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# The Influence of Pronunciation Education via Artificial Intelligence Technology on Vocabulary Acquisition in Learning English

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ABSTRACT

Correct pronunciation significantly increases the intelligibility of communication. However, it is uncertain whether acquiring the pronunciation of the words enhances word retention capability. Therefore, the major purpose of this research is to evaluate whether vocabulary acquisition with the aid of pronouncing with artificial intelligence leads to a longer memory. In this research, a full experimental pattern, and a pre-test and post-test control group design were applied. Furthermore, a total of 56 high school students aged between 14-15 were asked to memorize unknown vocabulary with two pronunciation teaching methods. Prior to the experimental process, the pre-test was applied to both groups, and then, the artificial intelligence-based speech recognition pronunciation teaching process was to the experimental group while the phonetic alphabet pronunciation process was to the control group on the 4th, 8th, and 12th weeks. According to the findings, it was obtained that pronunciation practice via artificial intelligence-enabled the words to remain in memory longer. Additionally, the participants' views were gathered at the end of the research. For further research, this study will benefit other research with a variety of accessible tools to meet objectives by utilizing a new artificial intelligence-supported pronunciation model, through recording and reacting to learners' pronouncing practices in different languages.

Keywords:
Artificial intelligence, speech recognition, vocabulary acquisition, pronunciation, high school students

## 1. Introduction

For decades, developing nations have placed great importance on acquiring proficiency in the English language and have been making concerted efforts to teach it effectively as a second foreign language. However, while language acquisition is monitored for a long period, there are huge challenges in terms of vocabulary learning. So as to tackle these difficulties, solutions that combine technology have been adopted by many nations. To get rid of the issues in vocabulary, numerous studies (Alemi, Meghdari, & Ghazisaedy, 2015; Başoğlu, & Akdemir, 2010; Chang, Yan, Tseng, 2012; Solak, & Çakır, 2015;) have been carried out by various countries employing technology. Some of the outcomes of these studies focused on particular areas of tech-integrated vocabulary acquisition, such as stress utilizing augmented reality, mobile phones, social robotics etc. Although WEB tools provide lots of memorization cards and other activities, learning a word through pronouncing it using WEB tools is not taken into consideration in the literature. Notwithstanding, several academics who see the acquisition of vocabulary as a sign of decent English have placed emphasis on teaching pronunciation as a profession, arguing that language learners require concise pronunciation in order to describe themselves more precisely in diverse contexts (Lowenberg, 2002; Levis, 2005). Accordingly, the major purpose of our study is to allow our English learners to speak more effectively in the target language

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by utilizing the "Games for Learning English" WEB service. Despite the fact that there are numerous studies (Kruk & Pawlak, 2021; Zeinali, Golshan, & Naeimi, 2021) in the literature on improving vocabulary learning through pronunciation in many countries, it can be stated that there are few studies on pronunciation education, integrating artificial intelligence in a digital setting, and discovering the effects on word retention. Over the effects of computers on vocabulary learning through pronunciation practice, Kruk & Pawlak (2021) stated that online materials generated permanent improvements and were highly appraised by learners. On the other hand, Zeinali et al. (2021) stated that computer-mediated interaction, notably in synchronous mode, is beneficial for the pronunciation improvement of medical students as the computer gives the chances through which medical students may detect the deficiencies in their existing English language and thus generate an updated output. Furthermore, several studies have discovered that incorporating game - based learning into language classes improves pupils' studying motivation and achievement (Chiu, Kao, & Reynolds, 2012). Scientists, for example, have proven that employing scaffolding activities assists learners achieve focused knowledge more effectively, and that employing game tactics in education reduces irritation caused by an overwhelming number of learning retries (Sun, Wang, & Chan, 2011). Furthermore, the usage of WEB-based activities aids with language acquisition, such as grammar or writing abilities. Accordingly, the validation of which pronunciation teaching method is more efficient in terms of vocabulary acquisition is evaluated in this research.

### 1.1. Literature Review

#### 1.1.1. Phonetic Alphabet and Pronunciation Teaching

Nowadays, many individuals studying English simply concentrate on increasing their speaking abilities, without giving attention to their pronunciation through vocabulary acquisition. This is problematic since an individual who says a word erroneously will result in misunderstandings. Therefore, increasing speech abilities is essential. One challenge for those wishing to improve their pronunciation skills is being perplexed about the standards used to master pronunciation (Dušek, & Popelková, 2021). More often than not, those who demand to learn the pronunciation of a phrase might utilize a digital dictionary that can utter the word. This is beneficial to accomplish, but not everyone listening to the dictionary can utter the words accurately. Such issues may be solved by adopting the international phonetic alphabet (IPA). IPA specifies the conventional phonetic symbols, which are commonly written in Latin symbols, providing the basic sound encoding for spoken language. It is additionally acknowledged as the norm for linguistics. Therefore, the researchers suggest that its symbols are crucial to learning how to pronounce English words properly. Despite this, the initial idea of the International Phonetic Alphabet (IPA) was introduced by Otto Jespersen in a correspondence to Paul Passy from the International Phonetic Association. Later on, it was further developed by A.J. Ellis, Henry Sweet, Daniel Jones, and Passy in the late 1800s (Britannica, 2022). Because of the current technological developments, contemporary methods fit for our century have become a requirement in recent years.

#### 1.1.2. Speech Recognition Through Artificial Intelligence and Pronunciation Teaching

Speech recognition is essential for interacting with devices. This, of course, demands great precision, rapid speed, and the capacity to recognize a broad range of loudspeakers. Considering today's internet accessibility, Google Speech may be utilized to produce quick and accurate outcomes since Google has the capability and databases to translate spoken language to text exerting the processing power of its own servers (Tseng, 2021). Apple Siri (powered by Nuance), Google, and Microsoft have all acquired a large quantity of user information while using speech technologies on their devices. New WEB-based tools might be accessible to collect, annotate, and analyze enormous speech volumes in many languages. Mustering the help of interested people on the Web might help develop enormous volumes of linguistic materials extremely swiftly and cost-effectively (Huang et al., 2014).

