3.3 Limitations and Drawbacks of the Robot

There are some contradictory comments on the limitations and drawbacks of the robot. The speech rate is mentioned by the interviewees as a limitation of the robot. Meanwhile, native speakers and participants who thought that their listening skill is at the advanced level did not believe in this issue. Participants 1, 2, 4, 5 and 6 emphasized that the NAO "talks too fast" and that they, or their friends, could not understand the robot's speech. For instance, Participant 6 said that "no emotion and goes like a robot which talks really fast, for me it's like ok I can hear it but most of my classmates is like really difficult to understand cause they are not used to that kind of fast English". However, Participant 3, who is not a native speaker, said "in order to acquire some knowledge from that robot you have to know English like very well some sentences or the listening skill must be some advanced. I mean if you are advanced in listening skill you won't have any problem with it".

The second limitation was the voice recognition system. The students needed to speak loud and clear; otherwise, the robot could not understand them. Participant 7, who is a shy person, said that "only thing that I had stress about was the sound, because when I went to the robot and I asked something, it couldn't hear me as well, and teacher said speak louder but I couldn't as required, I am shy". It was suggested by the interviewees to use the robot in the smaller groups in order to avoid this problem. They believed that using the robot in smaller groups may be more beneficial, Participant 3 said "I would use the robot in small groups mostly because as I said like some efficient something that interact students so it has to use in small groups to be more beneficial otherwise it doesn't matter to use a robot because it is a tool just to be seen". Similarly, participant 7 said "I prefer small groups, I think it can be more helpful in small groups, as much as I see the abilities".

There are some contradictory comments about the robot. Some said that the robot is attractive, Participant 4: “I mean it was attractive and the volume was good”, while some found it distractive, Participant 5 said that “it was distractive after a while, I couldn’t get used to the robot”. While most of the students believed that the robot has helped them to learn new words, some mentioned that they focus on the robot itself rather than English. For instance, Participant 5 said that “my attention was on the robot itself rather than English, maybe if I get used to the robot in the future I may benefit, but at the moment I didn’t benefit that much”.

Some participants mentioned that the robot became boring for them after a period of time. For example, Participant 2 said “first time its good but then it was boring. it was boring because I listen to the teacher every time in my school life. But robot at the first time was good and different but then it was boring”. However, some believed spending more time with the robot would be more beneficial for them. Participant 1 stated “in my opinion, I think we should study more with the robot if we can…. it would be more beneficial”.

Some believed that the robot was better than an instructor; Native 1 said “… It was better than a teacher in some way and giving synonyms and giving example suggestions was really helpful”. Similarly, Participant 1 said “it was good that robot repeat things, sometimes the teacher can’t explain or can’t give example about a word and the robot can do it immediately, I think it’s better than teacher but its robot”. There were other students who believed that it increased the instruction quality; Participant 3 said: “… teachers are not sufficient by itself mostly so having an assistant like that could be helpful for both students and teachers, it was motivating because it was a robot like something that every people haven't seen

around the worlds yes it grabs the student's attention". However, there were other students who believed that the instructor was better without the robot and that they did not like the NAO – Participant 8 told the researcher "teacher was better than the robot (was the robot distracting?) the robot was not distractive but it just explain the vocabulary teacher is explaining and has more emotion, when we don't understand something she explain shortly".

Based on the quantitative and qualitative data, the findings of this study are mixed. Some of the participants seem to like the NAO robot and believe that such technology is beneficial for them while others expressed negative feelings about the robot and its use.

4.4 Summary

In the beginning of this chapter, the age and gender of the participants are presented. This is followed by the quantitative data analyses. In this section, the result of the pre-test, post-test, and questionnaire are reported. The qualitative data is categorized and reported in the last section of this chapter. In the next chapter, conclusions are made and the results are discussed.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

First of all, in this chapter, an overview of the study is presented. After that, the findings of the study are presented, discussed, and compared to previous studies. Then, limitations of the study and suggestions for further studies are stated. Finally, according to the available data, conclusions are made.