Dictating with speech recognition systems is beneficial for vocabulary acquisition, simple to utilize, and fun for practicing (Liakin et al., 2017; McCrocklin, 2019). Language students might assess their vocabulary knowledge by comparing their overall meaning with speech recognition interpretation. In such a fashion, the dictating speech recognition WEB application provides students with customized pronunciation training and aids in identifying difficulties in pronouncing sounds. Liakin et al. (2014) stated that vocabulary education with dictating speech recognition feedback was much more efficient compared to teacher-based response and no response techniques. Transcription of speech recognition usage in a class leads to substantial pronunciation

improvement (McCrocklin, 2016) and boosts pronunciation conciseness (Golshan, et al. 2021). Furthermore, dictating speech recognition is effective for foreign language speech improvement among Chinese-speaking students (Evers and Chen, 2021). In the current research, transcription of speech recognition software was applied to offer fast pronunciation assessment and was combined with group learning.

### 1.1.3. The Purpose of the Study

Through the use of artificial intelligence technologies, in order to investigate the effect of speech recognition on pronunciation and practiced vocabulary remembrance, three essential research questions and four hypotheses related to research questions 1 and 2 were addressed as follows:

RQ1. Does artificial intelligence-based pronunciation teaching effectively enhance students' word retention?

RQ2. Does teaching phonetic alphabet-based pronunciation effectively improve students' word retention?

RQ3. How do students in the experimental group perceive the usefulness of AI-based pronunciation teaching?

*2.2.1. Hypotheses Based on the 1st and 2nd Research Question:*

H0: There was no statistically significant variation in the results of the tests administered during the first (pre-test), second (interval 1), third (interval 2), and fourth (post-test) time periods, with a gap of four weeks between both groups.

H1: There was a statistically significant difference among the tests applied for the first (pre-test), second, third and fourth times, with a four-week interval between both groups.

Ha1: The experimental group, which received pronunciation training with artificial intelligence, was more successful than the control group.

Ha2: The control group, which received pronunciation training using the phonetic alphabet method, was more successful than the experimental group.

## 2. Method

### 2.1. Research Design

In this study, an experimental approach was adopted, utilizing the pretest-posttest control group design as a quantitative research methodology. Additionally, a purposeful sampling method was employed. Following the experiment, participants' feedback on the study was collected through a qualitative research design using the semi-structured interview technique.

### 2.2. Participants and Context

This research was carried out with the authorization of the Ministry of National Education with 56 students (34 females, 22 males) whose ages ranged from 14 to 15. The research featured two study groups, selected as the experimental (n=28) and control groups (n=28) using the unbiased assignment approach.

The following characteristics will be examined for the criteria of the research group chosen:

- Students must be enrolled in the 10th grade.
- Learners must be enrolled in the English as a Foreign Language (EFL) program.

### 2.3. Experimental Procedure and Learning Activities

#### 2.3.1. Artificial-Intelligence Supported Speech Recognition Web 2.0 Learning Platform

One of the beginnings of artificial intelligence is the "Google Speech Recognition" capability. In terms of the roots of speech recognition, in the early 1980s, speech recognition took enormous leaps towards commercial appeal (Condecosoftware, 2022). A method called the Hidden Markov Model was applied, which enables voice recognition robots to more precisely characterize speech. Around this time, International Business Machines Corporation started development on Tangora, a system that can recognize 20,000 spoken syllables. Today, the speech recognition technology utilized by Google may be used not only in the sphere of commerce but also in the field of education. Therefore, in our work, an experimental study was conducted to employ the speech recognition system and digital game-based language learning (DGBLL) to achieve "pronunciation"

competence in foreign language acquisition. In the research, a Web 2.0 application called "Games to Learn English" which is a Web 2.0 tool that provides gamified language applications for English learners to acquire different abilities such as listening, reading, writing, and speaking, was employed. Then, the learning and retention processes of unfamiliar or unknown words were evaluated. One of the features of this Web 2.0 tool is the "Talk Easy" part. Thanks to this part, pupils' pronunciation ratings were established and assessed. Nevertheless, the ratings were not taken into consideration for the analyses, since, after the application of the game, the vocabulary tests were administered and their results were evaluated. As can be observed from Figure 1, there are 28 separate categories.


**Figure 1.** *Games to Learn English Web Page, "Word Categories".*

Upon picking a category displayed in Image 1, participants were required to pronounce the word that appeared onscreen, utilizing Google speech recognition via the "Google Chrome" browser. Should students not know how to pronounce the word, they may seek assistance by clicking on the audio picture or the "H" icon indicated in Figure 2, or they could go to the options area to simplify the game. At the conclusion of the

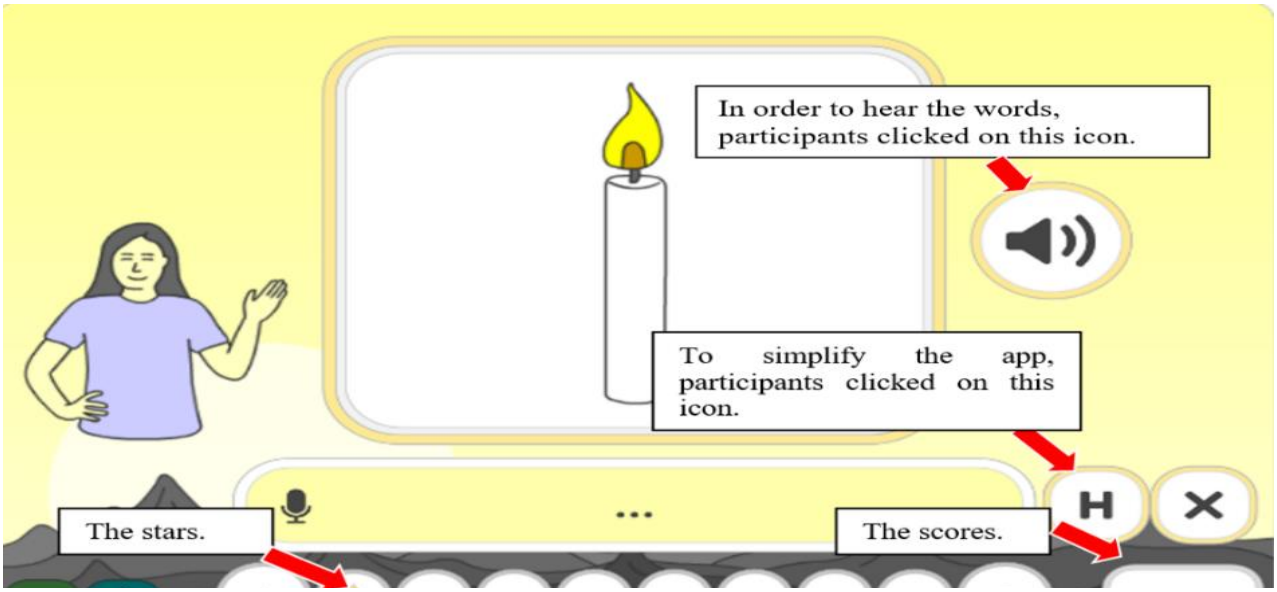


**Figure 2.** *Games to learn English WEB page, "Items"*

phrase set, pupils are assigned a rating, and they input their names and the name of the nation they originate from so that their scores may be included in the ranking. Thanks to this completely free tool, pupils have the possibility to compare their performances in pronunciation.

For this study, an artificial intelligence-supported speech recognition WEB 2.0 learning platform assisted by Google was administered to facilitate pronunciation, as illustrated in Figure 2. This platform consists of course materials supplied by the teacher and a module for pronouncing unfamiliar words. The objective of the course data is to give instructors a place to publish teaching new vocabulary online on the Games to Learn English WEBsite via artificial intelligence-supported speech recognition systems to enhance vocabulary acquisition. The educational resources offer learners the opportunity to participate in a game with other players from all around the globe, as well as provide stars and scores as feedback (Dwyer, 2022).

The research was carried out from November to January, 2021 (see Figure 3 for the experimental process). Prior to beginning the research, the pretest, which is the vocabulary chosen (see the appendix), was asked of the participants to get the meaning of them in their mother tongue. A week later, the instructor explained and taught the phonetic alphabet to the students of the control group, while, the artificial intelligence-supported speech recognition pronunciation teaching for the experimental group for a week. For the control group, learners underwent a vocabulary training with the pronunciation alphabet, and with the symbols, they learned the meanings of the words. For the experimental group, learners were introduced to a Web 2.0 tool called the "Games to Learn English" WEBsite to learn the pronunciation of the words uttered by each of them through the artificial intelligence-based speech recognition system. Rather than being introduced to the meaning of the words, the participants extracted the meaning of the words from the visuals as well as pronouncing them. Each group received the same test on the 4th week, to answer the meanings in their mother tongue after each process (phonetic alphabet and artificial intelligence). The same test was applied on the 8th and 12th week again to measure how many of the words they recalled. At the end of the 12-weeks experiment, the participants' attitudes towards the techniques were analyzed with a semi-structured interview by an academician and an English teacher.

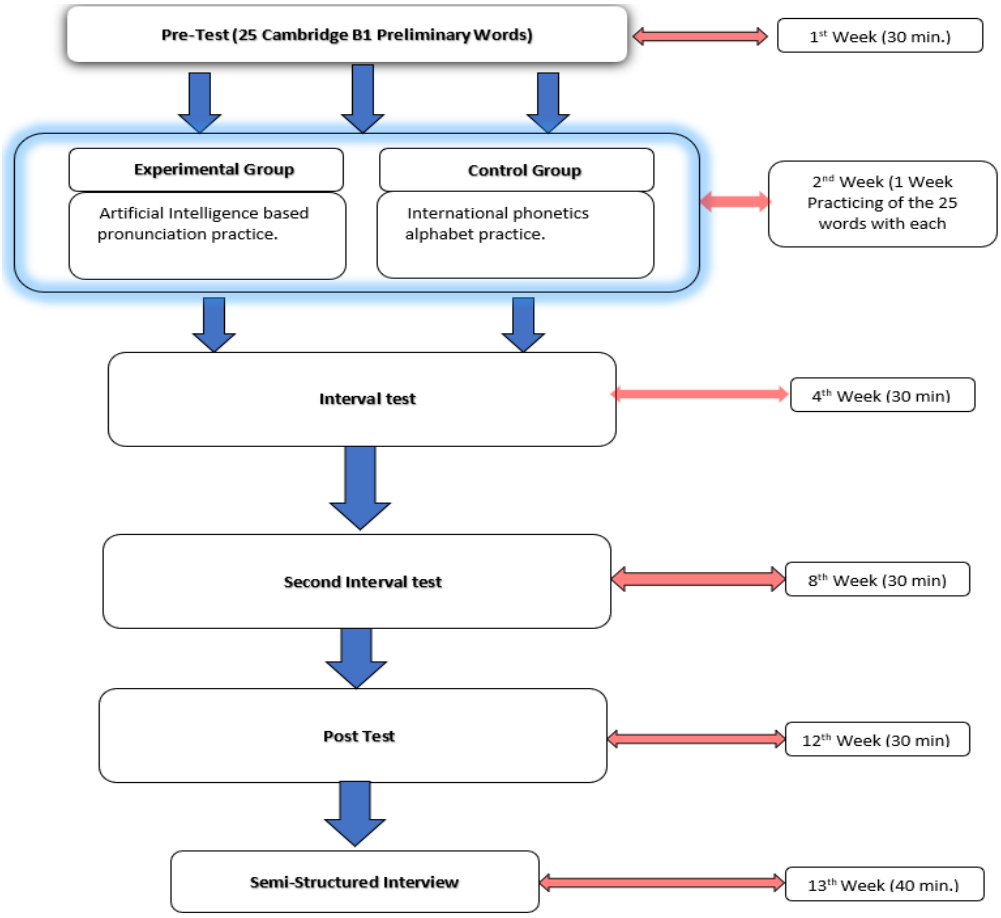


**Figure 3.** *Experimental Procedure*

After the administration to the pre-test (30-min.) the 25 unknown words were gathered and applied on the 4th, 8th and 12th weeks. Before the administration of the test on the 4th week, both the experimental and control groups practiced the vocabulary utilizing the different techniques stated in Figure 3, and completed the tests (interval and post-tests). The post-test results of each group on word retention following each technique are presented in the data analysis section. Afterwards, the thoughts were collected willingly without any intervention to obtain comments on the artificial intelligence assisted speech recognition method to pronunciation teaching and the international phonetic alphabet technique to pronunciation education for around 40 minutes. This investigation was conducted outside the classroom to avoid disrupting the curriculum.