5.2 Overview of the Study

This study tried to find the impact of the NAO robot as a teacher's assistant on vocabulary learning of adult learners. Additionally, the learners' attitude towards this technology, and the way it was used, was explored. In order to collect data, a mixed-method research was designed. A quasi-experiment was designed and used to find the impact of the robot on the learners' vocabulary learning. In the second part of this research, a questionnaire, as well as a semi-structured interview, was used to explore the learners' attitude.

The quasi-experiment included three main stages. First of all, learners took the pre-test after signing the written consent forms. Then, the treatment started. The robot was used as an assistant to explain the target words in the experimental group. In the other group, the control group of this study, the instructor explained the targeted words. In the final stage of the treatment, learners took the post-test; they had 30 minutes to answer the post-test.

At the end of the quasi-experiment, almost all of the experimental group's students filled out the questionnaire. Ten volunteers were chosen from the experimental group to participate in the interview which was the last stage of data collection process. Each interview lasted about 15 minutes. The whole data collection process was done within a month. In the next section, findings of this study are presented briefly.

5.3 Summary of the Findings

This study has investigated the impact of the NAO robot on adult learners' vocabulary learning and their attitude towards it. The collected data in the current study explains:

(a) The age and gender of the participants

(b) Adult learners' vocabulary knowledge improvement with and without the robot

(c) The learners' attitude towards the NAO robot

(d) The learners' opinion on the advantages of this technology

(e) The learners' opinion on the limitations of the NAO robot

As it was mentioned earlier, in this study, both quantitative and qualitative data were collected. In order to check the consistency of the findings in this study, quantitative and qualitative data are compared with each other. Comparing the interview findings and questionnaire results reveals that there is consistency among these two types of data in most of the cases. Here, the findings of this study are compared with previous studies to see whether or not these findings are confirmed and supported by previous

studies. By comparing the results with previous studies about RALL, consistency of the results of this study is checked.

5.4 Discussion of Findings

5.4.1 Could a Robot, as a Teacher Assistant, help with Students' Vocabulary Learning?

To answer the first research question, a quasi-experiment was done. All of the target words were unknown to the participants. As it was mentioned earlier, the pre-test result for all the participants is considered as zero. They went through the treatment period and then took the post-test. The results of the post-test were analyzed by an independent-sample t-test.

The result of the t-test does not show any significant difference among the groups. It shows that the participants' lexical knowledge is enhanced in both groups. In this study, participants of the control group performed better than the experimental group. These findings are not consistent with the findings of Hyun et al. (2008). They reported that learners of the RALL group outperformed the non-RALL group. It should be noted that participants of the above mentioned study were preschool language learners. Likewise, Mazzoni, and Benvenuti (2015) reported that preschool students performed better when a robot was used. Similarly, Aidinlou et al. (2014) reported that teenage students who were in RALL group performed better than the non-RALL group in terms of vocabulary learning.

Like the previous studies in this field, the findings of this study indicate some level of vocabulary learning by the help of the robot. However, higher score of the non-RALL group in this study is inconsistent with previous studies. This inconsistency

may be due to reasons which are discussed here. This issue may be due to the age of the participants of the current study. In previous studies, the impact of this technology on younger language learners was investigated, but in this study, the participants were all adults. It should also be noted that the type of robot and its role in previous studies were different from the current study. This issue may also be the reason of the control group better performance.

Some of the interviewees' comments may explain the inconsistency between the findings of this study and previous studies. In the interview, a few participants mentioned that they needed more time to get used to the robot. Participant 5 said that "… I couldn't get used to the robot". Spending more time with the robot may help language learners get used to the robot and focus more on learning rather than the robot. Since the robot is a new form of technology, most of the learners had not seen it before. Some of the interviewees said that the robot was distracting, and that their attention was on the robot itself rather than the English. Participant 5 said that "my attention was on the robot itself rather than English, maybe if I get used to the robot in the future I may benefit, but at the moment I didn't benefit that much". In other words, the robot may distract students rather than attracting their attention to the lessons.

Another explanation may be the speech rate of the robot. A few participants mentioned in their interviews that the robot talks too fast and that they could not understand what it said. In other words, they did not understand the explanations that the NAO provided for them. Participant 6 said that "no emotion and goes like a robot which talks really fast, for me it's like ok I can hear it but most of my classmates is like really difficult to understand cause they are not used to that kind of fast

English". This issue may be the main reason for the lower post-test score of the experimental group.

5.4.2 What are the students' attitudes towards the robot and using it in vocabulary learning?

In order to answer this question, a questionnaire was adapted from Lee et al. (2011). The adapted version's Cronbach alpha is .88 which is higher than the previous version (0.76). The findings of the questionnaire show that most of participants liked NAO as a teacher's assistant. Generally, they showed positive attitude towards the robot and its abilities. This is consistent with previous studies such as Han, Jo, Jones, and Jo (2008), Lee et al. (2011), Aidinlou et al. (2014), and Hong et al. (2016). The qualitative data also supports the quantitative data in most of the cases. It should also be noted that there were a few negative comments about the robot. To make the findings more comprehensible, the findings are categorized into 4 subcategories.

5.4.2.1 The Robot is Intelligent and Safe to Use

As it can be seen in Table 5.1, 69% of the participants believed that the robot was smart. Only 4 participants (13.8 %) disagreed with this statement. The high percentage of agreements with this statement shows that participants believed that the robot is intelligent and smart. Also, most of the participants (about 72 %) agreed that the robot is safe to use. In addition, 24.1 % of them were neutral about the safety of the robot. This high percentage of agreements shows that they see the robot a safe tool. This issue is also supported by the interview findings. For instance, Participant 1 says that "I was not afraid of it, he was like my friend, it was like asking a question from a friend". These findings are in line with Lee et al. (2011).

5.4.2.2 The Robot Can Walk and Watch

NAO has two cameras which gives it the ability to watch others. Using these cameras, the NAO can detect objects and faces. Usually, it searches for the sound source and looks at the person who talks to it. This issue is investigated by the second statement. More than 72% of the participants agreed that the robot could watch them. It shows that the robot is considered as an intelligent tool that can watch the learners. There are 2 statements which investigate the participants' opinions on the robot's walking ability. Statements 4 and 6 explore the participants' attitude on the robot's walking ability.

About 45% of the participants agreed with the fourth statement. In addition, about 45% of them felt neutral about this issue. The robot's walking ability was demonstrated for the experimental group but, most of the time, the robot stood still and did not move around. It may explain why almost half of the participants felt neutral about this statement. Additionally, 61% of the participants believed that the body of NAO was suitable for moving around. Some of the participants mentioned in their interview that they liked the robot's movements. For instance, Participant 7 said "the movements were great; the robot could walk and talk". Generally, it can be said that students were satisfied which is consistent with Lee et al (2011).

5.4.2.3 The Robot's Listening and Speaking abilities

The third statement of the questionnaire investigates the participants' opinion on the robot's listening ability. Although 76% of the participants believed that the NAO could hear them, some participants said that this skill could be improved. For example, Native 1 said that "I know just one thing will be improving the robot ability to hear, receive sound because sometimes it has problems, voice recognition". Similarly, it is reported in previous studies that the voice recognition of the robots

should be improved. NAO's voice recognition system is limited and should be improved. Generally, it can be said that most of the participants were satisfied with NAO's voice recognition system. The reported rate of agreement by Lee et al. (2011) is almost the same.

About the voice of NAO, it can be said that the robot's voice was pleasant for participants. In other words, they liked it. Quantitative data shows that 65.5 % of the participants felt that the robot's voice was pleasing. In addition, the same frequency of participants believed that the compliments the robot used was pleasing to them. According to the quantitative data, it can be said that participants liked the voice of the robot and the compliments it used which is in line with Lee et al. (2011).