**2.4. Data Collection Tool**

The data collection tools adopted in this study were the word retention test, and the semi-structured interview questions on students' perceived usefulness of using the artificial intelligence-supported speech recognition pronunciation practice method.

**2.5. Data Analysis**

The word sets were obtained from the Cambridge intermediate-level preliminary word bank. The Cambridge Intermediate Preliminary Word Bank was initially produced by Cambridge Assessment in cooperation with external experts to aid question authors who generate resources for the Intermediate Preliminary test. It comprises terminology from the Council of Europe's Threshold Standard and additional words whose corpus data reveals a high frequency. The vocabulary of English varies over time, with phrases being introduced and other words slipping into usage. In an attempt to preserve its currency, the Intermediate Preliminary Vocabulary List is updated on a regular basis, with the choice to add or delete terms influenced by reference to the Cambridge Learner Corpus and English Profile Wordlists. The revision of the words included three stages. Initially, professional item writers recommended additional terms to extend the range of the set of words, and then selected those that were no longer applicable. The list of potential terms was then evaluated by corpus experts at Cambridge English. Revised lists were issued in 2018 and are freely accessible on the Cambridge English WEBsite (Cambridge, 2022). The specified words were compared with the words in the curriculum. The words that were not included in the students' curriculum were selected by an academic and an English teacher. The selected vocabulary list can be seen in Appendix A.

The vocabulary test was verified by exam preparation specialists, including a linguistics expert, an assessment and evaluation expert, and an academician from the researcher's university. The specialists were asked to assess the words' suitability for the study's purpose, clarity, and terminology employed. The vocabulary test in this study underwent modifications based on validation judgments provided by experts. A table of criteria was utilized to ensure the content validation of the test, which was also verified by experts. To construct the 25-item vocabulary test, the researcher listed the subjects addressed as rows on the table and the degree of cognitive field as the column of the table, following Bloom's taxonomy of educational goals. Percentage weights were then applied to each item and the levels of the cognitive domain. This was done to ensure that the materials taught were appropriately covered in the exam while reducing the quantity of words. A vocabulary set was created from the 25 unknown words, and both methods were applied to each group using these words. Additionally, pilot testing was conducted by administering copies of the test to a similar sample of different students (n=10) (DeVellis, 2021) to assess the internal consistency reliability of the vocabulary exam. The data collected from the pilot testing were analyzed using Cronbach's alpha coefficient, a commonly used measure of internal consistency reliability (Nunnally, 1975). In conclusion, pilot testing was conducted to evaluate the internal consistency reliability of the vocabulary exam, and the results indicated that the exam had a high level of dependability. This methodology is essential in ensuring the validity and reliability of measurement instruments in educational and psychological research" (DeVellis, 2021; Nunnally, 1975). In order to minimize potential sources of error and ensure the feasibility of the pilot testing, the vocabulary exam was designed to be completed within a 30-minute time frame. In addition, the pilot students were selected based on the same criteria as the experimental and control groups to accurately reflect the student population for the vocabulary exam. It should be emphasized that the pilot participants who took the vocabulary test were not included in the actual study; they were only utilized to evaluate the exam's internal consistency reliability. The temporal stability of the test was assessed by administering copies of the vocabulary test at

four-week intervals after the initial administration. Reliability statistics ($\alpha$=0.91) were used to examine the results from the two administrations, confirming the test's dependability.

In order to ensure the reliability of the study, a test-retest method was applied. The pre-test was conducted on both the experimental and control groups before the experimental process began. Then, the artificial intelligence-based speech recognition pronunciation teaching process was provided to the experimental group, while the phonetic alphabet pronunciation process was provided to the control group on the 4th, 8th, and 12th weeks. The post-test was then conducted on both groups to compare their retention capabilities. By applying the same test to the same group of participants at different times, the test-retest method helped dentify any potential changes in participants' performance that were not related to the intervention. Therefore, it can be concluded that the results obtained from this study are reliable and valid.

At the conclusion of the activities, the participants from both the experimental group and the control group engaged in a 30-minute semi-structured interview in their mother tongue to aid in grasping the students' involvement. The interview framework and coding methodology were based on the content analysis. In content analysis, data gathered from interviews, observations or documents is examined in four stages: (1) coding the data, (2) discovering the codes, categories and themes, (3) arranging the codes, categories and themes, and (4) defining and interpreting the results. (Eysenbach and Köhler, 2002; Miles and Huberman, 1994). Therefore, in order to ensure reliability, the coding process was carried out by three experts (an academician, an assessment and evaluation expert, and a linguistic expert). There are six question items (see the Appendix). The whole interview was paper-based, and the responses were noted down. The answers provided by the pupils were coded into the categories. In the event of a dispute among them, the categories were evaluated jointly to achieve a consensus. The kappa ratio of the coding findings of the three researchers was 0.92, suggesting remarkable consistency (Lavrakas, 2008).

### 2.6. Ethical

The Ethics Committee decision about the study entitled: "The Influence of Pronunciation Education with Artificial Intelligence Technology on Vocabulary Acquisition in Learning English" by XXX and XXX is attached to the manuscript (See Appendix).

## 3. Findings

### 3.1. Experimental Results

In order to analyze the statistics of achievement scores, the control and the experimental groups have been compared by means of an ANOVA. The data acquired are as follows:

**Table 1.** *Mean Analysis of the Achievement Scores of the Participants at Four Different Test Occasions*

| Weeks | Methods | Group | N | Mean | sd |
|---|---|---|---|---|---|
| 1st week | Pre-Test | Experimental Group | 28 | 08.21 | 03.86 |
| | | Control Group | 28 | 07.92 | 04.63 |
| 4th week | Interval Test 1 | Experimental Group | 28 | 72.28 | 15.43 |
| | | Control Group | 28 | 61.57 | 22.55 |
| 8th week | Interval Test 2 | Experimental Group | 28 | 71.14 | 15.56 |
| | | Control Group | 28 | 60.71 | 19.56 |
| 12th week | Post Test | Experimental Group | 28 | 75.28 | 14.56 |
| | | Control Group | 28 | 59.57 | 18.29 |