Qualitative data reveals another aspect of this issue. Some of the participants did not like the way the robot talked. For example, Participant 6 mentioned that "no emotion and goes like a robot which talks really fast, for me it's like ok I can hear it but most of my classmates is like really difficult to understand cause they are not used to that kind of fast English".

Additionally, some of them believed that the robot talked too fast while others believed that the speech rate was appropriate. While Participants 1, 2, 4, 5, 6, and 7 believed that NAO talked too fast, Participant 3 said "in order to acquire some knowledge from that robot you have to know English like very well some sentences or the listening skill must be some advanced. I mean if you are advanced in listening skill you won't have any problem with it". In contrast Participant 7 says "it was fast and not clear".

There are contradictory comments on the speech rate of the robot. Some of the participants understood it, while others believed that it was not understandable for them. Similarly, there were some participants who liked the way NAO talked while others described it as a boring, emotionless robot voice. Further research should be conducted to investigate this issue. A variety of speech rate should be tested to find the most suitable speech rate for the learners. In general, it can be said that the robot's voice was pleasing for most of the participants but the speech rate was too fast for them. In other words, participants had different feelings about this issue.

5.4.2.4 The Robot's Appearance and Facial Expressions

As mentioned earlier, the NAO is a human-like robot that can show facial expressions using its lights. More than 65% of the participants agreed that the robot's appearance looked comfortable for learning environments. Additionally, more than 55% of them liked the facial expressions of NAO. In this case, qualitative data supports the quantitative data. Most of the participants described NAO in a positive way and said that they liked it. They used positive adjectives such as "cool and interesting" (Native 1) "interesting" (Participant 8), "exciting" (Participant 7) and "attractive" (Participant 4) to describe the robot.

In addition, Participant 4 said that "robot looks like so cute that's why I fell so comfortable I don't felt I am under pressure". Similarly, Participant 1 said "I was not afraid of it, he was like my friend, it was like asking a question from a friend". These comments show that they consider the robot their friend and that they liked NAO. Participant 8 also shared the same feelings by saying "I see the robot for the first time in my life, I liked when it moves or dancing, it was interesting". To sum it up, it can be said that the learners were satisfied with the NAO's appearance and facial expressions. These findings are in line with Lee et al. (2011)

5.5 Pedagogical Implications of this Study

Although there were some gains in learning vocabulary, this study found no statistically significant difference between the vocabulary learning of the experimental group and the control group. Unlike previous studies, this study cannot claim whether this technology is beneficial for adult learners or not. In addition, participants had mixed feelings about the robot and using it for vocabulary learning. Further studies are needed to investigate the effect of RALL on adult learners' vocabulary learning and their attitudes towards it.

This technology can be beneficial for the learners if they spend more time with it. Spending more time will help them to get used to the robot. At first it may be distracting since the learners' attention may be on the robot itself rather than the language. Using the robot in smaller groups is the approach that is suggested by most of the interviewees. According to them, using the robot in smaller groups will help them to get used to it faster. In addition, they will have more time to interact with it and practice new words. Some of them claimed that RALL is more beneficial than the teacher since it immediately provides examples and meanings.

There are also a few challenges for integrating this technology that teachers and researchers should be aware of. Introducing the robot in a proper way is extremely crucial; if the robot is not introduced properly, language learners will not have a good relationship with this technology and may resist interacting with it. In addition, good and deep pre-programing is necessary. Language learners may lose their trust in the robot if it cannot answer their questions. It should also be mentioned that context

should be appropriate for the learners' proficiency level. Finally, the robots' speech rate should be adjusted to be appropriate for learners.

5.6 Limitations of the Study

Like other studies, this study had its own limitations. Due to time constraints, this study was done in a short amount of time. In other words, the long term effects of the robot could not be investigated in this study. The available sample for this study is also limited to first year ELT students who took the vocabulary course. The small number of participants is caused by this issue. In addition, due to time constraints, a limited number of words were selected to be taught. The number of selected words was reduced due to the time constraints.