With the intention of examining the influences of the online artificial intelligence-supported speech recognition on students' pronunciation performance and word retention, the one-way ANOVA method was adopted, using the pre-performing ratings as the covariate and the post-performing ratings as dependent variables. An ANOVA was performed after verifying that the regression did not violate the homogeneity tests ($F_{(pre\text{-}test)} = .662$, $p = .42 > .05$; $F_{(4th\ week\ test\ results)} = 2.66$, $p = .10 > .05$; $F_{(8th\ week\ test\ results)} = .15$, $p = .70 > .05$; $F_{(12th\ week\ test\ results)} = .22$, $p = .63 > .05$). Table 2 presents the ANOVA results for the two groups. Based on the results, there were significant differences between the two groups in their 4th and 8th week post-test results ($F_{(4th\ week\ test\ results)} = 4.245$, $p = .04 < .05$, $\eta 2 = .07$; $F_{(8th\ week\ test\ results)} = 5.093$, $p = .02 < .05$, $\eta 2 = .09$; $F_{(12th\ week\ test\ results)} = 12.644$, $p = .00 < .05$, $\eta 2$

= .19). Moreover, the artificial intelligence-supported speech recognition method had a significant impact on students' word retention.

**Table 2.** *ANOVA Results Analyzing the Scores of Word Retention Tests*

| Weeks | Groups | Sources of Var. | df | Mean Square | F | p* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| 1st week (pre-test) | Experimental Group (EG) | Between Groups (BG) | 1 | 0001.14 | .063 | .80 | .001 |
| | Control Group (CG) | Within Groups (WG) | 54 | 0018.19 | | | |
| 4th week | EG | BG | 1 | 1607.14 | 4.303 | .04 | .105 |
| | CG | WG | 54 | 0373.49 | | | |
| 8th week | EG | BG | 1 | 1522.57 | 4.872 | .03 | .122 |
| | CG | WG | 54 | 0312.53 | | | |
| 12th week (Post-test) | EG | BG | 1 | 3457.14 | 12.644 | .00 | .190 |
| | CG | WG | 54 | 0273.41 | | | |

Levene= ($F_{(pre\text{-}test)}$ = .662, $p$= .42> .05**; $F_{(4th\ week\ test\ results)}$ = 2.66, $p$= .10> .05**; $F_{(8th\ week\ test\ results)}$ = .15, p= .70>.05**; $F_{(12th\ week\ test\ results)}$ = .22, p= .63>.05**)

*Note.*** The homogenous distribution was obtained p>.05, *There is a statistically significant difference * p < .05.

To provide further clarity on the results, an ANOVA was conducted to evaluate the word retention of the students over a period of four weeks. The study also assessed the effects of the two teaching strategies on the students' word retention. According to the findings, the pre-test results didn't show any statistical significance because the words chosen by the experts, are not included in the curriculum. Thus, the participants didn't know most of the words. In addition, the results showed a significant improvement in word retention when comparing the two techniques used to evaluate the four-week interval tests (Mean $_{(4th\ week)}$ =72.28>61.57; Mean $_{(8th\ week)}$ =71.14>60.71; Mean $_{(12th\ week)}$ =75.28>59.57), implying that the artificial intelligence-supported speech recognition pronunciation teaching model aided students in improving their memory of words for a longer period of time than the phonetic alphabet pronunciation teaching method. At partial η2 value, .01 low potency, .06 average potency, .14 and above are considered high potency (Karakaş, 2017). According to the partial effect size value, an average potential effect was detected in favor of the artificial intelligence-supported voice recognition method ($\eta 2_{(4th\ week)}$ =.105; $\eta 2_{(8th\ week)}$ =.122; $\eta 2_{(12th\ week)}$ =.190). Therefore, the H1 and Ha1 hypotheses is confirmed. After analyzing the pre-test and post-test scores, it was found that the control group had a success rate of 86.20%, while the experimental group had a success rate of 89.09%. Therefore, it can be concluded that the method applied in the experimental group was more successful than in the control group.

### 3.2. Interview Results

The opinions of the experiment and the control group were gathered through the research process and the results were presented in Table 3 below as frequencies and percentages. The results are as follows:

**Table 3.** *The Semi-Structured İnterview Results*

| Questions | Categories | Experimental Group | | Control Group | |
|---|---|---|---|---|---|
| | | f | % | f | % |
| 1. Do you think you can remember words better with the phonetic alphabet technique? (For the control group.) | Yes | X | X | 15 | 53.60 |
| | No | X | X | 13 | 46.40 |
| 2. Do you think you can remember words better with artificial intelligence techniques? (For the experimental group.) | Yes | 27 | 96.40 | X | X |
| | No | 1 | 03.60 | X | X |
| 3. Do you think that the applied technique contributes to practicing your pronunciation skills in a foreign language in daily life? | Yes | 20 | 71.40 | 13 | 46.40 |
| | No | 8 | 28.60 | 15 | 53.60 |
| 4. In what ways do you think these techniques have improved your language learning? | Pronunciation | 7 | 25.00 | 2 | 07.10 |
| | Fun | 8 | 28.60 | 9 | 32.10 |
| | Learning new vocabulary | 1 | 03.60 | 5 | 17.90 |
| | Speaking | 2 | 07.10 | 5 | 17.90 |
| | Remembrance of the words easily | 6 | 21.40 | 3 | 10.70 |

| | | | | | |
|---|---|---|---|---|---|
| | The attitude | 4 | 14.30 | 4 | 14.30 |
| | Phonetic Symbols | X | X | 16 | 57.10 |
| 5. In which ways do you think you have had difficulty with the applied technique? | Memorization | 11 | 39.30 | 4 | 14.30 |
| | I didn't have any difficulty | 17 | 61.70 | 8 | 28.60 |
| 6.Did the applied technique improve your vocabulary acquisition in general? | Yes | 28 | 100.00 | 15 | 53.60 |
| | No | 0 | 00.00 | 13 | 47.40 |
| Total for each item | | 28 | 100.00 | 28 | 100.00 |