In addition, since participants were divided into two groups by the administer of the ELT department, the researcher could not make any changes to the groups to make them more homogenous in terms of age and gender. The instructor was not the same for the groups. In addition, this issue could not be controlled by the researcher. However, the researcher tried to reduce the influence of this factor by reaching an agreement on instruction with the instructors. Instructors have used the same definitions, examples, and methods to teach the target words.

The findings of this study could be more comprehensive if the sample size and the number of target words of the study were more. Additionally, using an instructor for both groups may make the results more valid and reliable. The data collection process took place in the second half of the spring semester. This issue caused time constraints for the researcher. Furthermore, students were busy with their projects

and other courses, therefore more learners could not be convinced to participate in the interview.

Also, the instructor's opinion on this technology and the way it was used could not be obtained by the researcher. This issue could be considered as another limitation of this study. This study only looked into the receptive aspect of word knowledge; this issue can be considered as another limitation of this study. In conclusion, this study's results could be generalized only to the population of adult ELT students. No data was obtained about the instructor's attitude towards the NAO robot and its use.

5.7 Recommendations for further studies

Using robots in education, specifically language teaching, is a fairly new topic which needs to be investigated more. A similar study with a larger number of participants and target words is suggested. The effect of this robot on vocabulary retention could also be explored by adding a delayed post-test. A research with the same instructor for both groups could be conducted. This technology can be used for other university students and their attitude towards this technology could also be investigated.

In addition, instructors' opinion on this technology and its use could be investigated. The effect of gender and age on the effectiveness of this technology could be explored. Robots could play several roles in the classroom. The effect of a robot that plays other roles within the classroom on vocabulary learning and other language skills could also be explored. The possible impact of robots' speech rate on language learning can also be explored.

The effect of the robot on the productive aspect of vocabulary knowledge and other aspects of receptive knowledge could also be a good research topic. The attitude of

the larger number of students on this technology and the way it was used could be explored as well. Additionally, RALL could be compared with CALL and MALL. Comparing RALL with previous trends could be a good research topic. In these studies, the opinions of instructors and their preferences could also be investigated.

To sum it up, since RALL is a fairly new area of research, there are a lot of gaps in the literature. Researchers can design and conduct many different studies according to their interests.

5.8 Conclusion

This study has looked into the possible impact of using a robot on adult language learners' vocabulary learning. In addition, their attitude towards this technology and the way it was used has been explored. A mixed-method study was designed to reach the objectives of the study. Both quantitative and qualitative data were collected and analyzed. This process lasted about one month at the ELT department of Eastern Mediterranean University, North Cyprus. First year ELT students, who had taken the vocabulary course, have participated in this study.

Like the previous studies in this field, the findings of this study indicate some level of vocabulary learning by the help of the robot. In contrast to previous studies, this study could not find any significant differences between the non-RALL group and the RALL group. However, in this study, the non-RALL group performance was better than the experimental group. Many reasons may cause this inconsistency. This issue is discussed in detail in the discussion section.

Although quantitative data showed that the attitudes of learners towards the robot were mostly positive, qualitative data showed that participants had mixed feelings

about the robot. Some of them liked the robot and accepted it as a beneficial tool that could be used in classrooms to teach vocabulary while there were others who did not like the robot. In conclusion, it can be said that most of the learners accepted the robot as a beneficial and interesting tool which could help them learn new words.

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APPENDICES

Appendix A: Questionnaire Consent Form

STUDENT QUESTIONNAIRE CONSENT FORM

Dear participants,

You are requested to participate in a study conducted by Hossein BANAEIAN, MA student in FLE department of Eastern Mediterranean University. The study is about the effect of using robots on vocabulary learning and students' attitudes towards it.

You are kindly invited to participate in this research by filling in a questionnaire. Your identity and individual responses will be kept confidential and will be used only for research purposes.