Based on the statements obtained from the respondents, the findings suggest that in the experimental group, the words were remembered to a greater extent (96.40%) than in the control group (53.60%). In terms of the contribution of the techniques in daily life, the artificial intelligence-supported speech recognition technique was stated to be more beneficial (71.40%) than the phonetic alphabet pronunciation teaching process (46.40%). Although the most benefited areas were "entertainment" and "learning words readily" in the experimental group, the most beneficial area was the "entertainment" factor in the control group. While the least utilized regions were classified as "new vocabulary acquisition" in the experimental group, this area was specified as the "pronunciation" area in the control group. It was also discovered that in the control group, the most challenging area was the symbols of the phonetic alphabet (57.10%) and the least challenging part was the memorization part (14.30%). As it contains Latin symbols, it may be difficult for the participants to memorize their utterances. Furthermore, in the experimental group, the most challenging part was the remembrance of the words (39.30%). The experimental group's and the control group's opinions on the vocabulary acquisition improvement in general were exceptionally successful. Nonetheless, the maximum percentage (100.00%) of agreement on the enhancement of vocabulary acquisition in the experimental group was attained, rather than in the control group.

**4. Discussion**

The findings of the investigation revealed that the experimental group who utilized the artificial intelligence-supported speech recognition pronunciation instruction method considerably boosted their word memory capacities. However, the learning attitude of the control group did not exhibit improvement regarding the phonetic alphabet owing to the perplexing alphabet. In other words, artificial intelligence-supported speech recognition is a learning method that may enhance students' word recall capability much better than the international phonetic alphabet pronunciation teaching method. Referring to the enhancement of the pronunciation teaching model regarding word remembrance, the artificial intelligence-supported speech recognition pronunciation teaching method makes it feasible to facilitate participants' recalling phrases throughout the learning activities to make them more memorable for a longer duration. In a review of research (Karlina, Rahman & Chowdhury, 2020; Lee, 2021) that utilized the artificial intelligence-supported speech recognition pronunciation education technique for a pronunciation program, a substantial impact of the artificial intelligence-supported speech recognition pronunciation instruction method on learning performance was identified. Through the interview findings, the benefits of the artificial intelligence-supported speech recognition pronunciation instruction method may also be recognized. Participants indicated that playing the game using an artificial intelligence-supported voice recognition WEBsite boosted their pronunciation skills as well as their word memory capacities, prompting them to think about whatever sections perplexed them. This coincides with a statement by academics in pronunciation education (Dillon & Wells, 2021; Tejedor García et al., 2020; Spring & Tabuchi, 2021) that effective techniques may assist learners by encouraging them to participate actively and think critically. The artificial intelligence-supported speech recognition pronunciation method offers significant potential to reinvent pronunciation teaching with appropriate techniques. For instance, Dillon & Wells (2021) discovered that there was a remarkable enthusiasm for the convenience and effectiveness of speech recognition, with over 72% of respondents thinking that the technique was both affordable and beneficial. In terms of support for the utilization of speech recognition as a testing technique, 60% claimed that they believed they performed well on the exam. On the other hand, Spring & Tabuchi (2021) revealed the effects of speech recognition on pronunciation skills as the findings indicated that enthusiastic behavior was gathered by the participants towards the speech recognition-assisted practice and that intelligibility was obviously fairly improved, particularly for the ones who started with lower competence. Furthermore, the method was shown to be most effective for students who scored less than 95%

on their pretests. Moreover, participants felt the software was most beneficial for learning consonant and vowel sounds, but a statistical model failed to specify which sessions were most helpful for their general growth. Similar data were collected in other studies, which revealed significant pronunciation development among participants who used the computer-aided pronunciation tool (Tejedor Garcia et al., 2020). As a result of these studies it can be concluded that utilizing speech recognition systems enhances pronunciation and word retention skills. In this study, it was clearly observed that participants enjoyed, and made improvements on their word retention skills.

**5. Conclusion**

Tech-supported pronunciation education has received considerable attention in recent years. Nowadays, the significance of phonemic awareness is expanding with each passing day. Particularly during communication, blunders produced by mispronunciation of phrases may induce a loss of confidence in individuals; hence it can be recognized that these individuals refrain from communicating. In order to overcome these challenges, this research carried out an experiment on pronunciation education in foreign language education with different techniques for vocabulary acquisition.

According to the quantitative data analysis, a 25-item vocabulary set was administered as a pre-test to both the experimental group and the control group prior to the start of the study. Based on the results, each group received different pronunciation courses to practice the vocabulary for one week. The ANOVA results indicated that the success rate of the experimental group was higher than that of the control group. Therefore, it was concluded that the artificial intelligence-supported speech recognition and pronunciation technique was slightly more effective than the phonetic alphabet. With the advancement of technology, it is crucial to adopt new approaches to pronunciation teaching. Hence, based on the findings of this study, it is recommended that WEB 2.0 tools with artificial intelligence-supported speech recognition capability should be integrated into the curriculum in the future.

Based on the interviews carried out at the end of the process, it was mentioned that the majority of the participants had benefited from pronunciation training with artificial intelligence-supported speech recognition and that it contributed to them in various areas. As a consequence of these views, it is advised that this application should be considered appropriately in terms of increasing the quality of the pupils' pronunciation instruction and guaranteeing that the phrases are more effectively remembered. In addition, when the answers to the interview questions at the end of the process were analyzed, it was found that most of the participants would use the techniques learned in their daily lives, and it was stated that these techniques contributed to the participant's enjoyment of the process. Nevertheless, it was concluded from the interview findings that the symbols of the phonetic alphabet method restricted and forced the students in a sense and contributed to the students' pronunciation of the words, making it the most challenging way for the participants to learn the phonetic alphabet. Therefore, it can be stated that rather than memorizing the phonetic alphabet, directly hearing and pronouncing the word is much more convenient for the participants.

In general, and particularly during the COVID-19 pandemic, considering that students' motivation in schools has diminished, vocabulary instruction in foreign language learning should not be abandoned just in the path of memory but should be reinforced by supplementary training. In order to achieve this, similar studies have carried out experiments on speech recognition's effects on pronunciation. According to one of the studies cited in the experiments, speech recognition with pronunciation provides significant improvements over the letter-based baseline, as measured by word-error rates (Xu et al., 2021). In another study, Arora et al. (2018) focused on the phonological features of speech recognition systems by extracting phonemes when analyzing the speech of the participants in learning a language through speech recognition. According to the research, word-level feedback aids learners in achieving more effective results in their learning of new languages.

In this research, one of these contemporary supplementary lessons was identified, and it was designed to contribute to the students' confidence in their communicating abilities in the target language by promoting the growth of not only the meaning of words but also their pronunciation skills in the future. Throughout this entire process, it is anticipated that employing strategies that will promote motivation with the use of technology and games in future research on pronunciation will allow the participants to retain the words longer. Consequently, future research should concentrate on whether these strategies boost motivation or if they are supported by various methods of the influence of pronunciation training on vocabulary acquisition.

## 6. Limitations and Suggestions For Future Research

In this study, the participants were assigned to either the experimental or control group based on availability, meaning that the group each participant was assigned to was determined by practical considerations, such as the availability of the participant and the scheduling of the study. While this method of assigning participants to groups may introduce potential sources of bias, such as selection bias or confounding variables, it is important to note that random assignment was not feasible in this case. Nonetheless, the study aimed to minimize the potential for bias through other means, such as ensuring that the pre-test scores of the experimental and control groups were similar. To ensure the validity of the study's conclusions, it is important to consider the potential limitations of non-random assignment. For example, it is possible that the participants who were available for the study may have differed in important ways from those who were not available, which could affect the results of the study. Additionally, the results may not be generalizable to other populations, as the sample of participants was limited to high school students aged 14-15.

Despite these limitations, the study employed appropriate statistical methods to analyze the data and draw conclusions about the effects of the two different pronunciation teaching methods on word retention capability. By using a repeated measures ANOVA, the study was able to compare the differences between the experimental and control groups over time, while controlling for individual differences in pre-test scores. Overall, while the method of assignment to groups may have introduced potential sources of bias, the study's rigorous statistical analysis helps to ensure the validity of its findings.

This research combined an artificial intelligence-supported speech recognition teaching approach to support vocabulary acquisition and revealed that it successfully increased the students' recollection of unknown words. There are implications for English instructors and scholars. The first implication is utilizing pronunciation practice techniques. The pronunciation course with an artificial intelligence-supported speech recognition method focuses on repeated practice on word memory, and technology has seldom been required to assist with pronunciation training on word retention. Implementing the artificial intelligence-supported speech recognition pronunciation practice method coupled with online teaching and offline tutorial instruction benefited the students by integrating informed theory into practical practice. The findings of this research offer promising potential for overcoming communication barriers through the implementation of appropriate technology and techniques for improving vocabulary skills. In addition, students may get a comprehensive grasp of the tech-related theoretical concepts of pronunciation through the use of artificial intelligence-supported speech recognition online apps. This may motivate English instructors or academics to come up with new communication technologies to cater to learners' demands. The study findings may also be valuable for academic or educational English app developers to produce more productive apps to facilitate the learning process.

There are shortcomings in this research that should be acknowledged. First of all, the sample size was restricted since, in English classes, it is nearly impossible to ensure the effectiveness of teaching if the class size is too-large. Secondly, considering the particular properties of phonemes in the phonetic alphabet, it could be challenging for the participants to grasp the alphabet in a short period of time. Therefore, learners' technology acceptability and the curriculum design should be taken into account to improve participants' pronunciation and vocabulary learning with the use of technology. In the long term, it would therefore be worth developing and adapting the existing strategy to new disciplines of pronunciation teaching. Eventually, there will be a great desire to investigate additional technological gadgets and instructional methodologies for pronunciational vocabulary acquisition in order to boost students' word remembrance capabilities and their learning perspectives.

## 7. Declarations

Authors declare no conflict of interest.

Athors declare that all the ethical standards were obtained.

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**8. References**


Alemi, M., Meghdari, A., & Ghazisaedy, M. (2015). The impact of social robotics on L2 learners' anxiety and attitude in English vocabulary acquisition. *International Journal of Social Robotics*, *7*(4), 523-535.

Arora V., Lahiri A., Reetz H., (2018). Phonological feature-based speech recognition system for pronunciation training in non-native language learning. *The Journal of the Acoustical Society of America*, 143(1), 98-108. https://doi.org/10.1121/1.5017834

Başoğlu, E. B., & Akdemir, O. (2010). A comparison of undergraduate students' English vocabulary learning: Using mobile phones and flash cards. *Turkish Online Journal of Educational Technology-TOJET*, *9*(3), 1-7.

Britannica (2022). International phonetic alphabet. Encyclopedia Britannica. Available at: https://www.britannica.com/topic/International-Phonetic-Alphabet (accessed 21 February 2022)

Chang, C. C., Yan, C. F., & Tseng, J. S. (2012). Perceived convenience in an extended technology acceptance model: Mobile technology and English learning for college students. *Australasian Journal of Educational Technology*, *28*(5).

Chiu, Y., Kao, C., & Reynolds, B. (2012). The relative effectiveness of digital game-based learning types in English as a foreign language setting: A meta-analysis. *British Journal of Educational Technology*, 45(3), 104-107.

Condecosoftware. (2022). The history of voice recognition technology. Available at: https://www.condecosoftware.com/blog/a-history-of-voice-recognition-technology/ (accessed 15 January 2022)

Cutler, A. (2015). Lexical stress in English pronunciation. *The handbook of English pronunciation* 106-124. https://doi.org/10.1002/9781118346952.ch6

DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development: Theory and applications*. Sage.

Dillon T., & Wells D. (2021). Student perceptions of mobile automated speech recognition for pronunciation study and testing. *English Teaching*, 76(4), 101-122. https://doi.org/10.15858/engtea.76.4.202112.101

Dušek R., Popelková R. (2021). Map labeling with the international phonetic alphabet: the example of the middle east. *Journal of Maps* 17(1), 136-144.

Dwyer O. (2022). Speak easy games to learn English. Available at: https://www.gamestolearnenglish.com/speak-easy/ (12 December 2022)

Evers K., Chen S. (2021). Effects of automatic speech recognition software on pronunciation for adults with different learning styles. *Journal of Educational Computing Research*, 59(4), 669–685. https://doi.org/10.1177/0735633120972011

Eysenbach G., Köhler C. (2002). How do consumers search for and appraise health information on the world wide WEB? Qualitative study using focus groups, usability tests, and in-depth interviews. *BMJ*, 324(7337), 573-577.