It should also be noted that participation is voluntary and you can withdraw at any stage you want.

If you have any questions, please do not hesitate to contact us.

Researcher:

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Faculty member
0392 630 2614
ilkay.gilanlioglu@emu.edu.tr

If you agree to participate in this study, please sign below.

Name-Surname: _____

Signature: _____

Date: _____

E-mail/telephone number: _____

Appendix B: Interview Consent Form

STUDENT INTERVIEW CONSENT FORM

Dear participants,

You are requested to participate in a study conducted by Hossein BANAEIAN, MA student in FLE department of Eastern Mediterranean University. The study is about the effect of using robots on vocabulary learning and students' attitudes towards it.

You are kindly invited to participate in this research by taking part in an interview. Your identity and individual responses will be kept confidential and will be used only for research purposes.

It should also be noted that participation is voluntary and you can withdraw at any stage you want.

If you have any questions, please do not hesitate to contact us.

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If you agree to participate in this study, please sign below.

Name-Surname: _____

Signature: _____

Date: _____

E-mail/telephone number: _____

Appendix C: Classroom Observation Consent Form

CONSENT FORM FOR CLASSROOM OBSERVATION

I hereby give my consent to Hossein BANAEIAN, an MA student in FLE Department at EMU, to observe activities which are done by the robot in my classroom.

I give permission for the use of these data, in the writing up and reporting of the study. I understand that my identity will be kept confidential and will be used only for research purposes.

SIGNATURES

Class Instructor.....**Date**.....

Researcher.....**Date**.....

Appendix D: Video Recording Consent Form

CONSENT FORM FOR CLASSROOM VIDEO-RECORDING

I hereby give my consent to Hossein BANAEIAN, an MA student in FLE Department at EMU, to video-record activities which are done by the robot in my classroom.

I give permission for the use of these data, in the writing up and reporting of the study. I understand that my identity will be kept confidential and will be used only for research purposes.

SIGNATURES

Class Instructor.....**Date**.....

Researcher.....**Date**.....

Appendix E: Pre-test

Dear student,

Your knowledge of following words will be evaluated by this test. Be informed that the result of this test does not affect your score. Follow the instruction and cross the **most appropriate** box.

Name:

Surname:

Age:

Gender:

Are you native speaker of English?

Please read the words and choose one of the following options by crossing (X) the appropriate box.

1. I do not know this word.
2. I have seen or heard this word before, but I am not sure about the meaning.
3. I understand this word when I see it or hear it in a sentence, but I do not know how to use it in my writing or speaking. ***(please write the meaning of the word if you know it)***
4. I know this word and I can use it in my speaking and writing.

Words	1	2	3	4	Meaning
Constitute					
Induce					
Radical					
Cease					
Exceed					
Interpret					
Revolution					
Civil					
Interval					
Subsequent					
Grant					
Objective					
Theme					
Commentary					
Ideological					
Principal					
Compute					
Implicit					
Proceed					
Violation					
Prominent					
Equivalent					
Albeit					
Convinced					
Conflict					
Ambiguous					
Correspond					
Amend					
Preliminary					

Clause					
Deviation					
Grade					
Protocol					
Consent					
Distorted					
Index					
Route					
Consultation					
Integral					
Tense					
Contradictory					
Inconsistent					
Permanent					
Restricted					
Institute (V)					
Accumulate					
Detect					
Inspect					
Enormous					
Integrity					
Spherical					
Thereby					
Generating					
Chart					
Implement					
Minimal					
Uniformity					
Component					
Incidence					

Visualize					
Perception					
Innovation					
Velocity					
Procedure					
Segment					
Inspire					
Protest					
Massacre					
Prestigious					
Accustomed					
Instant					
Resent					
Legislation					
Susceptibility					
Destructive					
Fatigue					
Irritation					
Inhibited					
Harness					
Insect					
Shallow					
Diagnostic					
Probe					
Intense					
Corrosion					
Weld					
Compromising					
Utilize					

Appendix F: Post-test

Instructions: This is a vocabulary test. Your score on this test will not have an effect on your overall grade for this course. You must choose the right word to go with each meaning. Write the number of that word next to its meaning. Here is an example.