Golshan M., Nejad M. Z., Naeimi A. (2021). The effect of synchronous and asynchronous computer-mediated communication (CMC) on learners' pronunciation achievement. *Cogent Psychology*, 8(1), 1-18. https://doi.org/10.1080/23311908.2021.1872908

Huang, X., Baker, J., & Reddy, R. (2014). A historical perspective of speech recognition. *Communications of the ACM*, *57*(1), 94–103. https://doi.org/10.1145/2500887

Karlina Y., Rahman A., & Chowdhury R. (2020). Designing phonetic alphabet for Bahasa Indonesia (PABI) for the teaching of intelligible English pronunciation in Indonesia. *Indonesian Journal of Applied Linguistics*, *9*(3), 724-732. https://doi.org/10.17509/ijal.v9i3.23223

Kruk M., & Pawlak M. (2021). Using internet resources in the development of English pronunciation: the case of the past tense-ed ending. *Computer Assisted Language Learning* 1-33. https://doi.org/10.1080/09588221.2021.1907416

Lee J. S. (2021). *Informal digital learning of English: research to practice* (1st ed.). Routledge. https://doi.org/10.4324/9781003043454

Levis J. M. (2005). Changing contexts and shifting paradigms in pronunciation teaching. *Teachers of English to Speakers of Other Languages*, 39(3), 369-377. https://doi.org/10.2307/3588485

Liakin D., Cardoso W., Liakina N. (2014). Learning L2 pronunciation with a mobile speech recognizer: French/y/. *CALICO Journal*, 32(1), 1–25. https://doi.org/10.1558/cj.v32i1.25962

Liakin D., Cardoso W., Liakina N. (2017). Mobilizing instruction in a second-language context: Learners' perceptions of two speech technologies. *Languages*, 2(3), 11–32. https://doi.org/10.3390/languages2030011

Lowenberg P. H. (2002). Assessing English proficiency in the expanding circle. *World Englishes*, 21(3), 431-435. https://doi.org/10.1111/1467-971X.00261

McCrocklin S. (2016). Pronunciation learner autonomy: The potential of Automatic Speech Recognition. *System*, *57*(1), 25-42. https://doi.org/10.1016/j.system.2015.12.013.

McCrocklin S. (2019). ASR-based dictation practice for second language pronunciation improvement. *Journal of Second Language Pronunciation*, 5(1), 98-118. https://doi.org/ 10.1075/jslp.16034.mcc.

Miles M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage Publications, Inc.

Nunnally, J. C. (1975). Psychometric theory—25 years ago and now. *Educational Researcher*, *4*(10), 7-21. https://doi.org/10.3102/0013189X004010007

Reed M., Michaud, C. (2015). *Intonation in research and practice: The importance of metacognition.* The handbook of English pronunciation (pp. 454-470). https://doi.org/10.1002/9781118346952.ch25

Solak, E., & Cakir, R. (2015). Exploring the effect of materials designed with augmented reality on language learners' vocabulary learning. *Journal of Educators Online*, *12*(2), 50-72.

Spring R., & Tabuchi R. (2021). Assessing the practicality of using an automatic speech recognition tool to teach English pronunciation online. *Journal of English Teaching through Movies and Media*, *22*(2), 93-104.

Sun, C.-T., Wang, D.-Y., & Chan, H.-L. (2011). How digital scaffolds in games direct problem-solving behaviors. *Computers & Education, 57*(3), 2118-2125.

Tanner M., Landon M. (2009). The effects of computer-assisted pronunciation readings on ESL learners' use of pausing, stress, intonation, and overall comprehensibility. *Language Learning and Technology*, *13*(3), 51-65. http://llt.msu.edu/vol13num3/tannerlandon.pdf

Tejedor-García C., Escudero-Mancebo D., Cámara-Arenas E., González-Ferreras C., Cardeñoso-Payo V. (2020). Assessing pronunciation improvement in students of English using a controlled computer-assisted pronunciation tool. *IEEE Transactions on Learning Technologies*, *13*(2), 269-282. https://doi.org/10.1109/TLT.2020.2980261

Tseng, J.-L. (2021). Intelligent Augmented Reality System based on Speech Recognition. *International Journal of Circuits, Systems and Signal Processing*, *15*, 178–186. https://doi.org/10.46300/9106.2021.15.20

Vihman, M. M. (2015). *Acquisition of the English sound system.* The Handbook of English Pronunciation pp. 331-352). https://doi.org/10.1002/9781118346952.ch19

Xu W., Ouyang F. (2021). A systematic review of ai role in the educational system based on a proposed conceptual framework. *Education and Information Technologies*, 26(6), 1-29. https://doi.org/10.1007/s10639-021-10774-y

Zeinali Nejad M., Golshan M., Naeimi A. (2021). Pronunciation achievement in computer-mediated communication (CMC) classrooms. *International Journal of Foreign Language Teaching and Research*, *9*(38), 205-214. https://doi.org/10.52547/JFL.9.38.205

## 11. Appendix

### *A. The Cambridge Preliminary Words List:*

**Table 4.** The 25-Words selected from the word list by the experts:

| | | | | |
|---|---|---|---|---|
| Fare | Queue | Accurate | Depth | Fetch |
| Issue | Litter | Annoy | Bay | Avoid |
| Brake | Charity | Comma | Collar | Complicated |
| Consist | Convenient | Description | Dig | Hitchhike |
| Obvious | Owe | Pile | Permit | Spoil |

The B1 preliminary word list can be downloaded from here:
https://www.cambridgeenglish.org/images/506887-b1-preliminary-2020-vocabulary-list.pdf

### *B. Semi-Structured Interview Questions After Learning Activities:*

1. Do you think you can remember words better with the phonetic alphabet technique? (For the control group.)
2. Do you think you can remember words better with artificial intelligence techniques? (For the experiment group.
3. Do you think that the applied technique contributes to practicing your pronunciation skills in a foreign language in daily life?
4. In what ways do you think these techniques have improved your language learning?
5. In which ways do you think you have had difficulty with the applied technique?
6. Did the applied technique improve your vocabulary acquisition in general?