1. business	
2. clock	___ part of a house
3. horse	___ animal with four legs
4. pencil	___ something used for writing
5. shoe	
6. wall	

You answer it in the following way.

1. business	
2. clock	__6_ part of a house
3. horse	__3_ animal with four legs
4. pencil	__4_ something used for writing
5. shoe	
6. wall	

1. amend
2. brief
3. correspond
4. diminish
5. eliminate
6. induce

___ match
___ change
___ causing something to happen

1. ambiguous
2. established
3. preliminary
4. radical
5. subsequent
6. tense

___ not clear
___ coming after
___ coming before

1. clause
2. consultation
3. deviation
4. interval
5. protocol
6. revolution

___ the time between two events
___ difference from what is usual
___ meeting to discuss and get advice

1. distorted
2. ideological
3. implicit
4. secure
5. uniform
6. valid

___ out of shape
___ not stated directly
___ based on beliefs, especially political beliefs

1. consent
2. demonstration
3. legislation
4. terminal
5. variant
6. violation

___ law
___ permission
___ breaking the law or an agreement

1. definite
2. enormous
3. equivalent
4. inconsistent
5. integral
6. labored

___ have the same amount
___ necessary part of something
___ two statements which cannot both be true

1. cease
2. convince
3. interpret
4. mediate
5. process
6. simulate

___ stop
___ make someone believe something
___ explain the meaning of information or an action

1. albeit
2. assuming
3. contradictory
4. institute
5. pose
6. unified

___ although
___ start a system
___ if one is true the other is false

Appendix G: Questionnaire

Student Questionnaire

Please tell your opinion about following items by putting a cross (X) in the appropriate box.

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. The robot looks smart.					
2. The robot can watch you.					
3. The robot can listen to your song and speech.					
4. The robot can come to you.					
5. The robot's appearance looks comfortable for learning.					
6. The robot's body looks comfortable for moving around in a classroom.					
7. The robot's facial expression looks comfortable to you.					
8. The robot's compliment is pleasing to you.					
9. The robot's voice is pleasing.					
10. The robot seems secure.					

Appendix H: Interview

Student Semi-structured interview

1. What do you think about using a robot for teaching English?
2. Did the robot help you to learn new words better? If yes, how? If not, why?
3. Can you tell me about the best and the worst experience you had with the robot?
4. In your opinion what were the advantages and disadvantages of using the robot in the class as a teacher assistant?
5. How did you feel about having a robot as a teacher assistant in the classroom?
6. Do you think the robot help you to learn new words? If yes, in what ways? If not, why?
7. How can the robot be used to benefit you more in vocabulary learning?
8. If you were the instructor, how would you use the robot?
9. What else would you like to say about learning new vocabulary with the help of the robot?

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Etik Kurulu / Ethics Committee

Reference No: ETK00-2018-0117 27.03.2018
Subject: Application for Ethics.

RE: Hossein Banaeian
Department of Foreign Language Education

To Whom It May Concern,

As part of the 2017-2018 Spring Semester, pertaining to Master Thesis questionnaires EMU's Scientific Research and Publication Ethics Committee has granted Mr. Hossein Banaeian, from the Foreign Language Education Department, to pursue with his survey entitled ***The Effect of Using Robots on University Students' Vocabulary Learning and Their Attitudes Towards Rall.*** This decision has been taken by the majority of votes. (Meeting number 2018/56-41)

Regards,

EASTERN MEDITERRANEAN UNIVERSITY ★ ETİK KURULU ★ ETHICS COMMITTEE 1979 Gazimagosa-North Cyprus

Assoc. Prof. Dr. Şükrü Tüzmen
Director of Ethics Commitee

ŞT/sky.